2002-2003 Science Planning Summary

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Aeronomy & Astrophysics

Read more about it on the NSF website

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The polar regions have been called Earth's window to outer space. Research projects here require the unique conditions of the Antarctic. What scientists learn from these projects contributes to the understanding of Antarctica's role in global environmental change. The Aeronomy & Astrophysics branch of Antarctic science promotes interdisciplinary study of geosphere-biosphere interactions in the middle and upper atmosphere. It contributes to our understanding of the interactions between the polar atmosphere and the magnetosphere and how solar activity affects both.

Program Manager: Dr. Vladimir Papitashvili. Read more about Dr. Papitashvili.

List this year's Aeronomy & Astrophysics projects

Biology & Medicine

Read more about it on the NSF website

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The Antarctic Biology & Medicine program funds research that will improve understanding of the physiology, behavior, adaptations, and processes of Antarctic life forms and ecosystems. Support is focused on these areas:

- Marine ecosystem dynamics
- Terrestrial and limnetic ecosystems
- Population biology and physiological ecology
- Genetic adaptation
- Human behavior and medical research

Program Manager: Dr. Polly Penhale. Read more about Dr. Penhale

List this year's Biology & Medicine projects

Antarctica represents about 9 percent of the Earth's continental crust and has been in a near-polar position for more than 100 million years. It is covered by a continental ice sheet with an average thickness of 3 kilometers. In geophysics, the Antarctic continent and its environs have a central role in the geodynamic processes that have shaped the present global environment. Important program areas include:

Geology & Geophysics

Read more about it on the NSF website

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- Antarctica's tectonic evolution and its relationship to that of other continents
- The structure of the continent's crust
- The continent's effect on paleocirculation of the world oceans, on the evolution of life, and on global paleoclimates as well as the present climate
- Detailed history of the ice sheets, identifying geological controls to ice sheet behavior and defining geological responses to the ice sheets on both regional and global scales
- The evolution of sedimentary basins on the continent and along its margins

Program Manager: Dr. Scott Borg. Read more about Dr. Borg

List this year's Geology & Geophysics projects

Glaciology

Read more about it on the NSF website

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The Antarctic Glaciology program is concerned with the history and dynamics of the Antarctic ice sheet including the study of near-surface snow and firn, floating glacier ice (ice shelves), ice streams, and continental and marine ice sheets. Program emphases include paleoenvironments from ice cores, ice dynamics, numerical modeling, glacial geology, and remote sensing of ice sheets. Some specific objectives are:

- Correlation of climatic fluctuations evident in Antarctic ice cores with data from arctic and lower-latitude ice cores
- Integration of the ice record with the terrestrial and marine records
- Investigation of the physics of fast glacier flow with emphasis on processes at glacier beds
- Investigation of ice-shelf stability and the identification and quantification of the feedback between ice dynamics and climate change.

Program Manager: Dr. Julie Palais. Read more about Dr. Palais

List this years Glaciology projects

Antarctic oceanic and tropospheric studies focus on the structure and processes of the ocean-atmosphere environment and their relationships with the global ocean, the atmosphere, and the marine biosphere. As part of the global heat engine, the Antarctic has a major role in the world's transfer of energy. Its ocean/atmosphere system is both an indicator and a component of climate change. Major program elements include:

Oceans & Climate

Read more about it on the NSF website

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- Physical oceanography
  - The dynamics of the polar oceans,
  - The interaction of wind, solar radiation, and heat exchange,
  - Water-mass production and modification processes,
  - Ocean dynamics at the pack-ice edge, and
  - The effect of polynyas on ventilation
- Chemical oceanography
  - Chemical composition of seawater and its global differentiation,
  - Reactions among chemical elements and compounds in the ocean,
  - Fluxes of material within ocean basins and at their boundaries, and
  - Time and space scales of oceanic processes.
- Sea-ice dynamics
  - Material characteristics of sea-ice from the individual crystal to the large-scale patterns of freezing, deformation, and melting
- Meteorology
  - Atmospheric circulation systems and dynamics including the energy budget,
  - Atmospheric chemistry,
  - Transport of atmospheric contaminants to the Antarctic, and
  - The role of large and mesoscale systems in global exchange of heat, momentum, and trace constituents.

Program Manager: Dr. Bernhard Lettau. Read more about Dr. Lettau

List this year's Oceans & Climate projects

Artists & Writers

Read more about it on the NSF website

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The Artists & Writers Program provides opportunities for the humanities -- painting, photography, writing, history, and other liberal arts -- to be a part of the U.S. Antarctic Program. Artists and writers work at stations and field camps, often with science groups but also on their own. The program helps record America's Antarctic heritage and responds to White House direction that the USAP support a range of U.S. Antarctic interests.

Candidates apply for the program and compete in a peer-review selection process. Awardees receive field support including air travel, but no direct award of funds.

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Program Manager: Mr. Guy Guthridge. Read more about Mr. Guthridge

List this year's Artists & Writers projects

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USAP Station Schedules & Overviews

	Austral Summer Season Openings		Austral Summer Season Closing	Estimated Population	
Station	**Operational**	**Science**		**Summer**	**Winter**
McMurdo	19 August 2002 (WinFly*)	02 October 2002 (mainbody)	22 February 2003	1,000 (weekly average) 2,900 (total)	200 (winter total)
South Pole	23 October 2002	30 October 2002	15 February 2003	220 (weekly average) 600 (total)	60 (winter total)
Palmer	29-September-2002	17 October 2002	May 2003	37-44 (weekly average) 60 (total)	35 (winter total)
Research Vessels	**Year-round**			**RV / IB NBP**	**RV LMG**
				39 science & staff 25 crew	32 science & staff 25 crew

*Four research projects begin at McMurdo.

McMurdo Station	Amundsen-Scott South Pole Station	Palmer Station	USAP Research Vessels	Other (not station-based)

McMurdo Station

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McMurdo Station is the largest of the United States Antarctic stations, and is the main operational center for the continental U.S. Antarctic Program. It has two landing strips and more than 100 buildings ranging in size from a small radio shack to large, three-story structures linked by above ground water, sewer, telephone, and power lines. Read more about it...

Support contractor staff at McMurdo Station provide support to temporary and long-term field camps. Read more about it...

McMurdo-based air operations personnel and contractors provide air support to deep field camps, to South Pole Station and for project logistics. Read more about it...

List this year's McMurdo-based projects

Amundsen-Scott South Pole Station

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Established in 1957, the Amundsen-Scott South Pole Station has always been operated year-round. Station elevation is 2900 meters (?? feet) and is the coldest, driest, windiest place on earth?. No landmarks are visible on the 3,000-meter-thick plateau of ice 1,350 km (? miles) from McMurdo Station. Scientific research at the station falls into the general disciplines of upper-atmosphere physics, meteorology, earth sciences, geophysics, glaciology, biomedicine, and astrophysics. Air transportation is provided by the New York Air National Guard's 109th Airlift Wing.

Read more about it...

List this year's South Pole-based projects

Palmer Station

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Palmer Station is the only United States Antarctic Program station on the Antarctic Peninsula, and is a base for Aeronomy, Biology, Geology & Geophysics, and Oceans & Climate Systems research. The station receives all logistics support from the Research Vessel *Laurence M. Gould*, a USAP-chartered research and supply vessel. The *Gould* transports cargo and personnel to and from the station throughout the entire year. Therefore, unlike the McMurdo and South Pole stations, Palmer Station does not have the long period of winter isolation associated with "wintering-over" in Antarctica.

Read more about it...

List this year's Palmer-based projects

USAP Research Vessels

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The USAP operates two scientific research vessels, the Nathaniel B. Palmer (NBP) and the Laurence M. Gould (LMG).

Both vessels are managed for the NSF by the support contractor, Raytheon Polar Services Company (Denver, CO), on a long-term charter from Edison Chouest Offshore (Galliano, LA).

Unlike continent-based research stations, the USAP vessels operate on year-round schedules. Each cruise is identified by a unique cruise number. Three letters indicate the ship (NBP or LMG). The first two digits indicate the calendar year and the next two indicate the sequential cruise number. At the time of this printing, the NBP is scheduled through April 2003 to support eight science projects. Other projects will be added when their requirements and logistics needs are determined. Look for the latest scheduling information on the Internet at http://www.usap.gov/science/marine.

Read more about it...

List this year's RV LMG-based projects

List this year's RV/IB NBP-based projects

Other (not station-based)

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Every year, the NSF supports projects that are not tied to any of the USAP stations. Some of these entail collaboration with other U.S. governmental entities, such as NOAA, NASA, or the USGS;. Others involve collaboration with other national Antarctic programs, including projects invited to work at the bases or on the research vessels of other nations. Most of these non-station-based projects deploy around the periphery of the Antarctic continent, often at island locations or at sea in the Southern Ocean. All have their own unique requirements for planning and logistical support.

List this year's non station-based projects

2002-2003 Science Planning Summary

Technical Events

Table of Contents	Project Indexes	USAP Program overviews	Station schedules & overviews	Technical Events

Every field season, the USAP sponsors a variety of technical events that are not scientific research projects but support one or more science projects.

NASA (GSFC)	NASA (GSFC): NAILS, MTRS1, MTRS2, and SPTR
ICDS	Ice Core Drilling Services (ICDS)
Scripps AARC	Arctic and Antarctic Research Center at Scripps Institution of Oceanography
CTBT	Installation, operation and maintenance of a Comprehensive Test Ban Treaty (CTBT) class infrasound array in Windless Bight, Antarctica
MGS	NASA/McMurdo Ground Station (MGS)

NASA (GSFC) NAILS, MTRS1, MTRS2, and SPTR

Event #: TO-008-O

Station: McMurdo

Work Site: McMurdo

Team Leader: Michael Comberiate

Affiliation:
NASA (GSFC)
Code 422
Building 16W, Room N066
Greenbelt, MD 20771
301.286.2165
mike.comberiate@gsfc.nasa.gov

NASA researchers will be performing the following maintenance and upgrades to their systems during the Austral 2002-2003 summer season:

NAILS two-meter satellite tracking station on Ross Island:

- Install new diplexor/LNA for antenna
- Perform system checkup, test and repair if necessary
- Examine spares, re-organize, and retrograde old equipment and equipment for Antarctic Museum display

Project Description: MTRS1 and MTRS2 TDRS uplink station on Black Island:

- Perform system checkup, repair if necessary
- Install new waveguide switches

The project team will work with a staff communications technician for reconfigurations and repairs. Except for AC power, heat, and internet support to the project team's equipment, normal operations will require no support from McMurdo station contractor support personnel. One communications technician will be needed in the vicinity of the equipment during launch support of NOAA 17 (launched in June 2002) and the DMSP satellite launch scheduled for October 2002.

ICDS Ice Core Drilling Services (ICDS)

Event #: TO-150-M/S

Station: McMurdo and South Pole Stations

Work Site: Windless Bight, ?where at the pole?

Team Leader: Dr. Charles R. Bentley

Affiliation: University of Wisconsin Madison
Department of Geology and Geophysics
1215 W. Dayton Street
Madison, WI 53706
608.262.0693
bentley@geology.wisc.edu

Project Description: Supporting Sridhar Anandakrishnan's glaciology project (IO-205-O) the McMurdo-based ICDS team will test modifications to the shot hole drill at Windless Bight and will drill 600 holes at Onset D. IN its current configuration the drill can penetrate 35 meters. By using casing in the hole, the project team will attempt to achieve 75-meter depths.

Supporting Rhett Butler's GO-090-S, the South Pole-based project team will operate the ICDS 4-inch drill system to core and then ream out three 12" diameter boreholes to a depth of about 300 meters. The USGS group will deploy seismometers into the boreholes.

Tests of new components on the drilling/reamer system are also planned for the 2002-2003 austral summer. The ICDS team will be based in a tent camp eight kilometers from the South Pole station.

Scripps AARC — Arctic and Antarctic Research Center at Scripps Institution of Oceanography (AARC), TeraScan project

Event #: TO-312-M/N/P

Station: McMurdo and Palmer Stations, RV/IB Nathaniel B. Palmer

Work Site: Windless Bight

Team Leader: Dr. Dr. Dan Lubin

Affiliation:
Scripps Institution of Oceanography
Arctic and Antarctic Research Center
California Space Institute
9500 Gilman Drive, mail code 0214
La Jolla, CA 92093-0221
858.534.6369
dlubin@ucsd.edu
http://arcane.ucsd.edu

Project Description:

The AARC is funded to archive and distribute all NOAA and DMSP (Defense Meteorological Satellite Program) data collected south of 60 degrees. The data from polar orbiting satellites are collected by ground stations at McMurdo and Palmer Stations aboard the RV/IB Nathaniel B. Palmer. It is distributed by ARCC to the scientific community and to support contractor meteorologists for forecasting.

No AARC project team will be traveling to Antarctica this season. Support contractor technicians will collect data from each TeraScan-equipped station. Data collection is scheduled for the maximum coverage and quantity of NOAA and DMSP data for the McMurdo region on a year-round basis. Before sending the data out, ARCC personnel check it for quality by reading and processing random collected passes.

CTBT — Installation, operation and maintenance of a Comprehensive Test Ban Treaty (CTBT) class infrasound array in Windless Bight, Antarctica

Event #: TO-396-O

Station: McMurdo

Work Site: Windless Bight

Team Leader: Mr. Daniel L. Osborne

Affiliation:
University of Alaska Fairbanks
Geophysical Institute
903 Koyukuk Avenue
P.O. Box 757320
Fairbanks, AK 99775-7320
907.474.7107
dosborne@gi.alaska.edu
http://maxwell.gi.alaska.edu/~infra/

This group operates and maintains a CTBT (Comprehensive Test Ban Treaty) infrasound array across the globe.

Project Description: In Antarctica this season, the project team will refuel and service the power system at the Windless Bight installation. Team members will establish a camp at the site, and plan to spend about two weeks in the field. The project team includes a technician from Northern Power Systems who will service the diesel generators. The CTBT Hub Room will be reconfigured to accommodate the additional equipment required by the AFTAC seismic team.

Data from the Windless Bight system is forwarded to the CTBT office in Vienna, as well as to the principal investigator's home institution where it will be made available for research into the natural infrasonic background.

MGS NASA/McMurdo Ground Station (MGS)

Event #: TO-927-O

Station: McMurdo

Work Site:

Team Leader: Mr. Ken Griffin

Affiliation: Honeywell Technical Solutions, Inc.
NASA Wallops Flight Facility
Building E-106, Room 209
Wallops Island, VA 23337
757.824.2478
Ken.Griffin@csoconline.com

Project Description: NASA’s McMurdo Ground Station (MGS) performs critical support for countdown, liftoff and early-orbit phases of satellite launching operations. It also tracks a variety of in-orbit scientific (TRACE, FAST, WIRE, SWAS, GRACE 1 and 2, SAC-C, CHAMP, etc.) and mapping (Radarsat, Lansat-7,QuikSCAT, ERS-2, etc.) satellites. MGS supplies real time data (downlink) and commanding (uplink) support to a variety of projects via NASA’s dedicated 128Kbit data line. Voice support is through a dedicated 16Kbit voice loop with Goddard Space Flight Center. Radarsat, ERS-2 SAR, and Taurus START 2 treaty compliance data will be shipped back to the U.S. for processing. If requested, MGS will uplink data through the MTRS-1 ground station located on Black Island, or MTRS-2 ground station located on Crater Hill through TDRSS (Telemetry and Data Relay Satellite System) to White Sands, New Mexico.

Each austral summer, project team members at McMurdo Station are responsible for the maintenance and operation of the ground station.

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Principal Investigators

PI Last Name	PI First Name	NSF/OPP Award #	Project Title	Event #
Adriani	Alberto	90-17805	Study of polar stratospheric clouds by LIDAR	AO-107-O
Ainley	David	01-25608	Geographic structure of Adelie penguin populations: Demography of population expansion	BO-031-O
Albert	Mary	98-14676	U.S. ITASE: Snow and firn microstructure and transport properties	IU-155-O
Amsler	Charles	01-25181	The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula	BO-022-L/P
Anandakrishnan	Sridhar	00-86297	Characterizing the onset of ice stream flow: A ground geophysical program	IO-205-O
Arcone	Steven	98-14589	U.S. ITASE: High resolution radar profiling of the snow and ice stratigraphy beneath the ITASE traverses	IU-311-O
Avallone	Linnea	98-75829	In situ measurements of halogen oxides in the troposphere	AO-132-O
Avery	Susan	00-00957	Dynamics of the Antarctic MLT (mesosphere-lower-thermosphere) region using ground-based radar and TIMED instrumentation	AO-284-O
Bales	Roger	98-14810	U.S. ITASE: Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica	IU-158-O
Bao	Huiming	01-25842	Multiple isotope analyses of soil sulfate and nitrate in the Antarctic Dry Valleys	GO-051-O
Bart	Philip	00-94078	CAREER: Relative frequency and phase of extreme expansions of the Antarctic ice sheets during the late Neogene	GO-154-O

Berger	Glenn	99-09665	Development of a luminescence dating capability for antarctic glaciomarine sediments: Tests of signal zeroing at the Antarctic Peninsula	GO-092-O
Bieber	John	98-16129	Solar and heliospheric studies with antarctic cosmic ray observations	AO-120-M/S
Blanchette	Robert	99-09271	Investigation on deterioration in the Historic Huts of the Ross Sea region of Antarctica	BO-038-O
Bowser	Samuel	00-03639	Seasonal dynamics of giant agglutinated foraminifera	BO-043-O
Butler	Rhett	EAR 00-04370	Global Seismograph Station: IRIS & USGS/ASL	GO-090-P/S
Cande	Steve	01-26340 01-26334	Improved Cenozoic plate reconstructions of the circum-Antarctic region	GO-071-O
Carlstrom	John	00-94541	DASI (Degree Angular Scale Interferometer)	AO-373-O
Castellini	Michael	01-30417	Effects of foraging on the lipid biochemistry of freely diving Weddell seals	BO-199-O
Chereskin	Teresa	98-16226	Shipboard acoustic doppler current profiling on R/V Nathaniel B. Palmer and R/V Laurence M. Gould	OO-317-L
Connell	Laurie	01-25611	Yeasts in the Antarctic Dry Valleys: Biological role, distribution, and evolution	BO-019-O
Conway	Howard	00-87345	Western Divide WAISCORES site selection	IO-209-O
Cuffey	Kurt	01-25579	Dynamics and climatic response of the Taylor Glacier system	IO-161-O
Dalziel	Ian	00-03619	A GPS network to determine crustal motions in the bedrock of the West Antarctic Ice Sheet: Phase I, Installation	GO-087-M
Davis	Randall	99-09422	Hunting behavior and energetics of free-ranging Weddell seals	BO-017-O
			Antifreeze proteins in antarctic fishes: Ecological and organismal physiology,	BO-

DeVries	Arthur	99-09841	protein structure-function and mechanism, genetics, and evolution	005-M
Deshler	Terry	99-80594	In situ measurements of polar stratospheric clouds, condensation nuclei, and ozone during the austral winter and spring	AO-131-O
Detrich, III	H. William	00-89451	Structure, function and expression of tubulins, globins, and microtubule-dependent motors from cold-adapted antarctic fishes	BO-037-L/P
Doran	Peter	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	BM-042-D
Ducklow	Hugh	02-17282	Seabird component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-013-L/P
Ducklow	Hugh	02-17282	Phytoplankton ecology component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-016-L/P
Ducklow	Hugh	02-17282	Zooplankton component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-028-L/P
Ducklow	Hugh	02-17282	Bio-optical component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-032-L/P
Ducklow	Hugh	00-87872	LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-045-L/P
Dye	Timothy	01-25893	Culture emergence and health in Antarctica	BO-027-O
Eicken	Hajo	0126007	Measurements and improved parameterizations of the thermal conductivity and heat flow through first-year sea ice	OO-253-O
Ejiri	Masaki	US-Japan	All-Sky Imager at the South Pole	AO-117-O
Elliot	David	00-87919	Ferrar basaltic tuff-breccias formed by direct eruption: Evaluating an hypothesis	GO-290-O

Emslie	Steven	99-09274	Abandoned penguin colonies in Antarctica	BO-034-E
Engebretson	Mark	99-09212	Conjugate and high time resolution studies of ULF waves and magnetospheric dynamics using ground based induction magnetometers at four high latitude manned sites	AO-102-M/S
Firing	Eric	98-16226	Shipboard acoustic doppler current profiling on RVIB Nathaniel B. Palmer and RV Laurence M. Gould	OO-315-N
Fleming	Thomas	01-26106	Emplacement of the ferrar mafic igneous province: A pilot study of intrusive architecture and flow directions in Southern Victoria Land	GO-062-O
Fountain	Andrew	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-F
Fraser	William	01-30525	Monitoring the effects of tourism and environmental variability on Adelie penguins at Palmer Station, Antarctica	BO-198-P
Fraser-Smith	Antony	01-38126	The operation of an ELF/VLF radiometer at Arrival Heights	AO-100-O
Gaisser	Thomas	99-80801	South Pole Air Shower Experiment - 2 (SPASE-2)	AO-109-O
Garrott	Robert	02-25110	Patterns and processes: Dynamics of the Erebus Bay Weddell seal population	BO-009-O
Gordon	Arnold	01-25172	ANSLOPE: Cross slope exchanges at the Antarctic slope front	OO-215-O
Hall	Brenda	01-24014	Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change.	IO-196-M
Hall	Brenda	01-24014	AMS Radiocarbon Chronology of Glacier Fluctuations in South Shetland Islands during Glacial/Interglacial Hemicycle: Implications Antarctica's Role in Global Climate Change	IO-194-E
Hallet	Bernard	97-26139	Stability of land surfaces in the Dry Valleys: Insights based on the dynamics of sub-surface ice and sand-wedge polygons	GO-053-O
			U.S. ITASE: Mass balance and accumulation	IU-

Hamilton	Gordon	98-15510	rate along US ITASE routes	178-O
Hansen	Anthony	98-15140	Measurement of combustion effluent carbonaceous aerosols in the McMurdo Dry Valleys, Antarctica	OO-314-O
Harvey	Ralph	99-80452	The Antarctic search for meteorites (ANSMET)	GO-058-O
Hernandez	Gonzalo	99-09743	High-latitude Antarctic neutral mesospheric and thermospheric dynamics and thermodynamics	AO-110-M/S
Hofmann	Gretchen	00-87971	Evolutionary loss of the heat shock response in antarctic fishes	BO-134-O
Hofmann	Dave	90-17842	South Pole monitoring for climatic change -- U.S. Department of Commerce NOAA climate monitoring and diagnostic laboratory	OO-257-O
Hofmann	Dave	NSF/NOAA agreement	Collection of atmospheric air for the NOAA/CMDL worldwide flask sampling network	OO-264-O
Holzapfel	William	00-91840	ACBAR (Arcminute Cosmology Bolometer Array)	AO-378-O
Hunt	George	02-34570 (SGER)	Food web structure across a large-scale ocean productivity gradient: Top predator assemblages in the southern Indian Ocean	BO-025-E
Inan	Umran	99-09872	ELF/VLF waves at the South Pole	AO-106-S
Inan	Umran	00-93381	A VLF beacon transmitter at South Pole (2001-2004)	AO-108-O
Inan	Umran	99-10565	Global thunderstorm activity and its effects on the radiation belts and the lower ionosphere	AO-306-P
Jacobel	Robert	98-14574	U.S. ITASE: Radar studies of internal stratigraphy and bedrock topography along the traverse	IU-133-O
Jefferies	Stuart	00-87541	Mapping the sound speed structure of the sun's atmosphere	AO-115-O
Jeffrey	Wade		Latitudinal Effects of UVR on bacterioplankton: BRIDE OF TABASCO science of opportunity cruise	BO-200-O
		EAR-99-	University NAVSTAR Consortium (UNAVCO)	GO-

Johns	Bjorn	03413	GPS survey support	295-O
Kanatous	Shane	01-25475	Ontogeny of aerobic capacity, lipid metabolism, and elevated myoglobin concentrations in the skeletal muscles of Weddell seals	BO-018-O
Keeling	Ralph	95-Okeel	A study of atmospheric oxygen variability in relation to annual to decadal variations in terrestrial and marine ecosystems	OO-204-O
Kelley	Scott	(none)	terra incognita: anvers island and surrounding area	WO-221-O
Kemerait	Robert	NSF/OPP-DoD MOA	AFTAC Dry Valley seismic project (Air Force Technical Applications Center)	GO-078-O
Kim	Stacy	01-26319	Community dynamics in a polar ecosystem: Benthic recovery from organic enrichment in the Antarctic	BO-010-O
Kooyman	Gerald	02-24957 (SGER)	Effects of B15 on breeding success of the Cape Crozier emperor penguin colony	BO-197-O
Kyle	Philip	98-14921 01-16577 (MRI)	Mount Erebus Volcano Observatory: Gas emissions and seismic studies Development of integrated seismic, geodetic and volcanic gas surveillance instrumentation for volcanic research	GO-081-O
LaBelle	James	00-90545	A versatile electromagnetic waveform receiver for South Pole Station	AO-128-O
Lancaster	Nicholas	00-88136	Aeolian processes in the McMurdo Dry Valleys, Antarctica	GO-183-O
Lanzerotti	Louis		A continuation of magnetometer data acquisition at McMurdo and South Pole Stations	AO-101-M/S
Lessard	Marc	01-32576	Measurement and analysis of extremely low frequency (ELF) waves at South Pole Station	AO-136-O
Luyendyk	Bruce	00-88143	Antarctic cretaceous-cenozoic climate, glaciation, and tectonics: Site surveys for drilling from the edge of the Ross Ice Shelf	GO-152-O
Lyons	W. Berry	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-L
			Chemical weathering in Taylor Valley	GO-

Lyons	W. Berry	00-87915	streams: Sources, mechanisms and global implications	074-O
Manahan	Donal	01-30398	Energetics of protein metabolism during development of Antarctic echinoderms	BO-006-O
Marchant	David	98-11877	Response of the East Antarctic Ice Sheet to middle miocene global change	GO-054-A
Marsh	Bruce	98-14332	The ferrar magmatic mush column system, Dry Valleys, Antarctica	GO-056-O
Martinson	Douglas	02-17282	Long Term Environmental Research (LTER): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-021-L
Mayewski	Paul	97-25057	U.S. ITASE: Science management for the United States component of the International Trans Antarctic Expedition	IU-153-A
Mayewski	Paul	98-11857	U.S. ITASE: Glaciochemistry	IU-153-B
McConnell	Joseph	00-87776	U.S. ITASE: Deposition of the HFC degradation product trifluoroacetate in antarctic snow and ice	IU-323-O
McKnight	Diane	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-M
Meese	Debra	99-80434	U.S. ITASE: The physical properties of the U.S. ITASE ice cores	IU-185-O
Mende	Steven	98-18086	Antarctic Auroral Imaging	AO-104-O
Morse	Robert	99-80474	AMANDA 2000 (Antarctic Muon And Neutrino Detector Array)	AA-130-O
Mullins	Jerry	02-33246	Antarctic mapping, geodesy, geospatial data, satellite image mapping and Antarctic Resource Center management	GO-052-M
Murray	Alison	00-85435	Gene expression in extreme environments: Extending microarray technology to understand life at its limits	BO-179-O
Myers	Joan	(none)	A photographic overview of the ongoing human exploration and occupation of Antarctica, the most hostile continent on our planet	WO-219-O

Novak	Giles	01-30389	Mapping galactic magnetic fields with SPARO (Submillimeter Polarimeter for Antarctic Remote Observations)	AO-376-O
Palinkas	Lawrence	00-90343	Prevention of environment-induced decrements in mood and cognitive performance	BO-321-M/S
Pringle	Laurence	(none)	A nonfiction, illustrated children's book about the Weddell seal	WO-218-O
Priscu	John	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-P
Raymond	James	00-88000	Function and chemical nature of ice-active substances associated with sea ice diatoms	BO-001-O
Renne	Paul	01-25194	Calibration of cosmogenic argon production rates in Antarctica	GO-064-O
Rosenberg	Theodore	00-03881	Riometry in Antarctica and conjugate region	AO-111-M/S
Rosenberg	Theodore	98-18176	Polar Experiment Network for Geophysical Upper-Atmospheric Investigations	AO-112-O
Ruhl	John	99-80654	BOOMERanG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics): A balloon-borne measurement of polarization in the cosmic microwave background	AB-148-O
Sanderson	Colin		University of Miami/Dept of Energy-Environmental Measurements Lab, Remote Atmospheric Measurements Program (RAMP)	OO-275-O
Scambos	Theodore	01-25570	Characteristics of snow megadunes and their potential effects on ice core interpretation	IO-186-O
Sidell	Bruce	01-25890	Cold body temperature as an evolutionary shaping force in the physiology of antarctic fishes	BO-036-L/P
Sims	Kenneth	01-26269	U-Series (uranium-series) isotopic constraints on the rates of magma genesis evolution and degassing at Mt. Erebus, Antarctica	GO-085-O
			Effects of enhanced solar disturbances during the 2000-2002 solar-max period on	AO-

Sivjee	Gulamabas	99-09339	the Antarctic mesosphere-lower-thermosphere (MLT) and F regions composition, thermodynamics and dynamics	129-O
Smith	Walker	00-87401	Interannual Variability in the Antarctic Ross Sea (IVARS): Nutrient fields and seasonal productivity II	BO-047-O
Sprintall	Janet	00-03618	Drake Passage XBT Program	OO-260-O
Stacey	Gordon	00-94605	Wide-field imaging spectroscopy in the submillimeter: Deploying SPIFI on AST/RO	AO-377-O
Stark	Antony	01-26090	AST/RO (Antarctic Submillimeter Telescope and Remote Observatory)	AO-371-O
Stearns	Charles	01-26262	Antarctic Meteorological Research Center (AMRC)	OO-202-O
Stearns	Charles	00-88058	Antarctic automatic weather station program: 2001-2004	OO-283-M
Steig	Eric	99-04947	U.S. ITASE: Stable isotope studies at West Antarctic ITASE sites	IU-193-O
Stepp	William	NASA	Long duration balloon program (LDB)	AB-145-O
Svarney	Thomas	(none)	Frigid Beauty: Weather in Antarctica	WO-220-O
Takahashi	Taro	00-03609	Mesoscale, seasonal, and inter-annual variability of surface water carbon dioxide in the Drake Passage	OO-214-O
Taylor	Frederick	01-26472	The Scotia Arc GPS Project: Focus on the Antarctic Peninsula and South Shetland Islands	GO-080-L
Trivelpiece	Wayne	99-80641	Foraging behavior and demography of pygoscelis penguins	BO-040-O
Tyler	Kelly	(none)	The Lost Men: A book linking modern science and Shackleton’s Ross Sea Party	WO-217-O
Virginia	Ross	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	BM-042-V

Walden	Von		Work at Dome C through NASA and the Italian/French program	OO-213-M
Wall	Diana	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	BM-042-W
Warren	Stephen	00-03826	Solar radiation on the East Antarctic Plateau	OO-201-O
Wefel	John	ATIC	ATIC Long Duration Balloon Flight (Advanced Thin Ionization Calorimeter)	AB-143-O
Wiens	Douglas	99-09603	A broadband seismic experiment to investigate deep continental structure across the East-West Antarctic boundary	GO-089-M
Wilhelm	Steven	02-28895	Viral dynamics and the Southern Ocean iron cycle	BO-229-E
Woodside	James	(none)	To Paint in Antarctica	WO-223-O

2002-2003 Science Planning Summary

USAP Programs in Antarctica

Aeronomy & Astrophysics	Dr. Vladimir Papitashvili Program Manager
Biology & Medicine	Dr. Polly Penhale Program Manager
Geology & Geophysics	Dr. Scott Borg Program Manager
Glaciology	Dr. Julie Palais Program Manager
Oceans & Climate	Dr. Bernhard Lettau Program Manager
Artists & Writers	Mr. Guy Guthridge Program Manager

Click on a link to view a list of projects for each USAP program.

2002-2003 Science Planning Summary

Principal Investigators' Home Institutions

Institution	PI Last Name	PI First Name	NSF/OPP Award #	Event #
Alabama Birmingham, University of	Amsler	Charles	01-25181	BO-022-L/P
Alaska Fairbanks, University of	Castellini	Michael	01-30417	BO-199-O
Alaska Fairbanks, University of	Eicken	Hajo	0126007	OO-253-O
Arizona State University Tempe	Hofmann	Gretchen	00-87971	BO-134-O
Arizona, University of	Bales	Roger	98-14810	IU-158-O
Augsburg College	Engebretson	Mark	99-09212	AO-102-M/S
Berkeley Geochronology Center	Renne	Paul	01-25194	GO-064-O
Boston University	Marchant	David	98-11877	GO-054-A
California Berkeley, University of	Holzapfel	William	00-91840	AO-378-O
California Berkeley, University of	Cuffey	Kurt	01-25579	IO-161-O
California San Diego, University of	Kooyman	Gerald	02-24957 (SGER)	BO-197-O

California San Diego, University of	Palinkas	Lawrence	00-90343	BO-321-M/S
California San Diego, University of	Cande	Steve	01-26340 01-26334	GO-071-O
California San Diego, University of	Keeling	Ralph	95-Okeel	OO-204-O
California San Diego, University of	Chereskin	Teresa	98-16226	OO-317-L
California Santa Barbara, University of	Ruhl	John	99-80654	AB-148-O
California Santa Barbara, University of	Luyendyk	Bruce	00-88143	GO-152-O
California, Berkeley, University of	Mende	Steven	98-18086	AO-104-O
Case Western Reserve University	Harvey	Ralph	99-80452	GO-058-O
Chicago, University of	Carlstrom	John	00-94541	AO-373-O
Cold Regions Research & Engineering Lab	Albert	Mary	98-14676	IU-155-O
Cold Regions Research and Engineering Laboratory	Meese	Debra	99-80434	IU-185-O
Cold Regions Research and Engineering Laboratory	Arcone	Steven	98-14589	IU-311-O
College of William and Mary	Ducklow	Hugh	02-17282	BP-013-L/P
College of William and Mary	Ducklow	Hugh	02-17282	BP-016-L/P
College of William and Mary	Ducklow	Hugh	02-17282	BP-028-L/P

College of William and Mary	Ducklow	Hugh	02-17282	BP-032-L/P
College of William and Mary	Ducklow	Hugh	00-87872	BP-045-L/P
Colorado Boulder, University of	Avallone	Linnea	98-75829	AO-132-O
Colorado Boulder, University of	McKnight	Diane	98-10219	BM-042-M
Colorado Boulder, University of	Scambos	Theodore	01-25570	IO-186-O
Colorado State University	Wall	Diana	98-10219	BM-042-W
Colorado, University of	Avery	Susan	00-00957	AO-284-O
Columbia University	Martinson	Douglas	02-17282	BP-021-L
Columbia University	Gordon	Arnold	01-25172	OO-215-O
Columbia University	Takahashi	Taro	00-03609	OO-214-O
Dartmouth College	LaBelle	James	00-90545	AO-128-O
Dartmouth College	Lessard	Marc	01-32576	AO-136-O
Dartmouth College	Virginia	Ross	98-10219	BM-042-V
Delaware, University of	Gaisser	Thomas	99-80801	AO-109-O
Delaware, University of	Bieber	John	98-16129	AO-120-M/S
Desert Research				BO-

Institute	Murray	Alison	00-85435	179-O
Desert Research Institute	Berger	Glenn	99-09665	GO-092-O
Desert Research Institute	Lancaster	Nicholas	00-88136	GO-183-O
Desert Research Institute	McConnell	Joseph	00-87776	IU-323-O
Ecological and Evolutionary Biology	Hunt	George	02-34570 (SGER)	BO-025-E
Embry Riddle Aeronautical University	Sivjee	Gulamabas	99-09339	AO-129-O
Fisica Dell'Atmosfera, Instituto De	Adriani	Alberto	90-17805	AO-107-O
Groundfish, Inc.	Kelley	Scott	(none)	WO-221-O
H.T. Harvey & Associates	Ainley	David	01-25608	BO-031-O
Hawaii Manoa, University of	Firing	Eric	98-16226	OO-315-N
Idaho, University of	Walden	Von		OO-213-M
Illinois Chicago, University of	Doran	Peter	98-10219	BM-042-D
Illinois Urbana, University of	DeVries	Arthur	99-09841	BO-005-M
Incorporated Research Institutions for Seismology	Butler	Rhett	EAR 00-04370	GO-090-P/S
Johns Hopkins University	Marsh	Bruce	98-14332	GO-056-O
Louisiana State				AB-

University Baton Rouge	Wefel	John	ATIC	143-O
Louisiana State University Baton Rouge	Bart	Philip	00-94078	GO-154-O
Lucent Technologies	Lanzerotti	Louis		AO-101-M/S
Magee Scientific Company	Hansen	Anthony	98-15140	OO-314-O
Maine, University of	Connell	Laurie	01-25611	BO-019-O
Maine, University of	Sidell	Bruce	01-25890	BO-036-L/P
Maine, University of	Hall	Brenda	01-24014	IO-196-M
Maine, University of	Mayewski	Paul	97-25057	IU-153-A
Maine, University of	Mayewski	Paul	98-11857	IU-153-B
Maine, University of	Hamilton	Gordon	98-15510	IU-178-O
Maine, University of	Hall	Brenda	01-24014	IO-194-E
Maryland, University of	Rosenberg	Theodore	00-03881	AO-111-M/S
Maryland, University of	Rosenberg	Theodore	98-18176	AO-112-O
Minnesota, University of	Blanchette	Robert	99-09271	BO-038-O
Montana State University Bozeman	Priscu	John	98-10219	BM-042-P
Montana State University Bozeman	Garrott	Robert	02-25110	BO-009-O
				BO-

Montana State University Bozeman	Trivelpiece	Wayne	99-80641	040-O
National Institute of Polar Research	Ejiri	Masaki	US-Japan	AO-117-O
National Oceanic and Atmospheric Administration	Hofmann	Dave	90-17842	OO-257-O
National Oceanic and Atmospheric Administration	Hofmann	Dave	NSF/NOAA agreement	OO-264-O
National Scientific Balloon Facility (NSBF)	Stepp	William	NASA	AB-145-O
Nevada Las Vegas, University of	Raymond	James	00-88000	BO-001-O
New Mexico Institute of Mining and Technology	Kyle	Philip	98-14921 01-16577 (MRI)	GO-081-O
New Mexico, University of	Jefferies	Stuart	00-87541	AO-115-O
New York State Department of Health	Bowser	Samuel	00-03639	BO-043-O
North Carolina, University of	Emslie	Steven	99-09274	BO-034-E
Northeastern University	Detrich, III	H. William	00-89451	BO-037-L/P
Northwestern University	Novak	Giles	01-30389	AO-376-O
Ohio State University	Lyons	W. Berry	98-10219	BM-042-L
Ohio State University	Lyons	W. Berry	00-87915	GO-074-O
Ohio State University	Elliot	David	00-87919	GO-290-O
Pennsylvania State	Anandakrishnan	Sridhar	00-86297	IO-205-

University				O
Polar Oceans Research Group	Fraser	William	01-30525	BO-198-P
Portland State University	Fountain	Andrew	98-10219	BM-042-F
Rochester, University of	Dye	Timothy	01-25893	BO-027-O
San Jose State University	Kim	Stacy	01-26319	BO-010-O
Sanford Greenburger Associates	Tyler	Kelly	(none)	WO-217-O
Scripps Institution of Oceanography	Sprintall	Janet	00-03618	OO-260-O
Smithsonian Institution	Stark	Antony	01-26090	AO-371-O
Southern California, University of	Manahan	Donal	01-30398	BO-006-O
Southern Connecticut State University	Fleming	Thomas	01-26106	GO-062-O
St. Olaf College	Jacobel	Robert	98-14574	IU-133-O
Stanford University	Fraser-Smith	Antony	01-38126	AO-100-O
Stanford University	Inan	Umran	99-09872	AO-106-S
Stanford University	Inan	Umran	00-93381	AO-108-O
Stanford University	Inan	Umran	99-10565	AO-306-P
Tennessee, University of	Wilhelm	Steven	02-28895	BO-229-E
Texas A & M University	Davis	Randall	99-09422	BO-017-

				O
Texas Austin, University of	Dalziel	Ian	00-03619	GO-087-M
Texas, University of	Kanatous	Shane	01-25475	BO-018-O
Texas, University of	Taylor	Frederick	01-26472	GO-080-L
UNAVCO/UCAR	Johns	Bjorn	EAR-99-03413	GO-295-O
United States Air Force	Kemerait	Robert	NSF/OPP-DoD MOA	GO-078-O
United States Department of Energy	Sanderson	Colin		OO-275-O
United States Geological Survey	Mullins	Jerry	02-33246	GO-052-M
Virginia Institute of Marine Sciences	Smith	Walker	00-87401	BO-047-O
Walnut Hill School	Woodside	James	(none)	WO-223-O
Washington University	Wiens	Douglas	99-09603	GO-089-M
Washington, University of	Hernandez	Gonzalo	99-09743	AO-110-M/S
Washington, University of	Conway	Howard	00-87345	IO-209-O
Washington, University of	Warren	Stephen	00-03826	OO-201-O
Washington, University of	Steig	Eric	99-04947	IU-193-O
West Florida, University of	Jeffrey	Wade		BO-200-

				O
Wisconsin Madison, University of	Morse	Robert	99-80474	AA-130-O
Wisconsin Madison, University of	Stearns	Charles	01-26262	OO-202-O
Wisconsin Madison, University of	Stearns	Charles	00-88058	OO-283-M
Woods Hole Oceanographic Institute	Sims	Kenneth	01-26269	GO-085-O
Wyoming, University of	Deshler	Terry	99-80594	AO-131-O

2002-2003 Science Planning Summary

USAP Stations in Antarctica

Amundsen-Scott South Pole Station

McMurdo Station

Palmer Station

RV/IB Nathaniel B. Palmer

RV Laurence M. Gould

Projects not based at a USAP station or vessel

Click on a link to view a list of projects at each station.

2002-2003 Science Planning Summary

Projects Sorted by Event Number Digits

	PI Last Name	PI First Name	NSF/OPP Award #	Project Title	Event #
001	Raymond	James	00-88000	Function and chemical nature of ice-active substances associated with sea ice diatoms	BO-001-O
005	DeVries	Arthur	99-09841	Antifreeze proteins in antarctic fishes: Ecological and organismal physiology, protein structure-function and mechanism, genetics, and evolution	BO-005-M
006	Manahan	Donal	01-30398	Energetics of protein metabolism during development of Antarctic echinoderms	BO-006-O
009	Garrott	Robert	02-25110	Patterns and processes: Dynamics of the Erebus Bay Weddell seal population	BO-009-O
010	Kim	Stacy	01-26319	Community dynamics in a polar ecosystem: Benthic recovery from organic enrichment in the Antarctic	BO-010-O
013	Ducklow	Hugh	02-17282	Seabird component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-013-L/P
016	Ducklow	Hugh	02-17282	Phytoplankton ecology component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-016-L/P
017	Davis	Randall	99-09422	Hunting behavior and energetics of free-ranging Weddell seals	BO-017-O
018	Kanatous	Shane	01-25475	Ontogeny of aerobic capacity, lipid metabolism, and elevated myoglobin concentrations in the skeletal muscles of Weddell seals	BO-018-O

019	Connell	Laurie	01-25611	Yeasts in the Antarctic Dry Valleys: Biological role, distribution, and evolution	BO-019-O
021	Martinson	Douglas	02-17282	Long Term Environmental Research (LTER): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-021-L
022	Amsler	Charles	01-25181	The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula	BO-022-L/P
025	Hunt	George	02-34570 (SGER)	Food web structure across a large-scale ocean productivity gradient: Top predator assemblages in the southern Indian Ocean	BO-025-E
027	Dye	Timothy	01-25893	Culture emergence and health in Antarctica	BO-027-O
028	Ducklow	Hugh	02-17282	Zooplankton component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-028-L/P
031	Ainley	David	01-25608	Geographic structure of Adelie penguin populations: Demography of population expansion	BO-031-O
032	Ducklow	Hugh	02-17282	Bio-optical component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-032-L/P
034	Emslie	Steven	99-09274	Abandoned penguin colonies in Antarctica	BO-034-E
036	Sidell	Bruce	01-25890	Cold body temperature as an evolutionary shaping force in the physiology of antarctic fishes	BO-036-L/P
037	Detrich, III	H. William	00-89451	Structure, function and expression of tubulins, globins, and microtubule-dependent motors from cold-adapted antarctic fishes	BO-037-L/P
038	Blanchette	Robert	99-09271	Investigation on deterioration in the Historic Huts of the Ross Sea region of Antarctica	BO-038-O
040	Trivelpiece	Wayne	99-80641	Foraging behavior and demography	BO-040-

				of pygoscelis penguins	O
042D	Doran	Peter	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	BM-042-D
042F	Fountain	Andrew	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-F
042L	Lyons	W. Berry	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-L
042M	McKnight	Diane	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-M
042P	Priscu	John	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	BM-042-P
042V	Virginia	Ross	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	BM-042-V
042W	Wall	Diana	98-10219	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	BM-042-W
043	Bowser	Samuel	00-03639	Seasonal dynamics of giant agglutinated foraminifera	BO-043-O
045	Ducklow	Hugh	00-87872	LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	BP-045-L/P
047	Smith	Walker	00-87401	Interannual Variability in the Antarctic Ross Sea (IVARS): Nutrient fields and seasonal productivity II	BO-047-O
051	Bao	Huiming	01-25842	Multiple isotope analyses of soil sulfate and nitrate in the Antarctic Dry Valleys	GO-051-O
052	Mullins	Jerry	02-33246	Antarctic mapping, geodesy, geospatial data, satellite image	GO-052-

				mapping and Antarctic Resource Center management	M
053	Hallet	Bernard	97-26139	Stability of land surfaces in the Dry Valleys: Insights based on the dynamics of sub-surface ice and sand-wedge polygons	GO-053-O
054	Marchant	David	98-11877	Response of the East Antarctic Ice Sheet to middle miocene global change	GO-054-A
056	Marsh	Bruce	98-14332	The ferrar magmatic mush column system, Dry Valleys, Antarctica	GO-056-O
058	Harvey	Ralph	99-80452	The Antarctic search for meteorites (ANSMET)	GO-058-O
062	Fleming	Thomas	01-26106	Emplacement of the ferrar mafic igneous province: A pilot study of intrusive architecture and flow directions in Southern Victoria Land	GO-062-O
064	Renne	Paul	01-25194	Calibration of cosmogenic argon production rates in Antarctica	GO-064-O
071	Cande	Steve	01-26340 01-26334	Improved Cenozoic plate reconstructions of the circum-Antarctic region	GO-071-O
074	Lyons	W. Berry	00-87915	Chemical weathering in Taylor Valley streams: Sources, mechanisms and global implications	GO-074-O
078	Kemerait	Robert	NSF/OPP-DoD MOA	AFTAC Dry Valley seismic project (Air Force Technical Applications Center)	GO-078-O
080	Taylor	Frederick	01-26472	The Scotia Arc GPS Project: Focus on the Antarctic Peninsula and South Shetland Islands	GO-080-L
081	Kyle	Philip	98-14921 01-16577 (MRI)	Mount Erebus Volcano Observatory: Gas emissions and seismic studies Development of integrated seismic, geodetic and volcanic gas surveillance instrumentation for volcanic research	GO-081-O
085	Sims	Kenneth	01-26269	U-Series (uranium-series) isotopic constraints on the rates of magma genesis evolution and degassing at Mt. Erebus, Antarctica	GO-085-O
				A GPS network to determine crustal	GO-

087	Dalziel	Ian	00-03619	motions in the bedrock of the West Antarctic Ice Sheet: Phase I, Installation	087-M
089	Wiens	Douglas	99-09603	A broadband seismic experiment to investigate deep continental structure across the East-West Antarctic boundary	GO-089-M
090	Butler	Rhett	EAR 00-04370	Global Seismograph Station: IRIS & USGS/ASL	GO-090-P/S
092	Berger	Glenn	99-09665	Development of a luminescence dating capability for antarctic glaciomarine sediments: Tests of signal zeroing at the Antarctic Peninsula	GO-092-O
100	Fraser-Smith	Antony	01-38126	The operation of an ELF/VLF radiometer at Arrival Heights	AO-100-O
101	Lanzerotti	Louis		A continuation of magnetometer data acquisition at McMurdo and South Pole Stations	AO-101-M/S
102	Engebretson	Mark	99-09212	Conjugate and high time resolution studies of ULF waves and magnetospheric dynamics using ground based induction magnetometers at four high latitude manned sites	AO-102-M/S
104	Mende	Steven	98-18086	Antarctic Auroral Imaging	AO-104-O
106	Inan	Umran	99-09872	ELF/VLF waves at the South Pole	AO-106-S
107	Adriani	Alberto	90-17805	Study of polar stratospheric clouds by LIDAR	AO-107-O
108	Inan	Umran	00-93381	A VLF beacon transmitter at South Pole (2001-2004)	AO-108-O
109	Gaisser	Thomas	99-80801	South Pole Air Shower Experiment - 2 (SPASE-2)	AO-109-O
110	Hernandez	Gonzalo	99-09743	High-latitude Antarctic neutral mesospheric and thermospheric dynamics and thermodynamics	AO-110-M/S
				Riometry in Antarctica and conjugate	AO-

111	Rosenberg	Theodore	00-03881	region	111-M/S
112	Rosenberg	Theodore	98-18176	Polar Experiment Network for Geophysical Upper-Atmospheric Investigations	AO-112-O
115	Jefferies	Stuart	00-87541	Mapping the sound speed structure of the sun's atmosphere	AO-115-O
117	Ejiri	Masaki	US-Japan	All-Sky Imager at the South Pole	AO-117-O
120	Bieber	John	98-16129	Solar and heliospheric studies with antarctic cosmic ray observations	AO-120-M/S
128	LaBelle	James	00-90545	A versatile electromagnetic waveform receiver for South Pole Station	AO-128-O
129	Sivjee	Gulamabas	99-09339	Effects of enhanced solar disturbances during the 2000-2002 solar-max period on the Antarctic mesosphere-lower-thermosphere (MLT) and F regions composition, thermodynamics and dynamics	AO-129-O
130	Morse	Robert	99-80474	AMANDA 2000 (Antarctic Muon And Neutrino Detector Array)	AA-130-O
131	Deshler	Terry	99-80594	In situ measurements of polar stratospheric clouds, condensation nuclei, and ozone during the austral winter and spring	AO-131-O
132	Avallone	Linnea	98-75829	In situ measurements of halogen oxides in the troposphere	AO-132-O
133	Jacobel	Robert	98-14574	U.S. ITASE: Radar studies of internal stratigraphy and bedrock topography along the traverse	IU-133-O
134	Hofmann	Gretchen	00-87971	Evolutionary loss of the heat shock response in antarctic fishes	BO-134-O
136	Lessard	Marc	01-32576	Measurement and analysis of extremely low frequency (ELF) waves at South Pole Station	AO-136-O
143	Wefel	John	ATIC	ATIC Long Duration Balloon Flight (Advanced Thin Ionization Calorimeter)	AB-143-O

145	Stepp	William	NASA	Long duration balloon program (LDB)	AB-145-O
148	Ruhl	John	99-80654	BOOMERanG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics): A balloon-borne measurement of polarization in the cosmic microwave background	AB-148-O
152	Luyendyk	Bruce	00-88143	Antarctic cretaceous-cenozoic climate, glaciation, and tectonics: Site surveys for drilling from the edge of the Ross Ice Shelf	GO-152-O
153A	Mayewski	Paul	97-25057	U.S. ITASE: Science management for the United States component of the International Trans Antarctic Expedition	IU-153-A
153B	Mayewski	Paul	98-11857	U.S. ITASE: Glaciochemistry	IU-153-B
154	Bart	Philip	00-94078	CAREER: Relative frequency and phase of extreme expansions of the Antarctic ice sheets during the late Neogene	GO-154-O
155	Albert	Mary	98-14676	U.S. ITASE: Snow and firn microstructure and transport properties	IU-155-O
158	Bales	Roger	98-14810	U.S. ITASE: Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica	IU-158-O
161	Cuffey	Kurt	01-25579	Dynamics and climatic response of the Taylor Glacier system	IO-161-O
178	Hamilton	Gordon	98-15510	U.S. ITASE: Mass balance and accumulation rate along US ITASE routes	IU-178-O
179	Murray	Alison	00-85435	Gene expression in extreme environments: Extending microarray technology to understand life at its limits	BO-179-O
183	Lancaster	Nicholas	00-88136	Aeolian processes in the McMurdo Dry Valleys, Antarctica	GO-183-O
185	Meese	Debra	99-80434	U.S. ITASE: The physical properties of the U.S. ITASE ice cores	IU-185-O
				Characteristics of snow megadunes	IO-

186	Scambos	Theodore	01-25570	and their potential effects on ice core interpretation	186-O
193	Steig	Eric	99-04947	U.S. ITASE: Stable isotope studies at West Antarctic ITASE sites	IU-193-O
194	Hall	Brenda	01-24014	AMS Radiocarbon Chronology of Glacier Fluctuations in South Shetland Islands during Glacial/Interglacial Hemicycle: Implications Antarctica's Role in Global Climate Change	IO-194-E
196	Hall	Brenda	01-24014	Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change.	IO-196-M
197	Kooyman	Gerald	02-24957 (SGER)	Effects of B15 on breeding success of the Cape Crozier emperor penguin colony	BO-197-O
198	Fraser	William	01-30525	Monitoring the effects of tourism and environmental variability on Adelie penguins at Palmer Station, Antarctica	BO-198-P
199	Castellini	Michael	01-30417	Effects of foraging on the lipid biochemistry of freely diving Weddell seals	BO-199-O
200	Jeffrey	Wade		Latitudinal Effects of UVR on bacterioplankton: BRIDE OF TABASCO science of opportunity cruise	BO-200-O
201	Warren	Stephen	00-03826	Solar radiation on the East Antarctic Plateau	OO-201-O
202	Stearns	Charles	01-26262	Antarctic Meteorological Research Center (AMRC)	OO-202-O
204	Keeling	Ralph	95-Okeel	A study of atmospheric oxygen variability in relation to annual to decadal variations in terrestrial and marine ecosystems	OO-204-O
205	Anandakrishnan	Sridhar	00-86297	Characterizing the onset of ice stream flow: A ground geophysical program	IO-205-O
209	Conway	Howard	00-87345	Western Divide WAISCORES site selection	IO-209-O

213	Walden	Von		Work at Dome C through NASA and the Italian/French program	OO-213-M
214	Takahashi	Taro	00-03609	Mesoscale, seasonal, and inter-annual variability of surface water carbon dioxide in the Drake Passage	OO-214-O
215	Gordon	Arnold	01-25172	ANSLOPE: Cross slope exchanges at the Antarctic slope front	OO-215-O
217	Tyler	Kelly	(none)	The Lost Men: A book linking modern science and Shackleton's Ross Sea Party	WO-217-O
218	Pringle	Laurence	(none)	A nonfiction, illustrated children's book about the Weddell seal	WO-218-O
219	Myers	Joan	(none)	A photographic overview of the ongoing human exploration and occupation of Antarctica, the most hostile continent on our planet	WO-219-O
220	Svarney	Thomas	(none)	Frigid Beauty: Weather in Antarctica	WO-220-O
221	Kelley	Scott	(none)	terra incognita: anvers island and surrounding area	WO-221-O
223	Woodside	James	(none)	To Paint in Antarctica	WO-223-O
229	Wilhelm	Steven	02-28895	Viral dynamics and the Southern Ocean iron cycle	BO-229-E
253	Eicken	Hajo	0126007	Measurements and improved parameterizations of the thermal conductivity and heat flow through first-year sea ice	OO-253-O
257	Hofmann	Dave	90-17842	South Pole monitoring for climatic change -- U.S. Department of Commerce NOAA climate monitoring and diagnostic laboratory	OO-257-O
260	Sprintall	Janet	00-03618	Drake Passage XBT Program	OO-260-O
264	Hofmann	Dave	NSF/NOAA agreement	Collection of atmospheric air for the NOAA/CMDL worldwide flask sampling network	OO-264-O

275	Sanderson	Colin		University of Miami/Dept of Energy-Environmental Measurements Lab, Remote Atmospheric Measurements Program (RAMP)	OO-275-O
283	Stearns	Charles	00-88058	Antarctic automatic weather station program: 2001-2004	OO-283-M
284	Avery	Susan	00-00957	Dynamics of the Antarctic MLT (mesosphere-lower-thermosphere) region using ground-based radar and TIMED instrumentation	AO-284-O
290	Elliot	David	00-87919	Ferrar basaltic tuff-breccias formed by direct eruption: Evaluating an hypothesis	GO-290-O
295	Johns	Bjorn	EAR-99-03413	University NAVSTAR Consortium (UNAVCO) GPS survey support	GO-295-O
306	Inan	Umran	99-10565	Global thunderstorm activity and its effects on the radiation belts and the lower ionosphere	AO-306-P
311	Arcone	Steven	98-14589	U.S. ITASE: High resolution radar profiling of the snow and ice stratigraphy beneath the ITASE traverses	IU-311-O
314	Hansen	Anthony	98-15140	Measurement of combustion effluent carbonaceous aerosols in the McMurdo Dry Valleys, Antarctica	OO-314-O
315	Firing	Eric	98-16226	Shipboard acoustic doppler current profiling on RVIB Nathaniel B. Palmer and RV Laurence M. Gould	OO-315-N
317	Chereskin	Teresa	98-16226	Shipboard acoustic doppler current profiling on R/V Nathaniel B. Palmer and R/V Laurence M. Gould	OO-317-L
321	Palinkas	Lawrence	00-90343	Prevention of environment-induced decrements in mood and cognitive performance	BO-321-M/S
323	McConnell	Joseph	00-87776	U.S. ITASE: Deposition of the HFC degradation product trifluoroacetate in antarctic snow and ice	IU-323-O
371	Stark	Antony	01-26090	AST/RO (Antarctic Submillimeter Telescope and Remote Observatory)	AO-371-O
373	Carlstrom	John	00-94541	DASI (Degree Angular Scale Interferometer)	AO-373-O

376	Novak	Giles	01-30389	Mapping galactic magnetic fields with SPARO (Submillimeter Polarimeter for Antarctic Remote Observations)	AO-376-O
377	Stacey	Gordon	00-94605	Wide-field imaging spectroscopy in the submillimeter: Deploying SPIFI on AST/RO	AO-377-O
378	Holzapfel	William	00-91840	ACBAR (Arcminute Cosmology Bolometer Array)	AO-378-O

2002-2003 Science Planning Summary

Deploying Participants

Last Name	First Name	Station (based on)	Event #
Adams	James H	McMurdo Station	AB-143-O
Adams	Gina	Dry Valleys	BM-042-W
Amsler	Margaret O	Palmer Station	BO-022-L/P
Amsler, Jr.	Charles D	Palmer Station	BO-022-L/P
Anandakrishnan	Sridhar	McMurdo Station	IO-205-O
Anderson	Donald M	South Pole Station	GO-090-P/S
Anderson	Kent R	South Pole Station	GO-090-P/S
Andrew	Calhoun M	McMurdo Station	GO-062-O
Annis	Lauren K	Nathaniel B. Palmer	GO-071-O
Aragon-Arreola	Manuel D	Nathaniel B. Palmer	GO-071-O
Arcone	Steven A	ITASE Traverse	IU-153-A
Asper	Lindell K	McMurdo Station	BO-047-O
Asper	Vernon	McMurdo Station	BO-047-O
Assman	Karen	Nathaniel B. Palmer	OO-215-O
Aster	Richard C	McMurdo Station	GO-081-O
			AO-

Avallone	Linnea M	McMurdo Station	132-O
Avery	Susan	South Pole Station	AO-284-O
Backman	Emily	Laurence M. Gould	GO-092-O
Baeseman	Jenny	McMurdo Station	BM-042-M
Bai	Xinhua	South Pole Station	AO-109-O
Baker	Billy J	Palmer Station	BO-022-L/P
Ballard	Grant	McMurdo Station	BO-031-O
Bao	Huiming	McMurdo Station	GO-054-A
Barlow	Stephen T	South Pole Station	AO-110-M/S
Barnes-Svarney	Patricia L	McMurdo Station	WO-220-O
Barrett	John E	Dry Valleys	BM-042-V
Bart	Philip J	Nathaniel B. Palmer	GO-154-O
Bartee	Justin A	South Pole Station	AO-129-O
Bartek	Louis R	Nathaniel B. Palmer	GO-152-O
Barwick	Steven W	South Pole Station	AA-130-O
Bauer	Robert J	McMurdo Station	IO-186-O
Becker-Karl	Heinz	South Pole Station	AA-130-O
Beigel	Michael L	McMurdo Station	BO-031-O
Benoit	Margaret H	McMurdo Station	GO-089-M
Bergamasco	Andrea	Nathaniel B. Palmer	OO-215-O
Berger	Glenn W	Laurence M. Gould	GO-

			092-O
Berkoff	Timothy A	South Pole Station	OO-257-O
Bernardini	Elisa	South Pole Station	AA-130-O
Bernardis	Paolo D	McMurdo Station	AB-148-O
Besson	David	South Pole Station	AA-130-O
Bevis	Michael G	McMurdo Station	GO-087-M
Blanchette	Robert A	McMurdo Station	BO-038-O
Bland	Philip A	McMurdo Station	GO-058-O
Blecker	Steve W	Dry Valleys	BM-042-W
Bliss	Andrew K	McMurdo Station	IO-161-O
Boch	Charles	Laurence M. Gould	BP-028-L/P
Boda	Kenneth	Nathaniel B. Palmer	OO-215-O
Boscaleri	Andrea	McMurdo Station	AB-148-O
Bowser	Samuel S	McMurdo Station	BO-043-O
Braddock	Peter	McMurdo Station	IO-205-O
Brandt	Richard E	McMurdo Station	OO-201-O
Bratcher	Amy	Nathaniel B. Palmer	OO-215-O
Brooksforce	Kathryn	Nathaniel B. Palmer	OO-215-O
Browning	Richard D	South Pole Station	AO-129-O
Bucic	Vanja	South Pole Station	AO-109-O
Burgess	Thomas T	South Pole Station	AA-130-O

Burreson	Eugene M	Laurence M. Gould	BP-045-L/P
Butler	Rhett G	South Pole Station	GO-090-P/S
Cable	Peter	McMurdo Station	GO-074-O
Cairo	Francesco	McMurdo Station	AO-107-O
Caldwell	Andy	McMurdo Station	GO-058-O
Cameron	Michael F	McMurdo Station	BO-009-O
Campo	Manuela	Laurence M. Gould	BO-034-E
Cande	Steven C	Nathaniel B. Palmer	GO-071-O
Candelaria	Frank A	McMurdo Station	AB-145-O
Carlstrom	John E	South Pole Station	AO-373-O
Carpenter	Tom M	Nathaniel B. Palmer	GO-152-O
Cartwright	John K	South Pole Station	AO-373-O
Case	Judd A	Not station-based	GO-061-O
Castellini	Michael A	McMurdo Station	BO-199-O
Catania	Ginny	McMurdo Station	IO-209-O
Chabot	Nancy	McMurdo Station	GO-058-O
Chamberlin, Jr.	Richard A	South Pole Station	AO-371-O
Chang	Jeffrey	South Pole Station	AO-108-O
Charrier	Amanda D	McMurdo Station	GO-056-O
Cheng-Devries	Christina C	McMurdo Station	BO-005-M
			OO-

Chereskin	Teresa K	Laurence M. Gould	317-L
Chin	Nancy P	McMurdo Station	BO-027-O
Chow	Juan M	Nathaniel B. Palmer	GO-154-O
Christl	Mark J	McMurdo Station	AB-143-O
Christner	Brent C	Dry Valleys	BM-042-P
Clarke	Andrew D	South Pole Station	OO-257-O
Clayton	Robert W	Nathaniel B. Palmer	GO-071-O
Conlan	Kathleen	McMurdo Station	BO-010-O
Connell	Laurie B	McMurdo Station	BO-019-O
Constatine	Emily	Laurence M. Gould	GO-092-O
Conway	Howard B	McMurdo Station	IO-209-O
Conway	Maurice E	McMurdo Station	IO-209-O
Cooley	Jodi A	South Pole Station	AA-130-O
Coons	Douglas H	McMurdo Station	BO-043-O
Cornick	Leslie	McMurdo Station	BO-199-O
Cowen	Douglas	South Pole Station	AA-130-O
Cox	Mark D	McMurdo Station	AB-143-O
Cozzetto	Karen	McMurdo Station	BM-042-M
Craig	Scott D	McMurdo Station	BO-019-O
Crawford	Emily W	Nathaniel B. Palmer	GO-152-O
Crill	Brendan P	McMurdo Station	AB-148-O

Cuffey	Kurt	McMurdo Station	IO-161-O
Cully	Tim	McMurdo Station	GO-290-O
Cupp	Kurt C	McMurdo Station	GO-183-O
Curchitser	Enrique	Nathaniel B. Palmer	OO-215-O
Cziko	Paul	McMurdo Station	BO-005-M
Dalziel	Ian W	McMurdo Station	GO-087-M
Davis	Randall W	McMurdo Station	BO-017-O
Davison	Victor	McMurdo Station	AB-145-O
Davour	Anna K	South Pole Station	AA-130-O
Day	Allan	South Pole Station	AO-373-O
De Los Heros	Carlos P	South Pole Station	AA-130-O
De Vries	Arthur L	McMurdo Station	BO-005-M
Delany	Chad	McMurdo Station	BM-042-F
Denny	Andrew	McMurdo Station	AB-145-O
Deshler	Terry L	McMurdo Station	AO-131-O
Desiati	Paolo	South Pole Station	AA-130-O
Detrich, III	H. William	Palmer Station	BO-037-L/P
Di Martino	Vincenzo	South Pole Station	AO-115-O
Dickinson	Jason C	South Pole Station	AO-371-O
Dickson	Bev	McMurdo Station	BO-134-O
Diebold	John	Nathaniel B. Palmer	GO-152-O

Dixon	Daniel	ITASE Traverse	IU-153-A
Doane	Sarah	Laurence M. Gould	GO-092-O
Dolbey	Derek P	McMurdo Station	AB-145-O
Domack	Eugene W	Laurence M. Gould	GO-092-O
Donhauser	Kathryn	McMurdo Station	BO-027-O
Doran	Peter T	McMurdo Station	BM-042-D
Dowling	Carolyn B	McMurdo Station	GO-074-O
Downey	Nathan J	Nathaniel B. Palmer	GO-071-O
Draucker	Sara E	Laurence M. Gould	GO-092-O
Drees	Jessica M	South Pole Station	AA-130-O
Ducklow	Hugh W	Palmer Station	BP-045-L/P
Dugger	Katie M	McMurdo Station	BO-031-O
Dunbar	Nelia W	McMurdo Station	GO-081-O
Dye	Timothy D	McMurdo Station	BO-027-O
Ebihara	Yusuke	South Pole Station	AO-117-O
Eicken	Hajo	McMurdo Station	OO-253-O
Elliot	David H	McMurdo Station	GO-290-O
Emslie	Steven D	Laurence M. Gould	BO-034-E
Eppler	Dean B	McMurdo Station	GO-058-O
Evans	Clive W	McMurdo Station	BO-005-M
Fahnestock	Mark A	McMurdo Station	IO-186-O

Fairhead	V. Anne	Palmer Station	BO-022-L/P
Farrar	Amy	McMurdo Station, South Pole Station	Girl Scout
Ferguson	Cynthia K	McMurdo Station	AB-143-O
Feser	Thomas H	South Pole Station	AA-130-O
Filiatrault	Kevin L	McMurdo Station	GO-078-O
Finsterle	Wolfgang	South Pole Station	AO-115-O
Firing	Eric	Nathaniel B. Palmer	OO-317-L
Fisher	Jesse L	McMurdo Station	GO-089-M
Fitzgibbon	Timothy O	McMurdo Station	BM-042-L
Fleming	Peter	McMurdo Station	BO-027-O
Fleming	Thomas H	McMurdo Station	GO-062-O
Foreman	Christine M	Dry Valleys	BM-042-P
Forte	Philip E	McMurdo Station	BO-043-O
Fowler	Sarah J	McMurdo Station	GO-056-O
Franzen	Olav N	South Pole Station	AA-130-O
Frey	Markus M	ITASE Traverse	IU-153-A
Frohlich	Clifford A	Laurence M. Gould	GO-080-L
Fuiman	Lee A	Laurence M. Gould	BO-017-O
Ganel	Opher	McMurdo Station	AB-143-O
Ganugapati	Raghunath	South Pole Station	AA-130-O
Garrott	Robert A	McMurdo Station	BO-009-O

Gauthier	Pierre J	McMurdo Station	GO-081-O
Geisz	Heidi N	Laurence M. Gould	BP-013-L/P
Gerecht	Eyal	South Pole Station	AO-371-O
Giebink	Cindy	South Pole Station	AO-115-O
Gilbert	Robert	Laurence M. Gould	GO-092-O
Gillies	John A	McMurdo Station	GO-183-O
Ginsburg	David W	McMurdo Station	BO-006-O
Glenday	Peter J	McMurdo Station	BM-042-D
Golish	Dathon	South Pole Station	AO-371-O
Gordon	Arnold	Nathaniel B. Palmer	OO-215-O
Gould	Randy E	McMurdo Station	AB-143-O
Granger	Clifford	McMurdo Station	AB-143-O
Granger	Douglas J	McMurdo Station	AB-143-O
Green	Allison J	McMurdo Station	BO-006-O
Gregg	Gerald S	McMurdo Station	AB-145-O
Greschke	Robert W	McMurdo Station	IO-205-O
Grimes	Craig B	McMurdo Station	GO-290-O
Gudding	Jill	McMurdo Station	BM-042-L
Gudipati	Krishnavikas	Laurence M. Gould	GO-080-L
Guzik	T. G	McMurdo Station	AB-143-O
Haag	Amanda L	McMurdo Station	BO-

			006-O
Hadley	Scott C	McMurdo Station	AB-145-O
Hadley	Gillian	McMurdo Station	BO-009-O
Hagey	William H	McMurdo Station	BO-017-O
Hall	Brenda L	Laurence M. Gould	
Hall	Bradley	South Pole Station	OO-257-O
Hallar	Anna G	McMurdo Station	AO-132-O
Hamilton	Gordon S	ITASE Traverse	IU-153-A
Handy	Sara M	Laurence M. Gould	BO-229-E
Hann	Steve	Palmer Station	BO-037-L/P
Hansen	Anthony D	McMurdo Station	OO-314-O
Harper	Shawn	McMurdo Station	BO-199-O
Hauschildt	Tonio	South Pole Station	AA-130-O
Hayward	Rodney	Laurence M. Gould	BO-034-E
Head	James W	McMurdo Station	GO-054-A
Held	Benjamin W	McMurdo Station	BO-038-O
Hendrickson	Jamie	Palmer Station	BO-036-L/P
Hernandez	Gonzalo	South Pole Station	AO-110-M/S
Herquet	Philippe	South Pole Station	AA-130-O
Hersum	Taber G	McMurdo Station	GO-056-O
Hester	Michelle M	McMurdo Station	BO-031-O

Hill	Gary C	South Pole Station	AA-130-O
Himmelsbach	Ralph C	McMurdo Station	GO-078-O
Hivon	Eric Francois A	McMurdo Station	AB-148-O
Hoefling	Kevin C	McMurdo Station	BO-005-M
Hofmann	Gretchen E	McMurdo Station	BO-134-O
Hollyfield-Jerri	Lynn	Palmer Station	BO-022-L/P
Holzapfel	William L	South Pole Station	AO-378-O
Horning	Markus	McMurdo Station	BO-017-O
Howell ,Jr.	Leonard	McMurdo Station	AB-143-O
Huang	Yusheng	Palmer Station	BO-022-L/P
Huber	Bruce	Nathaniel B. Palmer	OO-215-O
Huerta	Audrey	McMurdo Station	GO-089-M
Huffman	Louise T	McMurdo Station	BM-042-M
Hughey	Brennan J	South Pole Station	AA-130-O
Hulth	Per Olof	South Pole Station	AA-130-O
Hultqvist	Klas G	South Pole Station	AA-130-O
Hundertmark	Stephan	South Pole Station	AA-130-O
Hunt	Luke H	McMurdo Station	BO-005-M
Hunt	George	Not station based	BO-025-E
Hyrenbach	K D	Not station based	BO-025-E
Iacoangelli	Armando	McMurdo Station	AB-148-O

Inan	Umran S	South Pole Station	AO-306-P
Inglis	Susan	McMurdo Station	BO-199-O
Ireson	Kirk J	Palmer Station	BP-032-L/P
Isbert	Joachim B	McMurdo Station	AB-143-O
Jackson	Jimmy L	McMurdo Station	GO-078-O
Janech	Michael G	McMurdo Station	BO-001-O
Jeffries	Stuart M	McMurdo Station	AO-115-O
Johns	Bjorn L	McMurdo Station	GO-295-O
Jones	Bill	McMurdo Station	AB-148-O
Jones	Aaron J	McMurdo Station	GO-078-O
Kanatous	Shane B	McMurdo Station	BO-018-O
Karsten	Richard W	McMurdo Station	GO-081-O
Kaspari	Susan D	ITASE Traverse	IU-153-A
Kavanaugh	Jeffrey L	McMurdo Station	IO-161-O
Kelley	Scott	Palmer Station	WO-221-O
Kenig	Fabian	McMurdo Station	BM-042-D
Kim	Stacy L	McMurdo Station	BO-010-O
Kisner	Theodore S	McMurdo Station	AB-148-O
Knight	Kimberly B	McMurdo Station	GO-064-O
Knox	Allister	South Pole Station	AO-115-O
Kooi	Jacob W	South Pole Station	AO-371-O

Kooyman	Gerald L	McMurdo Station	BO-197-O
Kovac	John M	South Pole Station	AO-373-O
Kozlowski	Wendy A	Laurence M. Gould	BP-016-L/P
Kravchenko	Ilya V	South Pole Station	AA-130-O
Kroger	Chris	McMurdo Station	AO-131-O
Kromer	Edward P	South Pole Station	GO-090-P/S
Kuehn	Kyler W	South Pole Station	AA-130-O
Kuiper	Michael	McMurdo Station	BO-001-O
Kulesa	Craig	South Pole Station	AO-371-O
Kurnik	Charles W	McMurdo Station	GO-295-O
Kuznetsov	Evgueni	McMurdo Station	AB-143-O
Kyle	Philip R	McMurdo Station	GO-081-O
Laatsch	James G	ITASE Traverse	IU-153-A
Labelle	James W	South Pole Station	AO-128-O
Lancaster	Nicholas	McMurdo Station	GO-183-O
Lancaster	Redgie	South Pole Station	OO-257-O
Lange	Andrew	McMurdo Station	AB-148-O
Lauretta	Dante	McMurdo Station	GO-058-O
Lawson	Jennifer L	McMurdo Station	BM-042-D
Lazzara	Matthew A	McMurdo Station	OO-283-M
			BM-

Lefebvre	Amy	McMurdo Station	042-F
Leich	Holger	South Pole Station	AA-130-O
Leitch	Erik M	South Pole Station	AO-373-O
Leventer	Amy R	Laurence M. Gould	GO-092-O
Lewis	Adam R	McMurdo Station	GO-054-A
Li-Hua	Bai	South Pole Station	AO-376-O
Liu	Chuntao	McMurdo Station	AO-131-O
Long	Bruce	McMurdo Station	IO-205-O
Lorenzo	Juan	Nathaniel B. Palmer	GO-154-O
Luyendyk	Bruce P	Nathaniel B. Palmer	GO-152-O
Lyons	William B	McMurdo Station	BM-042-L
Mactavish	Carolyn	McMurdo Station	AB-148-O
Madsen	James M	South Pole Station	AA-130-O
Malinine	Alexandre	McMurdo Station	AB-143-O
Malone	Dan	McMurdo Station	BO-010-O
Manahan	Donal T	McMurdo Station	BO-006-O
Marchant	David R	McMurdo Station	GO-054-A
Margerison	Helen	McMurdo Station	GO-054-A
Marsh	Bruce D	McMurdo Station	GO-056-O
Marshak	Stephen	McMurdo Station	GO-062-O
Marske	Jared P	Nathaniel B. Palmer	GO-152-O

Marstall	Robert T	McMurdo Station	WO-218-O
Martin	Christopher L	South Pole Station	AO-371-O
Martin	Daniel L	Palmer Station	BP-028-L/P
Martinez	Lisandro M	South Pole Station	AO-129-O
Masi	Silvia	McMurdo Station	AB-148-O
Massoli	Paola	McMurdo Station	AO-107-O
Masters	Otto J	McMurdo Station	AB-145-O
Mastroianni	Joseph D	McMurdo Station	OO-314-O
Matoza	Robin S	Nathaniel B. Palmer	GO-152-O
Mau	Tamara L	McMurdo Station	BO-199-O
Mauskopf	Phil	McMurdo Station	AB-148-O
Maxson	Robert E	McMurdo Station	BO-006-O
Mayewski	Paul A	ITASE Traverse	IU-153-A
Mazzucchi	David	McMurdo Station	BM-042-D
Mc Callister	Shannon	Palmer Station	BP-045-L/P
Mc Carthy	Michael P	McMurdo Station	AO-110-M/S
Mcconnell	Joseph R	South Pole Station	IU-323-O
Mcintosh	William C	McMurdo Station	GO-081-O
Mcknight	Diane	McMurdo Station	BM-042-M
Meazell	Bobby	McMurdo Station	AB-145-O
			OO-

Mele	Philip A	Nathaniel B. Palmer	215-O
Mercer	Jennifer	Dry Valleys	BM-042-V
Messenger	Scott	McMurdo Station	GO-058-O
Metzger	Mark A	McMurdo Station	AB-145-O
Meyer	Jackie	South Pole Station	AA-130-O
Meyers	Joshua E	South Pole Station	AA-130-O
Mikucki	Jill	Dry Valleys	BM-042-P
Miller	Amber D	South Pole Station	AO-373-O
Minaeva	Yulia	South Pole Station	AA-130-O
Moerland	Timothy S	Laurence M. Gould, Palmer Station	BO-036-L/P
Montroy	Thomas E	McMurdo Station	AB-148-O
Moore	Robert	South Pole Station	AO-108-O
Moorhead	Daryl L	McMurdo Station	BM-042-L
Morgan	Susan	Laurence M. Gould	GO-092-O
Morse	Robert M	South Pole Station	AA-130-O
Morse	David L	McMurdo Station	IO-161-O
Muhs	Eric	South Pole Station	AA-130-O
Mullins	Jerry L	McMurdo Station	GO-052-M
Murray	Alison E	Palmer Station	BO-179-O
Mutiso	Charles K	South Pole Station	AO-129-O
Myers	Joan	McMurdo Station	WO-219-O

Nahnhauer	Rolf	South Pole Station	AA-130-O
Nam	Jiwoo	South Pole Station	AA-130-O
Netterfield	Barth	McMurdo Station	AB-148-O
Nevins	Hannahrose M	McMurdo Station	BO-031-O
Nickling	William G	McMurdo Station	GO-183-O
Niessen	Peter	South Pole Station	AA-130-O
Nikola	Thomas	South Pole Station	AO-371-O
Norcross	Zack	Laurence M. Gould	GO-092-O
Novak	Giles A	South Pole Station	AO-376-O
Nyblade	Andy	McMurdo Station	GO-089-M
Nylen	Thomas H	McMurdo Station	BM-042-F
O' Neel	Shad R	McMurdo Station	GO-295-O
Ogren	John	South Pole Station	OO-257-O
Oliver	John S	McMurdo Station	BO-010-O
Orsi	Alejandro H	Nathaniel B. Palmer	OO-215-O
Pace	Douglas A	McMurdo Station	BO-006-O
Padman	Laurence	Nathaniel B. Palmer	OO-215-O
Parker	Sandra	Palmer Station, Laurence M. Gould	BO-037-L/P
Parsons	Andrew N	Dry Valleys	BM-042-W
Pascale	Enzo	McMurdo Station	AB-148-O
Paschal	Evans	South Pole Station	AO-108-O

Pawlowski	Jan W	McMurdo Station	BO-043-O
Peloquin	Jill A	McMurdo Station	BO-047-O
Pesce	Johnathan J	South Pole Station	AO-129-O
Peters	Kevin J	Palmer Station	BO-022-L/P
Peters	Leo E	McMurdo Station	IO-205-O
Pettit	Erin C	McMurdo Station	IO-209-O
Pezzoli	Glenn S	Laurence M. Gould	OO-260-O
Piacentini	Francesco	McMurdo Station	AB-148-O
Pichat	Sylvain	McMurdo Station	GO-081-O
Pierce	Jamie L	McMurdo Station	GO-058-O
Place	Sean P	McMurdo Station	BO-134-O
Ponganis	Paul J	McMurdo Station	BO-197-O
Porazinska	Dorota L	Dry Valleys	BM-042-W
Porrat	Dana	McMurdo Station	AO-100-O
Pringle	Laurence	McMurdo Station	WO-218-O
Pryke	Clement L	South Pole Station	AO-373-O
Purdy	Jesse E	McMurdo Station	BO-017-O
Pyle	Roger	McMurdo Station, South Pole Station	AO-120-M/S
Rains	Adam	McMurdo Station	BO-027-O
Rapex	Paolo	South Pole Station	AO-115-O
			BP-

Raulfs	Estella	Laurence M. Gould	045-L/P
Raymond	James A	McMurdo Station	BO-001-O
Rea	Lorrie D	McMurdo Station	BO-199-O
Redinger	Robert E	McMurdo Station	AB-145-O
Redman	Regina S	McMurdo Station	BO-019-O
Rektoris	Ladislav	Palmer Station	BO-040-O
Renne	Paul R	McMurdo Station	GO-064-O
Ribordy	Mathieu A	South Pole Station	AA-130-O
Richter	Steffen	South Pole Station	AA-130-O
Roberts	Donald	McMurdo Station	AB-145-O
Roberts	John R	McMurdo Station	GO-087-M
Rodriguez	Russell J	McMurdo Station	BO-019-O
Rodriguez-Morales	Fernando	South Pole Station	AO-371-O
Rosenberger	Glenn C	McMurdo Station	AB-145-O
Rosenburg	Joan	Nathaniel B. Palmer	GO-152-O
Rotella	Jay J	McMurdo Station	BO-009-O
Ruhl	John E	McMurdo Station, South Pole Station	AB-148-O
Ruiz	Mario C	McMurdo Station	GO-081-O
Salter	Robert G	McMurdo Station	AB-145-O
Savage	Brian	Nathaniel B. Palmer	GO-071-O
Saxer	Iris	Palmer Station	BO-040-O

Scambos	Theodore A	McMurdo Station	IO-186-O
Schieder	Rudolph	South Pole Station	AO-371-O
Schlosser	Aaron	McMurdo Station	IO-196-M
Schneider	Darryn A	South Pole Station	AA-130-O
Schneider	David	ITASE Traverse	IU-153-A
Schnell	Russell C	South Pole Station	OO-257-O
Schutt	John W	McMurdo Station	GO-058-O
Schwarz	Robert K	South Pole Station	AA-130-O
Sedlack	Steven N	South Pole Station	AO-129-O
Shields	Amy R	McMurdo Station	BO-047-O
Shipp	Stephanie S	McMurdo Station	
Shore	Patrick J	McMurdo Station	GO-089-M
Shulman	Leonard M	McMurdo Station, South Pole Station	AO-120-M/S
Shulz	Barbara E	McMurdo Station	BO-019-O
Shuman	Christopher A	McMurdo Station	IO-186-O
Sidell	Bruce D	Laurence M. Gould, Palmer Station	BO-036-L/P
Siegal	Dan	South Pole Station	AO-373-O
Silvestri	Andrea	South Pole Station	AA-130-O
Simpkins	John	Nathaniel B. Palmer	OO-215-O
Sims	Ken W	McMurdo Station	GO-081-O
Sines	Karie A	Laurence M. Gould, Palmer Station	BP-016-L/P

Sivjee	Gulamabas G	South Pole Station	AO-129-O
Six	Delphine M	McMurdo Station	OO-201-O
Sletten	Ronald S	McMurdo Station	GO-053-O
Smalley, Jr	Robert E	McMurdo Station	GO-087-M
Smith	Douglas R	McMurdo Station	AB-143-O
Smith	Miles	South Pole Station	AO-373-O
Smith	Walker O	McMurdo Station	BO-047-O
Smith	Walker T	McMurdo Station	BO-047-O
Smith	Andy M	McMurdo Station	IO-205-O
Solarz	Michael	South Pole Station	AA-130-O
Sorlien	Christopher C	Nathaniel B. Palmer	GO-152-O
Soto	Nelyn E	McMurdo Station	BO-005-M
Spatz	Peter A	McMurdo Station	BM-042-M
Spiering	Christian	South Pole Station	AA-130-O
Spikes	Vandy B	ITASE Traverse	IU-153-A
Stanton	Basil	Nathaniel B. Palmer	OO-215-O
Stark	Antony A	South Pole Station	AO-371-O
Stearns	Leigh A	ITASE Traverse	IU-153-A
Stefano	Giuseppe D	McMurdo Station	AB-148-O
Steffen	Peter	South Pole Station	AA-130-O
Stepp	William	McMurdo Station	AB-145-O

Sterling	Rick	McMurdo Station	AO-112-O
Stevens	Nicholas	McMurdo Station	BM-042-P
Stewart	Michael	McMurdo Station	AB-143-O
Stewart	Brent S	McMurdo Station	BO-009-O
Stieg	Eric	ITASE Traverse	IU-153-A
Stock	Joann M	Nathaniel B. Palmer	GO-071-O
Stoecker	Diane K	Not station based	BO-020-O
Stone	Robert	South Pole Station	OO-213-M
Stupak Jr	Robert J	South Pole Station	AO-371-O
Sulanke	Karl H	South Pole Station	AA-130-O
Sullivan	David W	McMurdo Station	AB-145-O
Svarney	Thomas E	McMurdo Station	WO-220-O
Sweeney	Colm	Nathaniel B. Palmer	OO-214-O
Taylor	Frederick W	Laurence M. Gould	GO-080-L
Tewksbury	Dave	Laurence M. Gould	GO-092-O
Thibault	Michelle E	Nathaniel B. Palmer	GO-152-O
Thomas	Jennifer A	South Pole Station	AA-130-O
Thomas	Stephanie G	McMurdo Station	GO-054-A
Thomas, II	Thomas W	McMurdo Station	AB-145-O
Thurber	Andrew R	McMurdo Station	BO-010-O
Tilav	Serap Z	South Pole Station	AO-109-O

Tompkins	Trevor	Laurence M. Gould	GO-092-O
Tothill	Nicholas	South Pole Station	AO-371-O
Trivelpiece	Susan G	Palmer Station	BO-040-O
Trivelpiece	Wayne Z	Palmer Station	BO-040-O
Trumble	Stephen J	McMurdo Station	BO-199-O
Turner	Paul L	McMurdo Station	BM-042-M
Turnipseed	Mary	Laurence M. Gould	BP-045-L/P
Tyler	Kelly	McMurdo Station	WO-217-O
Uhle	Maria	McMurdo Station	BM-042-D
Valicenti	Lyndon	Laurence M. Gould	BP-028-L/P
Van Matre	Erin C	McMurdo Station	BM-042-M
Venema	Bryan J	South Pole Station, McMurdo Station	AO-110-M/S
Vernet	Maria	Palmer Station	BP-016-L/P
Vineyard	John J	South Pole Station	GO-090-P/S
Virginia	Ross A	Dry Valleys	BM-042-V
Voigt	Donald E	McMurdo Station	IO-205-O
Wagner	Wolfgang	South Pole Station	AA-130-O
Wagner	Bernd	McMurdo Station	BM-042-D
Walker	Christopher K	South Pole Station	AO-371-O
Wall	Diana H	Dry Valleys	BM-042-W

Warren	Stephen G	McMurdo Station	OO-201-O
Watson	Rebecca	McMurdo Station	BO-018-O
Watson	Timothy	McMurdo Station	GO-089-M
Watt	James	McMurdo Station	AB-148-O
Wefel	John P	McMurdo Station	AB-143-O
Weidner	George A	McMurdo Station	OO-283-M
Weiss	Stephanie T	Palmer Station	BO-022-L/P
Welch	Kathleen A	McMurdo Station	BM-042-L
Welch	Brian	ITASE Traverse	IU-153-A
Welzenbach	Linda C	McMurdo Station	GO-058-O
Whiteside	Robin P	McMurdo Station	AB-145-O
Whitmer	Allsion C	McMurdo Station	BO-134-O
Whittaker	Thomas	McMurdo Station	IO-196-M
Whittington	Alan G	McMurdo Station	GO-062-O
Wiedemann	Christin	South Pole Station	AA-130-O
Wilhelm	Steven W	Laurence M. Gould	BO-229-E
Williams	Theresa M	McMurdo Station	BO-017-O
Williams	Jeffery	McMurdo Station	BO-047-O
Williams	Sunita	McMurdo Station	GO-058-O
Willis	Kate	McMurdo Station	BO-017-O
Wilton-	Ruth T	McMurdo Station,	AO-110-

Godbefforde		South Pole Station	M/S
Winberry	Paul	McMurdo Station	IO-205-O
Winkler	Matt	McMurdo Station	BO-006-O
Wissing	Henrike	South Pole Station	AA-130-O
Woodside	James D	Palmer Station	WO-223-O
Woschnagg	Kurt W	South Pole Station	AA-130-O
Wright	Gregory A	South Pole Station	AO-371-O
Wright	Matthew	Laurence M. Gould	BP-028-L/P
Wumkes	Mark A	ITASE Traverse	IU-153-A
Ye	Shengyi	South Pole Station	AO-128-O
Yerington	Alan M	McMurdo Station	GO-078-O
Yngvesson	Sigfrid	South Pole Station	AO-371-O
Yochem	Pamela K	McMurdo Station	BO-009-O
Youngman	Elizabeth F	ITASE Traverse	IU-153-A
Zambianchi	Enrico	Nathaniel B. Palmer	OO-215-O
Zannoni	Ric	South Pole Station	AO-371-O
Zavala	Karina	McMurdo Station	GO-056-O
Zippay	Mackenzie L	McMurdo Station	BO-134-O

2002-2003 Science Planning Summary

Teachers Experiencing Antarctica and the Arctic (TEA)

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List of 2002-2003 teachers and the science projects they are joining

For information about each teacher, visit http://tea.rice.edu

Teachers Experiencing Antarctica and the Arctic is sponsored by NSF Office of Polar Programs and the Division of Elementary, Secondary, and Informal Education in the Directorate of Education and Human Resources. It is facilitated by Rice University, the Cold Regions Research and Engineering Laboratory, and the American Museum of Natural History.

Candidates are nominated by principal investigators or by themselves. Selections are made in a competitive process. Awardees travel to Antarctica and become working members of research teams. Principal investigators volunteer to accept TEAs on their teams.

TEA is part of the NSF's strategy to integrate research and education in an effort to infuse education with the joy of discovery and an awareness of its connections to exploration. The program's goals are to immerse teachers in research as part of their professional development, to bring polar research into the classroom in engaging ways, to underscore the societal relevance of science and the scientific process, and to maintain a lively community among researchers, teachers, students, and school districts.

NSF funds the extra of supporting teachers including: ·

- A substitute while the teacher is away ·
- Travel to the investigator's institution before the trip ·
- Travel by the teacher to Antarctica ·
- Travel by the investigator to the teacher's school district for joint presentations

his is an exciting program that offers benefits to the research team, the teacher,

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the classroom, and K-12 students both present and future. Teachers and school districts can find more information at http:tea.rice.edu.

Teacher	School	Event Number	Principal Investigator	Project
Andrew Caldwell	Douglas County High School Castle Rock, CO	GO-058-0	Ralph Harvey	The Antarctic search for meteorites ANSMET
Mary Ann DeMello	Rockland Public School Rockland, MA	IO-196-M	Brenda Hall	Collaborative Research: Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change
Jerri Lunn Hollyfield	McElwain Elementary Birmingham, AL	BO-022-O	Charles Amsler	The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula
Louis T. Huffman	Kennedy Junior High Lisle, IL	BM-042-M	Diane McKnight	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.
Eric Muhs	Shorewood High School Seattle, WA	AA-130-O	Robert Morse	AMANDA 2000
Michael R. Weiss	Yarmouth High School Yarmouth, Maine	GO-056-O	Bruce Marsh	The ferrar magmatic mush Column system, Dry Valleys, Antarctica

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Cooperative programs between the National Science Foundation and America's two major scouting organizations -- Girl Scouts of the USA and Boy Scouts of America -- sponsor a national competition every two years to select a scout for participation in the U.S. Antarctic Program.

The goal is to acquaint the boy or girl scout with a variety of science disciplines and with career opportunities in polar research and operational support. The scout, through scouting publications and sites on their home pages, shares his or her Antarctic experience with the many other members of the two scouting groups. Inclusion of a scout in the USAP began when Paul Siple joined Richard E. Byrd's expedition 70 years ago.

For the 2002-2003 field season, girl scout Amy Farrar of Silver Spring, Maryland has been selected. Ms. Farrar graduated from John F. Kennedy High School in 2001 where she developed an interest in science and government. While a senior she competed in a National Moot Court competition where she and her teammate won first place. Ms Farrar will delay her sophomore year at the University of Massachusetts for a semester in order to participate in the U.S. Antarctic Program.

During the 2002-2003 field season, Ms. Farrar will work at McMurdo Station and South Pole Station from mid-October 2001 to mid- January 2002. She will participate in six science projects, which will take her to Mt. Erebus and the McMurdo Dry Valleys. Ms. Farrar will spend 10 to 14 days with each project, and will be an working member of the project teams, contributing to and learning from the science objectives. She may also work with selected work centers at McMurdo Station and Amundsen-Scott South Pole Station.

Amy Farrar
1425 Winding Waye Lane
Silver Spring, MD 20902

Next season, the opportunity will go to a Boy Scout.

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Each year the National Science Foundation selects a limited number of journalists to visit USAP research stations and report on the scientific work being done. The program's goal is inform American taxpayers about the publicly supported program. Without NSF support, these visits would be difficult or impossible since there is no commercial transportation to the continent or within it.

Public affairs officers from NSF's Office of Legislative and Public Affairs (OLPA) assist reporters during their stay in Antarctica. Many reporters maintain their interest in the program for years after they visit the southernmost continent. A reporter may join a research cruise or spend an extended time at a field camp. They may focus on research in a particular discipline, pursue a broader interest in the science program as a whole, or concentrate on a specific project taking place that season.

The Antarctic "group media tour" of the past has been replaced by individual visits, and there are many more requests than can be met. Journalists apply to the program by proposing a reporting plan based on ideas often developed in conjunction with OLPA's staff. Candidates are selected on a competitive basis by a committee drawn from OLPA and the Office of Polar Programs (OPP). The program is open to media professionals and representatives from a variety of media may be selected in a given year.

The media visitors for the 2002-2003 field season have not yet been selected.

On January 21, 1902, Robert Falcon Scott landed on Ross Island during his National Antarctic Expedition in his ship, DISCOVERY. Scott and his men constructed the Discovery Hut on a strip of land they christened "Hut Point" (near what is now McMurdo Station) and spent the winter there.

McMurdo Station is located on the southern end of Ross Island, on the farthest south solid ground accessible by ship, and is reached by ship from McMurdo Sound. The island and the sea surrounding it bear the name of James Clark Ross, who discovered the island in 1841. Captain Ross also chose the name of McMurdo Sound in honor of Lieutenant Archibald McMurdo, one of the officers onboard Ross expedition's vessel, the TERROR. Ross Island is approximately 45 miles wide and 45 miles long and is also the home to New Zealand's Scott Base.

In December 1955, Hut Point was selected as the U.S. site for Operation Deep Freeze-I, to support polar science activities. A tent camp was formed until prefabricated buildings could be unloaded and erected. The first winter over at McMurdo was in 1956 and consisted of ninety-three men.

Currently, McMurdo Station is the largest of the United States Antarctic stations, and is the main operational center for the continental U.S. Antarctic Program. It has two landing strips and more than 100 buildings ranging in size from a small radio shack to large, three-story structures linked by above ground water, sewer, telephone, and power lines.

Construction on McMurdo's newest building, the Science Support Center continues this year. Eventually it will house the Mechanical Equipment Center, the Berg Field Center, the Field Safety Training Program (FSTP) and grantee science cargo. The expected completion date is 2004.

During the 2002 austral-winter season, 228 science, Aviation Technical Services (ATS), and Raytheon Polar Services Company (RPSC) contractor personnel remained at McMurdo Station to maintain station operations and to conduct winter-over research.

The winter operations tempo changed at Winter Fly In (WINFLY) which began on 19 August 2002 with a series of six flights from Christchurch, New Zealand, to McMurdo Station. In the period between WINFLY and the mainbody austral-summer station opening on 02 October 2002, four research projects began. Preparation of the station's facilities to accommodate the planned summer program will begin at the actual mainbody station opening.

Early estimates indicate that 2600 participants will fly to McMurdo during the austral-summer season. However, the weekly population average is expected to be approximately 1000.

McMurdo station will close out the 2002-03 austral-summer season activities on 22 February 2003. After this closing, approximately 200 people will remain at the station during the 2003 austral-winter month to maintain station operations, perform construction tasks, and conduct winter-over research.

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During a 57-day journey, Norwegian Roald Amundsen with four team members and 18 dogs arrived at the South Pole on December 14, 1911. Amundsen returned to his base at the Bay of Whales without mishap.

Englishman Robert Scott's expedition reached the South Pole a month later on January 17, 1912 only to discover the Norwegian flag already flying. All members of the Scott party, disheartened by the defeat and weakened by a lack of food, perished on the journey back to the coast.

In 1957, the Amundsen-Scott South Pole Station was established and has operated year-around ever since. A new station was occupied in 1975 and named Siple Dome after the station's first scientific leader, Paul Siple. A third station is now under construction.

The South Pole Station elevation is 2,900 meters; however the equivalent pressure elevation, based on polar atmospheric conditions, will vary from 3,300 to 4,000 meters. No landmarks are visible on the 3,000-meter-thick plateau of ice, located 1,350 km from McMurdo Station. Scientific research at the station falls into the general disciplines of upper-atmosphere physics, meteorology, earth sciences, geophysics, glaciology, biomedicine, and astrophysics.

From the first station construction through 1999, the Navy [Antarctic Development Squadron Six (VXE-6)] flew various aircraft in support of the U.S. Antarctic Program, including LC-130 and Twin Otter aircraft. In 1998 the Air Force/Air National Guard took over support of the USAP air transportation (Operation Deep Freeze) from the Navy. VXE-6 continued to augment the Air National Guard with LC-130 flights until March 1999. The New York Air National Guard's 109th Airlift Wing, which had augmented VXE-6 since 1988, became the sole USAP provider of LC-130 aircraft support, beginning with the 1999/2000 field season.

Amundsen-Scott South Pole Station will be open for normal 2002-2003 austral-summer research and operations activities on 30 October 2002. An operational opening on 23 October 2002 will precede this normal opening. The operational opening consists of station turnover duties between the incoming and outgoing support crew in preparation for the upcoming summer activities.

One of the many constraints at South Pole is population, which has an established upper limit of 220 people. This number represents a continuation of the previous season's efforts as construction of the new South Pole Station proceeds into its sixth season. As the station will be operating at or near population capacity for most of the summer season, conservation of resources such as power and water consumption are again paramount.

The austral-summer to austral-winter transition is scheduled for 15 February 2003. A support crew of about 60 people will remain to maintain station operations, continue new station construction and scientific research for the austral-winter from 16 February 2003 until November 2003.

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Palmer Station

Palmer Station, established in 1965, is named for Nathaniel B. Palmer, a Connecticut sealer who, on 17 November 1820, may have been the first person to see Antarctica during an exploratory voyage ranging southward from the South Shetland Islands. (British and Russian ships were in the area at about the same time.)

While "Old Palmer" opened in 1965, it was only open for three years before construction on the current station began. It was completed and occupied in 1970. Built on solid rock, the station consists of two major buildings and three small ones, two large fuel tanks, a helicopter pad, and a dock. The new station replaced a prefabricated wood structure that was located two kilometers away and across Arthur Harbor. Old Palmer has been disassembled and removed from Antarctica.

Palmer Station is the only USAP station on the Antarctic Peninsula, and is a base for Aeronomy, Biology, Geology & Geophysics, and Oceans & Climate Systems research. The station receives all logistics support from the Research Vessel Laurence M Gould (R/V LMG), a USAP-chartered research and supply vessel. The Gould transports cargo and personnel to and from the station throughout the year. Unlike the other two USAP stations, McMurdo and South Pole,, Palmer Station does not have the long period of winter isolation associated with "wintering-over" in Antarctica.

Palmer Station laboratories were completely remodeled during the winter of 2002 and now provide a safer, more modern facility with the capability to support a wider variety of research projects. Communications have been significantly upgraded as well with the installation of an improved network and a satellite earth station that provides around-the-clock Internet connectivity.

Palmer Station opened for the 2002-2003 research season on 29 September 2002 with the arrival of cruise LMG 02-06. Onboard the Gould were the summer season support staff to begin the turnover process with the winter-over personnel. Research and additional support staff arrive on 17 October 2002 on cruise LMG02-07. The primary research season will extend through May 2003, with station population ranging between 37 and 44 staff members, divided approximately equally between support staff and researchers. The transition from summer to winter personnel will occur over the course of five cruises from 15 February 2003 through 24 June 2003, with an additional winter support cruise in mid-August 2003.

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USAP Research Vessels

Research Vessel/Icebreaker Nathaniel B. Palmer (NBP)

The vessel, built in 1992, began its second ten-year charter in 2002. It is ice-classed (ABS-A2), and capable of breaking three feet of level ice at three knots. The Palmer accommodates 39 scientists and RPSC staff and normally sails with an operating crew of 25.

There are more than 4,000 sq. ft. of exterior main deck workspace and 7,600 square feet of laboratory space aboard the vessel. The vessel is 308 feet (93.9 meters) long with a beam of 60 feet (18.3 meters) and maximum draft of 19 feet (5.9 meters).

Look for the latest scheduling information on the Internet at http://http://www.usap.gov/USAPgov/vesselScienceAndOperations/documents/nbpsched.pdf.

Research Vessel Laurence M. Gould (LMG)

The vessel begins its sixth year of service to the United States Antarctic Program (USAP) in January 2003. The vessel is on charter to Raytheon Polar Services (the support contractor to the National Science Foundation Office of Polar Programs) from Edison Chouest Offshore, Galliano Louisiana. The *LMG* is a 239-foot, ice-classed research vessel. It has a maximum berthing of 28 science personnel, including a minimum of four support staff. Two berthing vans house Palmer Station science and support personnel berthing during south and northbound transits.

During the 2002-2003 season the *LMG* is scheduled for eleven cruises. These will be a combination of scientific research and supply and personnel runs to Palmer Station and field camps in the Antarctic Peninsula.

Look for the latest scheduling information on the Internet at http://www.usap.gov/vesselScienceAndOperations/documents/lmgsched.pdf

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2002-2003 Science Planning Summary

Environmental Health and Safety in Antarctica

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The Antarctic Conservation Act (ACA) was made U.S. law in 1978 and was amended by the Antarctic Science, Tourism, and Conservation Act of 1996. The ACA is intended to conserve and protect the native mammals, birds, and plants of Antarctica and the ecosystem. It is broadly applied to U.S. citizens and other participants in U.S. government activities south of 60 degrees south latitude. It regulates ordinary on-ice activities and provides a permit system that allows while carefully restricting certain otherwise prohibited activities for worthwhile purposes. It empowers enforcement officers and prescribes serious penalties for violations.

In 1991, the United States along with the other treaty nations adopted the Protocol on Environmental Protection and its five annexes that outline a comprehensive protection system for the antarctic environment. Together, the ACA and the Protocol formalizes America's commitment to protect the environment of the southernmost continent and its dependent and associated ecosystems. Together, the United States and other treaty nations are committed to preserving the region as a natural reserve devoted to peace and science.

Specific provisions for environmental protection include regulating the introduction of nonindigenous species, prohibiting casual interference with flora and fauna, and managing pollutants. Particularly sensitive regions have been designated ASPAs (Antarctic Specially Protected Areas) and permits are required to enter them. Each five years, NSF's support contractor must apply for and be issued a Master Permit which establishes requirements for managing pollutants and wastes including removal and recycling or proper disposal in the United States of most wastes and excess materials generated by the program.

Recognizing that worthwhile scientific research and related logistic support can have effects on the Antarctic environment, the Antarctic Treaty Consultative Parties adopted recommendations on environmental monitoring in Antarctica with two important goals:

To detect any unforeseen effects, and to verify the actual impact and scope of those effects that were anticipated. The Protocol on Environmental Protection to the Antarctic Treaty also requires that environmental impacts be monitored. The U.S. Antarctic Program (USAP) is developing an Environmental Monitoring Program designed to detect and measure any impacts from science and operations at its research stations in Antarctica. Only with a sustained and coherent monitoring program can a reliable basis for sound environmental management decisions and possible improvements be established. Data obtained from the monitoring program will be used to document baseline conditions, verify operational impact, and monitor activities undertaken to recover from accidental impacts to the environment.

Environmental, Health and Safety (EHS) initiatives for the United States Antarctic Program were established in 1987 by a safety review panel appointed by the director of the NSF. The goals of the initiatives are to clean up debris from past activities, improve the health and safety of all USAP participants, and minimize the environmental impact of on-ice activities. The initiatives are consistent with US environmental protection regulations (45CFR670-672).

Historically, the USAP has recycled 60-70 percent of all the waste generated on stations. The remainder is incinerated, treated, or removed to landfills in the United States. Last season, 1.9 million kilograms of recyclables, waste, and equipment were removed from USAP stations and field camps. The preferred waste management strategy is pollution prevention and the EHS initiatives waste minimization program has reduced waste by about 9 percent annually since 1994.

The initiatives also include an environmental impact assessment program. All on-ice activities, research or otherwise, which are expected to have a minor or transitory environmental impact are documented to help identify alternatives and mitigate potential impacts. This program is designed to ensure that environmental considerations are taken into account in the planning of all activities with the aim of preventing adverse impacts. Each season, audits are conducted to ensure that research activities comply with environmental impact assessment requirements.

A comprehensive plan to educate science parties about the Antarctic Conservation Act (ACA) and other environmental practices has been developed to support the USAP. Waste management education and training is provided at each major station and for personnel deploying to the field. Specialized environmental information and training is provided for the wide variety of environments and situations encountered within the USAP, both before and during the field season. For example, all participants entering the McMurdo Dry Valleys are trained to work in an area with its unique environmental sensitivities.

Antarctica's remote location and extreme environment, combined with limited medical services, make safety a top priority for all people working within the USAP. The USAP integrates health and safety requirements and awareness into every activity at every site. A comprehensive field safety training program has been implemented to ensure participants know what to expect, and how to survive in a variety of field situations. On station, RPSC invites all USAP participants to take part in specific safety training, safety evaluations and work place inspections to become more proactive in safety as opposed to reactive. With the addition of new safety multi-media and presentations at each of the stations, USAP participants can check out videos and safety information to round out their knowledge or to learn new techniques in preventing personal injuries. USAP participants are ultimately responsible for their behaviors and contributions to the

Safety and Health Program. RPSC Safety and Health Professionals & Management are a dedicated safety resource to the USAP who can and should be used by all program participants.

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Aeronomy & Astrophysics

Dr. Vladimir Papitashvili, Program Manager

PI Last Name	PI First Name	Project Title	NSF/OPP Award #	Event #
Adriani	Alberto	Study of polar stratospheric clouds by LIDAR	90-17805	AO-107-O
Avallone	Linnea	In situ measurements of halogen oxides in the troposphere	98-75829	AO-132-O
Avery	Susan	Dynamics of the Antarctic MLT (mesosphere-lower-thermosphere) region using ground-based radar and TIMED instrumentation	00-00957	AO-284-O
Bieber	John	Solar and heliospheric studies with antarctic cosmic ray observations	98-16129	AO-120-M/S
Carlstrom	John	DASI (Degree Angular Scale Interferometer)	00-94541	AO-373-O
Deshler	Terry	In situ measurements of polar stratospheric clouds, condensation nuclei, and ozone during the austral winter and spring	99-80594	AO-131-O
Ejiri	Masaki	All-Sky Imager at the South Pole	US-Japan	AO-117-O
Engebretson	Mark	Conjugate and high time resolution studies of ULF waves and magnetospheric dynamics using ground based induction magnetometers at four high latitude manned sites	99-09212	AO-102-M/S
Fraser-Smith	Antony	The operation of an ELF/VLF radiometer at Arrival Heights	01-38126	AO-100-O
Gaisser	Thomas	South Pole Air Shower Experiment - 2 (SPASE-2)	99-80801	AO-109-O

Hernandez	Gonzalo	High-latitude Antarctic neutral mesospheric and thermospheric dynamics and thermodynamics	99-09743	AO-110-M/S
Holzapfel	William	ACBAR (Arcminute Cosmology Bolometer Array)	00-91840	AO-378-O
Inan	Umran	ELF/VLF waves at the South Pole	99-09872	AO-106-S
Inan	Umran	A VLF beacon transmitter at South Pole (2001-2004)	00-93381	AO-108-O
Inan	Umran	Global thunderstorm activity and its effects on the radiation belts and the lower ionosphere	99-10565	AO-306-P
Jefferies	Stuart	Mapping the sound speed structure of the sun's atmosphere	00-87541	AO-115-O
LaBelle	James	A versatile electromagnetic waveform receiver for South Pole Station	00-90545	AO-128-O
Lanzerotti	Louis	A continuation of magnetometer data acquisition at McMurdo and South Pole Stations		AO-101-M/S
Lessard	Marc	Measurement and analysis of extremely low frequency (ELF) waves at South Pole Station	01-32576	AO-136-O
Mende	Steven	Antarctic Auroral Imaging	98-18086	AO-104-O
Morse	Robert	AMANDA 2000 (Antarctic Muon And Neutrino Detector Array)	99-80474	AA-130-O
Novak	Giles	Mapping galactic magnetic fields with SPARO (Submillimeter Polarimeter for Antarctic Remote Observations)	01-30389	AO-376-O
Rosenberg	Theodore	Riometry in Antarctica and conjugate region	00-03881	AO-111-M/S
Rosenberg	Theodore	Polar Experiment Network for Geophysical Upper-Atmospheric Investigations	98-18176	AO-112-O
Ruhl	John	BOOMERanG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics): A balloon-borne measurement of polarization in the cosmic microwave background	99-80654	AB-148-O

Sivjee	Gulamabas	Effects of enhanced solar disturbances during the 2000-2002 solar-max period on the Antarctic mesosphere-lower-thermosphere (MLT) and F regions composition, thermodynamics and dynamics	99-09339	AO-129-O
Stacey	Gordon	Wide-field imaging spectroscopy in the submillimeter: Deploying SPIFI on AST/RO	00-94605	AO-377-O
Stark	Antony	AST/RO (Antarctic Submillimeter Telescope and Remote Observatory)	01-26090	AO-371-O
Stepp	William	Long duration balloon program (LDB)	NASA	AB-145-O
Wefel	John	ATIC Long Duration Balloon Flight (Advanced Thin Ionization Calorimeter)	ATIC	AB-143-O

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Biology & Medicine

Dr. Polly Penhale, Program Manager

Table of Contents	List projects by Principal Investigator	List projects by USAP program	List projects by institution	List projects by station	List projects by event number (digits)	List deploying team members

Long-Term Ecological Research (LTER)

Palmer Station | McMurdo Station

PI Last Name	PI First Name	Project Title	NSF/OPP Award #	Event #
Ainley	David	Geographic structure of Adelie penguin populations: Demography of population expansion	01-25608	BO-031-O
Amsler	Charles	The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula	01-25181	BO-022-L/P
Blanchette	Robert	Investigation on deterioration in the Historic Huts of the Ross Sea region of Antarctica	99-09271	BO-038-O
Bowser	Samuel	Seasonal dynamics of giant agglutinated foraminifera	00-03639	BO-043-O
Castellini	Michael	Effects of foraging on the lipid biochemistry of freely diving Weddell seals	01-30417	BO-199-O
Connell	Laurie	Yeasts in the Antarctic Dry Valleys: Biological role, distribution, and evolution	01-25611	BO-019-O
Davis	Randall	Hunting behavior and energetics of free-ranging Weddell seals	99-09422	BO-017-O
DeVries	Arthur	Antifreeze proteins in antarctic fishes: Ecological and organismal physiology, protein structure-function and mechanism, genetics, and evolution	99-09841	BO-005-M
Detrich, III	H. William	Structure, function and expression of tubulins, globins, and microtubule-dependent motors from cold-adapted antarctic fishes	00-89451	BO-037-L/P

Doran	Peter	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	98-10219	BM-042-D
Ducklow	Hugh	Seabird component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	02-17282	BP-013-L/P
Ducklow	Hugh	Phytoplankton ecology component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	02-17282	BP-016-L/P
Ducklow	Hugh	Zooplankton component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	02-17282	BP-028-L/P
Ducklow	Hugh	Bio-optical component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	02-17282	BP-032-L/P
Ducklow	Hugh	LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment	00-87872	BP-045-L/P
Dye	Timothy	Culture emergence and health in Antarctica	01-25893	BO-027-O
Emslie	Steven	Abandoned penguin colonies in Antarctica	99-09274	BO-034-E
Fountain	Andrew	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	98-10219	BM-042-F
Fraser	William	Monitoring the effects of tourism and environmental variability on Adelie penguins at Palmer Station, Antarctica	01-30525	BO-198-P
Garrott	Robert	Patterns and processes: Dynamics of the Erebus Bay Weddell seal population	02-25110	BO-009-O
Hofmann	Gretchen	Evolutionary loss of the heat shock response in antarctic fishes	00-87971	BO-134-O
Hunt	George	Food web structure across a large-scale ocean productivity gradient: Top predator assemblages in the southern Indian Ocean	02-34570 (SGER)	BO-025-E
Jeffrey	Wade	Latitudinal Effects of UVR on bacterioplankton: BRIDE OF TABASCO science of opportunity cruise		BO-200-O

Kanatous	Shane	Ontogeny of aerobic capacity, lipid metabolism, and elevated myoglobin concentrations in the skeletal muscles of Weddell seals	01-25475	BO-018-O
Kim	Stacy	Community dynamics in a polar ecosystem: Benthic recovery from organic enrichment in the Antarctic	01-26319	BO-010-O
Kooyman	Gerald	Effects of B15 on breeding success of the Cape Crozier emperor penguin colony	02-24957 (SGER)	BO-197-O
Lyons	W. Berry	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	98-10219	BM-042-L
Manahan	Donal	Energetics of protein metabolism during development of Antarctic echinoderms	01-30398	BO-006-O
Martinson	Douglas	Long Term Environmental Research (LTER): Climate migration, ecological response and teleconnections in an ice-dominated environment	02-17282	BP-021-L
McKnight	Diane	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	98-10219	BM-042-M
Murray	Alison	Gene expression in extreme environments: Extending microarray technology to understand life at its limits	00-85435	BO-179-O
Palinkas	Lawrence	Prevention of environment-induced decrements in mood and cognitive performance	00-90343	BO-321-M/S
Priscu	John	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.	98-10219	BM-042-P
Raymond	James	Function and chemical nature of ice-active substances associated with sea ice diatoms	00-88000	BO-001-O
Sidell	Bruce	Cold body temperature as an evolutionary shaping force in the physiology of antarctic fishes	01-25890	BO-036-L/P
Smith	Walker	Interannual Variability in the Antarctic Ross Sea (IVARS): Nutrient fields and seasonal productivity II	00-87401	BO-047-O
Trivelpiece	Wayne	Foraging behavior and demography of pygoscelis penguins	99-80641	BO-040-O
Virginia	Ross	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	98-10219	BM-042-V

Wall	Diana	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert	98-10219	BM-042-W
Wilhelm	Steven	Viral dynamics and the Southern Ocean iron cycle	02-28895	BO-229-E

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Geology & Geophysics

Dr. Scott Borg, Program Manager

PI Last Name	PI First Name	Project Title	NSF/OPP Award #	Event #
Bao	Huiming	Multiple isotope analyses of soil sulfate and nitrate in the Antarctic Dry Valleys	01-25842	GO-051-O
Bart	Philip	CAREER: Relative frequency and phase of extreme expansions of the Antarctic ice sheets during the late Neogene	00-94078	GO-154-O
Berger	Glenn	Development of a luminescence dating capability for antarctic glaciomarine sediments: Tests of signal zeroing at the Antarctic Peninsula	99-09665	GO-092-O
Butler	Rhett	Global Seismograph Station: IRIS & USGS/ASL	EAR 00-04370	GO-090-P/S
Cande	Steve	Improved Cenozoic plate reconstructions of the circum-Antarctic region	01-26340 01-26334	GO-071-O
Dalziel	Ian	A GPS network to determine crustal motions in the bedrock of the West Antarctic Ice Sheet: Phase I, Installation	00-03619	GO-087-M
Elliot	David	Ferrar basaltic tuff-breccias formed by direct eruption: Evaluating an hypothesis	00-87919	GO-290-O
Fleming	Thomas	Emplacement of the ferrar mafic igneous province: A pilot study of intrusive architecture and flow directions in Southern Victoria Land	01-26106	GO-062-O
Hallet	Bernard	Stability of land surfaces in the Dry Valleys: Insights based on the dynamics of sub-surface ice and sand-wedge polygons	97-26139	GO-053-O
Harvey	Ralph	The Antarctic search for meteorites (ANSMET)	99-80452	GO-058-O
		University NAVSTAR Consortium (UNAVCO) GPS	EAR-99-	GO-

Johns	Bjorn	survey support	03413	295-O
Kemerait	Robert	AFTAC Dry Valley seismic project (Air Force Technical Applications Center)	NSF/OPP-DoD MOA	GO-078-O
Kyle	Philip	Mount Erebus Volcano Observatory: Gas emissions and seismic studies Development of integrated seismic, geodetic and volcanic gas surveillance instrumentation for volcanic research	98-14921 01-16577 (MRI)	GO-081-O
Lancaster	Nicholas	Aeolian processes in the McMurdo Dry Valleys, Antarctica	00-88136	GO-183-O
Luyendyk	Bruce	Antarctic cretaceous-cenozoic climate, glaciation, and tectonics: Site surveys for drilling from the edge of the Ross Ice Shelf	00-88143	GO-152-O
Lyons	W. Berry	Chemical weathering in Taylor Valley streams: Sources, mechanisms and global implications	00-87915	GO-074-O
Marchant	David	Response of the East Antarctic Ice Sheet to middle miocene global change	98-11877	GO-054-A
Marsh	Bruce	The ferrar magmatic mush column system, Dry Valleys, Antarctica	98-14332	GO-056-O
Mullins	Jerry	Antarctic mapping, geodesy, geospatial data, satellite image mapping and Antarctic Resource Center management	02-33246	GO-052-M
Renne	Paul	Calibration of cosmogenic argon production rates in Antarctica	01-25194	GO-064-O
Sims	Kenneth	U-Series (uranium-series) isotopic constraints on the rates of magma genesis evolution and degassing at Mt. Erebus, Antarctica	01-26269	GO-085-O
Taylor	Frederick	The Scotia Arc GPS Project: Focus on the Antarctic Peninsula and South Shetland Islands	01-26472	GO-080-L
Wiens	Douglas	A broadband seismic experiment to investigate deep continental structure across the East-West Antarctic boundary	99-09603	GO-089-M

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Glaciology

Dr. Julie Palais, Program Manager

Table of Contents	List projects by Principal Investigator	List projects by USAP program	List projects by institution	List projects by station	List projects by event number (digits)	List deploying team members

United States component of the International Trans Antarctic Expedition (US ITASE)

PI Last Name	PI First Name	Project Title	NSF/OPP Award #	Event #
Albert	Mary	U.S. ITASE: Snow and firn microstructure and transport properties	98-14676	IU-155-O
Anandakrishnan	Sridhar	Characterizing the onset of ice stream flow: A ground geophysical program	00-86297	IO-205-O
Arcone	Steven	U.S. ITASE: High resolution radar profiling of the snow and ice stratigraphy beneath the ITASE traverses	98-14589	IU-311-O
Bales	Roger	U.S. ITASE: Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica	98-14810	IU-158-O
Conway	Howard	Western Divide WAISCORES site selection	00-87345	IO-209-O
Cuffey	Kurt	Dynamics and climatic response of the Taylor Glacier system	01-25579	IO-161-O
Hall	Brenda	Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change.	01-24014	IO-196-M
Hall	Brenda	AMS Radiocarbon Chronology of Glacier Fluctuations in South Shetland Islands during Glacial/Interglacial Hemicycle: Implications Antarctica's Role in Global Climate Change	01-24014	IO-194-E
Hamilton	Gordon	U.S. ITASE: Mass balance and accumulation rate along US ITASE routes	98-15510	IU-178-O

Jacobel	Robert	U.S. ITASE: Radar studies of internal stratigraphy and bedrock topography along the traverse	98-14574	IU-133-O
Mayewski	Paul	U.S. ITASE: Science management for the United States component of the International Trans Antarctic Expedition	97-25057	IU-153-A
Mayewski	Paul	U.S. ITASE: Glaciochemistry	98-11857	IU-153-B
McConnell	Joseph	U.S. ITASE: Deposition of the HFC degradation product trifluoroacetate in antarctic snow and ice	00-87776	IU-323-O
Meese	Debra	U.S. ITASE: The physical properties of the U.S. ITASE ice cores	99-80434	IU-185-O
Scambos	Theodore	Characteristics of snow megadunes and their potential effects on ice core interpretation	01-25570	IO-186-O
Steig	Eric	U.S. ITASE: Stable isotope studies at West Antarctic ITASE sites	99-04947	IU-193-O

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Oceans & Climate

Dr. Bernhard Lettau, Program Manager

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PI Last Name	PI First Name	Project Title	NSF/OPP Award #	Event #
Chereskin	Teresa	Shipboard acoustic doppler current profiling on R/V Nathaniel B. Palmer and R/V Laurence M. Gould	98-16226	OO-317-L
Eicken	Hajo	Measurements and improved parameterizations of the thermal conductivity and heat flow through first-year sea ice	0126007	OO-253-O
Firing	Eric	Shipboard acoustic doppler current profiling on RVIB Nathaniel B. Palmer and RV Laurence M. Gould	98-16226	OO-315-N
Gordon	Arnold	ANSLOPE: Cross slope exchanges at the Antarctic slope front	01-25172	OO-215-O
Hansen	Anthony	Measurement of combustion effluent carbonaceous aerosols in the McMurdo Dry Valleys, Antarctica	98-15140	OO-314-O
Hofmann	Dave	South Pole monitoring for climatic change -- U.S. Department of Commerce NOAA climate monitoring and diagnostic laboratory	90-17842	OO-257-O
Hofmann	Dave	Collection of atmospheric air for the NOAA/CMDL worldwide flask sampling network	NSF/NOAA agreement	OO-264-O
Keeling	Ralph	A study of atmospheric oxygen variability in relation to annual to decadal variations in terrestrial and marine ecosystems	95-Okeel	OO-204-O
Sanderson	Colin	University of Miami/Dept of Energy-Environmental Measurements Lab, Remote Atmospheric Measurements Program (RAMP)		OO-275-O
Sprintall	Janet	Drake Passage XBT Program	00-03618	OO-260-O
Stearns	Charles	Antarctic Meteorological Research Center (AMRC)	01-26262	OO-202-

				O
Stearns	Charles	Antarctic automatic weather station program: 2001-2004	00-88058	OO-283-M
Takahashi	Taro	Mesoscale, seasonal, and inter-annual variability of surface water carbon dioxide in the Drake Passage	00-03609	OO-214-O
Walden	Von	Work at Dome C through NASA and the Italian/French program		OO-213-M
Warren	Stephen	Solar radiation on the East Antarctic Plateau	00-03826	OO-201-O

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Artists & Writers

Mr. Guy Guthrige, Program Manager

PI Last Name	PI First Name	Project Title	NSF/OPP Award #	Event #
Kelley	Scott	terra incognita: anvers island and surrounding area	(none)	WO-221-O
Myers	Joan	A photographic overview of the ongoing human exploration and occupation of Antarctica, the most hostile continent on our planet	(none)	WO-219-O
Pringle	Laurence	A nonfiction, illustrated children's book about the Weddell seal	(none)	WO-218-O
Svarney	Thomas	Frigid Beauty: Weather in Antarctica	(none)	WO-220-O
Tyler	Kelly	The Lost Men: A book linking modern science and Shackleton's Ross Sea Party	(none)	WO-217-O
Woodside	James	To Paint in Antarctica	(none)	WO-223-O

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Major Field Camps Supported by McMurdo Station

Four USAP-supported Antarctic deep-field camps will be used by McMurdo-based researchers.

Byrd Surface Camp

80° 05' S, 119° 32' W

This camp is the staging area for the U.S. component of the International Trans-Antarctic Scientific Expedition (U.S. ITASE) traverse. Support contractor personnel will open and staff the camp while the traverse equipment is de-winterized and prepared for the traverse. The camp will close after the traverse departs for South Pole. Three members of the support contractor staff will accompany the traverse team.

Later in the season, Ian Dalziel (GO-087-O) and Charles Stearns (OO-283-O) will work at the site for short periods. Howard Conway (IO-209-O) will put in at the site to begin a traverse. All three groups will use tent camps rather than the existing camp structures.

Onset D Camp

80° 45' S, 125° 45' W

This season, Sridar Anandakrishnan (IO-205-O) will use the Onset D camp. Five resident contractor staff members will operate the camp.

TAMSEIS Camp

81° 41' S, 122° 26' E

"TAM Camp," staffed by three resident contractor staff members, will support two groups this season:

Douglas Weins (GO-089-O) will use the camp as a logistical hub and refueling point for extensive Twin Otter operations inspecting and servicing an array of seismic instruments

Ted Scambos (IO-186-O) will use TAM Camp for altitude acclimatization before deploying to a remote tent camp.

Siple Dome

81° 39' S, 149° 04' W

Siple Dome will support Ian Dalziel (GO-087-O) and will serve as a potential refueling site and diversionary landing site for fixed-wing aircraft.

At the end of the season, three resident contractor staff members will decommission the camp and retrograde materials left on-site from previous seasons.

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McMurdo-based aircraft (Helicopters, Twin Otter and LC-130 fixed-wing aircraft) will continue to support USAP researchers and program logistical functions.

Petroleum Helicopters Inc. (PHI) provides four helicopters, two AS-350-B2 "A-STAR" and two Bell 212 "Hueys". They support researchers in the Royal Society Range, the Dry Valleys, and on Mt. Erebus.

New York Air National Guard provides LC-130 Hercules fixed-wing aircraft:

- South Pole Station resupply and research support
- Siple Dome
- Onset D
- Byrd Surface Camp
- Patriot Hills in West Antarctica
- TAMSEIS Camp in East Antarctica
- Beardmore Glacier
- Odell Glacier
- Ford Ranges

Kenn Borek Air supports research activities with three DHC-6 Twin Otter aircraft.

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McMurdo Station

Event #	NSF/OPP Award #	PI Last Name	PI First Name	Project Title
AO-107-O	90-17805	Adriani	Alberto	Study of polar stratospheric clouds by LIDAR
BO-031-O	01-25608	Ainley	David	Geographic structure of Adelie penguin populations: Demography of population expansion
IU-155-O	98-14676	Albert	Mary	U.S. ITASE: Snow and firn microstructure and transport properties
IO-205-O	00-86297	Anandakrishnan	Sridhar	Characterizing the onset of ice stream flow: A ground geophysical program
IU-311-O	98-14589	Arcone	Steven	U.S. ITASE: High resolution radar profiling of the snow and ice stratigraphy beneath the ITASE traverses
AO-132-O	98-75829	Avallone	Linnea	In situ measurements of halogen oxides in the troposphere
IU-158-O	98-14810	Bales	Roger	U.S. ITASE: Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica
GO-051-O	01-25842	Bao	Huiming	Multiple isotope analyses of soil sulfate and nitrate in the Antarctic Dry Valleys
GO-154-O	00-94078	Bart	Philip	CAREER: Relative frequency and phase of extreme expansions of the Antarctic ice sheets during the late Neogene
AO-120-M/S	98-16129	Bieber	John	Solar and heliospheric studies with antarctic cosmic ray observations
BO-038-O	99-09271	Blanchette	Robert	Investigation on deterioration in the Historic Huts of the Ross Sea region of Antarctica

BO-043-O	00-03639	Bowser	Samuel	Seasonal dynamics of giant agglutinated foraminifera
BO-199-O	01-30417	Castellini	Michael	Effects of foraging on the lipid biochemistry of freely diving Weddell seals
BO-019-O	01-25611	Connell	Laurie	Yeasts in the Antarctic Dry Valleys: Biological role, distribution, and evolution
IO-209-O	00-87345	Conway	Howard	Western Divide WAISCORES site selection
IO-161-O	01-25579	Cuffey	Kurt	Dynamics and climatic response of the Taylor Glacier system
GO-087-M	00-03619	Dalziel	Ian	A GPS network to determine crustal motions in the bedrock of the West Antarctic Ice Sheet: Phase I, Installation
BO-017-O	99-09422	Davis	Randall	Hunting behavior and energetics of free-ranging Weddell seals
BO-005-M	99-09841	DeVries	Arthur	Antifreeze proteins in antarctic fishes: Ecological and organismal physiology, protein structure-function and mechanism, genetics, and evolution
AO-131-O	99-80594	Deshler	Terry	In situ measurements of polar stratospheric clouds, condensation nuclei, and ozone during the austral winter and spring
BM-042-D	98-10219	Doran	Peter	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert
BO-027-O	01-25893	Dye	Timothy	Culture emergence and health in Antarctica
OO-253-O	0126007	Eicken	Hajo	Measurements and improved parameterizations of the thermal conductivity and heat flow through first-year sea ice
GO-290-O	00-87919	Elliot	David	Ferrar basaltic tuff-breccias formed by direct eruption: Evaluating an hypothesis
AO-102-M/S	99-09212	Engebretson	Mark	Conjugate and high time resolution studies of ULF waves and magnetospheric dynamics using ground based induction magnetometers at four high latitude manned sites
GO-				Emplacement of the ferrar mafic igneous

062-O	01-26106	Fleming	Thomas	province: A pilot study of intrusive architecture and flow directions in Southern Victoria Land
BM-042-F	98-10219	Fountain	Andrew	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.
AO-100-O	01-38126	Fraser-Smith	Antony	The operation of an ELF/VLF radiometer at Arrival Heights
BO-009-O	02-25110	Garrott	Robert	Patterns and processes: Dynamics of the Erebus Bay Weddell seal population
IO-196-M	01-24014	Hall	Brenda	Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change.
GO-053-O	97-26139	Hallet	Bernard	Stability of land surfaces in the Dry Valleys: Insights based on the dynamics of sub-surface ice and sand-wedge polygons
IU-178-O	98-15510	Hamilton	Gordon	U.S. ITASE: Mass balance and accumulation rate along US ITASE routes
OO-314-O	98-15140	Hansen	Anthony	Measurement of combustion effluent carbonaceous aerosols in the McMurdo Dry Valleys, Antarctica
GO-058-O	99-80452	Harvey	Ralph	The Antarctic search for meteorites (ANSMET)
AO-110-M/S	99-09743	Hernandez	Gonzalo	High-latitude Antarctic neutral mesospheric and thermospheric dynamics and thermodynamics
BO-134-O	00-87971	Hofmann	Gretchen	Evolutionary loss of the heat shock response in antarctic fishes
OO-257-O	90-17842	Hofmann	Dave	South Pole monitoring for climatic change -- U.S. Department of Commerce NOAA climate monitoring and diagnostic laboratory
IU-133-O	98-14574	Jacobel	Robert	U.S. ITASE: Radar studies of internal stratigraphy and bedrock topography along the traverse
GO-295-O	EAR-99-03413	Johns	Bjorn	University NAVSTAR Consortium (UNAVCO) GPS survey support
BO-018-O	01-25475	Kanatous	Shane	Ontogeny of aerobic capacity, lipid metabolism, and elevated myoglobin concentrations in the skeletal muscles of Weddell seals

GO-078-O	NSF/OPP-DoD MOA	Kemerait	Robert	AFTAC Dry Valley seismic project (Air Force Technical Applications Center)
BO-010-O	01-26319	Kim	Stacy	Community dynamics in a polar ecosystem: Benthic recovery from organic enrichment in the Antarctic
BO-197-O	02-24957 (SGER)	Kooyman	Gerald	Effects of B15 on breeding success of the Cape Crozier emperor penguin colony
GO-081-O	98-14921 01-16577 (MRI)	Kyle	Philip	Mount Erebus Volcano Observatory: Gas emissions and seismic studies Development of integrated seismic, geodetic and volcanic gas surveillance instrumentation for volcanic research
GO-183-O	00-88136	Lancaster	Nicholas	Aeolian processes in the McMurdo Dry Valleys, Antarctica
AO-101-M/S		Lanzerotti	Louis	A continuation of magnetometer data acquisition at McMurdo and South Pole Stations
BM-042-L	98-10219	Lyons	W. Berry	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.
GO-074-O	00-87915	Lyons	W. Berry	Chemical weathering in Taylor Valley streams: Sources, mechanisms and global implications
BO-006-O	01-30398	Manahan	Donal	Energetics of protein metabolism during development of Antarctic echinoderms
GO-054-A	98-11877	Marchant	David	Response of the East Antarctic Ice Sheet to middle miocene global change
GO-056-O	98-14332	Marsh	Bruce	The ferrar magmatic mush column system, Dry Valleys, Antarctica
IU-153-A	97-25057	Mayewski	Paul	U.S. ITASE: Science management for the United States component of the International Trans Antarctic Expedition
IU-153-B	98-11857	Mayewski	Paul	U.S. ITASE: Glaciochemistry
IU-323-O	00-87776	McConnell	Joseph	U.S. ITASE: Deposition of the HFC degradation product trifluoroacetate in antarctic snow and ice
BM-042-	98-10219	McKnight	Diane	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in

M				a polar desert.
IU-185-O	99-80434	Meese	Debra	U.S. ITASE: The physical properties of the U.S. ITASE ice cores
GO-052-M	02-33246	Mullins	Jerry	Antarctic mapping, geodesy, geospatial data, satellite image mapping and Antarctic Resource Center management
WO-219-O	(none)	Myers	Joan	A photographic overview of the ongoing human exploration and occupation of Antarctica, the most hostile continent on our planet
BO-321-M/S	00-90343	Palinkas	Lawrence	Prevention of environment-induced decrements in mood and cognitive performance
WO-218-O	(none)	Pringle	Laurence	A nonfiction, illustrated children's book about the Weddell seal
BM-042-P	98-10219	Priscu	John	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.
BO-001-O	00-88000	Raymond	James	Function and chemical nature of ice-active substances associated with sea ice diatoms
GO-064-O	01-25194	Renne	Paul	Calibration of cosmogenic argon production rates in Antarctica
AO-111-M/S	00-03881	Rosenberg	Theodore	Riometry in Antarctica and conjugate region
AO-112-O	98-18176	Rosenberg	Theodore	Polar Experiment Network for Geophysical Upper-Atmospheric Investigations
AB-148-O	99-80654	Ruhl	John	BOOMERanG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics): A balloon-borne measurement of polarization in the cosmic microwave background
IO-186-O	01-25570	Scambos	Theodore	Characteristics of snow megadunes and their potential effects on ice core interpretation
GO-085-O	01-26269	Sims	Kenneth	U-Series (uranium-series) isotopic constraints on the rates of magma genesis evolution and degassing at Mt. Erebus, Antarctica
BO-047-O	00-87401	Smith	Walker	Interannual Variability in the Antarctic Ross Sea (IVARS): Nutrient fields and seasonal productivity II

OO-202-O	01-26262	Stearns	Charles	Antarctic Meteorological Research Center (AMRC)
OO-283-M	00-88058	Stearns	Charles	Antarctic automatic weather station program: 2001-2004
IU-193-O	99-04947	Steig	Eric	U.S. ITASE: Stable isotope studies at West Antarctic ITASE sites
AB-145-O	NASA	Stepp	William	Long duration balloon program (LDB)
WO-220-O	(none)	Svarney	Thomas	Frigid Beauty: Weather in Antarctica
WO-217-O	(none)	Tyler	Kelly	The Lost Men: A book linking modern science and Shackleton's Ross Sea Party
BM-042-V	98-10219	Virginia	Ross	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert
BM-042-W	98-10219	Wall	Diana	McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert
OO-201-O	00-03826	Warren	Stephen	Solar radiation on the East Antarctic Plateau
AB-143-O	ATIC	Wefel	John	ATIC Long Duration Balloon Flight (Advanced Thin Ionization Calorimeter)
GO-089-M	99-09603	Wiens	Douglas	A broadband seismic experiment to investigate deep continental structure across the East-West Antarctic boundary

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Amundsen-Scott South Pole Station

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Event #	NSF/OPP Award #	PI Last Name	PI First Name	Project Title
AO-284-O	00-00957	Avery	Susan	Dynamics of the Antarctic MLT (mesosphere-lower-thermosphere) region using ground-based radar and TIMED instrumentation
AO-120-M/S	98-16129	Bieber	John	Solar and heliospheric studies with antarctic cosmic ray observations
GO-090-P/S	EAR 00-04370	Butler	Rhett	Global Seismograph Station: IRIS & USGS/ASL
AO-373-O	00-94541	Carlstrom	John	DASI (Degree Angular Scale Interferometer)
AO-117-O	US-Japan	Ejiri	Masaki	All-Sky Imager at the South Pole
AO-102-M/S	99-09212	Engebretson	Mark	Conjugate and high time resolution studies of ULF waves and magnetospheric dynamics using ground based induction magnetometers at four high latitude manned sites
AO-109-O	99-80801	Gaisser	Thomas	South Pole Air Shower Experiment - 2 (SPASE-2)
AO-110-M/S	99-09743	Hernandez	Gonzalo	High-latitude Antarctic neutral mesospheric and thermospheric dynamics and thermodynamics
AO-378-O	00-91840	Holzapfel	William	ACBAR (Arcminute Cosmology Bolometer Array)
AO-106-S	99-09872	Inan	Umran	ELF/VLF waves at the South Pole
AO-108-O	00-93381	Inan	Umran	A VLF beacon transmitter at South Pole (2001-2004)

AO-115-O	00-87541	Jefferies	Stuart	Mapping the sound speed structure of the sun's atmosphere
AO-128-O	00-90545	LaBelle	James	A versatile electromagnetic waveform receiver for South Pole Station
AO-101-M/S		Lanzerotti	Louis	A continuation of magnetometer data acquisition at McMurdo and South Pole Stations
AO-136-O	01-32576	Lessard	Marc	Measurement and analysis of extremely low frequency (ELF) waves at South Pole Station
AO-104-O	98-18086	Mende	Steven	Antarctic Auroral Imaging
AA-130-O	99-80474	Morse	Robert	AMANDA 2000 (Antarctic Muon And Neutrino Detector Array)
AO-376-O	01-30389	Novak	Giles	Mapping galactic magnetic fields with SPARO (Submillimeter Polarimeter for Antarctic Remote Observations)
BO-321-M/S	00-90343	Palinkas	Lawrence	Prevention of environment-induced decrements in mood and cognitive performance
AO-111-M/S	00-03881	Rosenberg	Theodore	Riometry in Antarctica and conjugate region
AO-129-O	99-09339	Sivjee	Gulamabas	Effects of enhanced solar disturbances during the 2000-2002 solar-max period on the Antarctic mesosphere-lower-thermosphere (MLT) and F regions composition, thermodynamics and dynamics
AO-377-O	00-94605	Stacey	Gordon	Wide-field imaging spectroscopy in the submillimeter: Deploying SPIFI on AST/RO
AO-371-O	01-26090	Stark	Antony	AST/RO (Antarctic Submillimeter Telescope and Remote Observatory)

2002-2003 Science Planning Summary

Palmer Station

Event #	NSF/OPP Award #	PI Last Name	PI First Name	Project Title
BO-022-L/P	01-25181	Amsler	Charles	The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula
GO-090-P/S	EAR 00-04370	Butler	Rhett	Global Seismograph Station: IRIS & USGS/ASL
BO-037-L/P	00-89451	Detrich, III	H. William	Structure, function and expression of tubulins, globins, and microtubule-dependent motors from cold-adapted antarctic fishes
BP-013-L/P	02-17282	Ducklow	Hugh	Seabird component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-016-L/P	02-17282	Ducklow	Hugh	Phytoplankton ecology component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-028-L/P	02-17282	Ducklow	Hugh	Zooplankton component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-032-L/P	02-17282	Ducklow	Hugh	Bio-optical component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-045-L/P	00-87872	Ducklow	Hugh	LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BO-198-P	01-30525	Fraser	William	Monitoring the effects of tourism and environmental variability on Adelie penguins at Palmer Station, Antarctica
OO-264-O	NSF/NOAA agreement	Hofmann	Dave	Collection of atmospheric air for the NOAA/CMDL worldwide flask sampling network

AO-306-P	99-10565	Inan	Umran	Global thunderstorm activity and its effects on the radiation belts and the lower ionosphere
OO-204-O	95-Okeel	Keeling	Ralph	A study of atmospheric oxygen variability in relation to annual to decadal variations in terrestrial and marine ecosystems
WO-221-O	(none)	Kelley	Scott	terra incognita: anvers island and surrounding area
GO-052-M	02-33246	Mullins	Jerry	Antarctic mapping, geodesy, geospatial data, satellite image mapping and Antarctic Resource Center management
BO-179-O	00-85435	Murray	Alison	Gene expression in extreme environments: Extending microarray technology to understand life at its limits
OO-275-O		Sanderson	Colin	University of Miami/Dept of Energy-Environmental Measurements Lab, Remote Atmospheric Measurements Program (RAMP)
BO-036-L/P	01-25890	Sidell	Bruce	Cold body temperature as an evolutionary shaping force in the physiology of antarctic fishes
WO-223-O	(none)	Woodside	James	To Paint in Antarctica

2002-2003 Science Planning Summary

Research Vessel Laurence M Gould

(RV LMG)

Event #	NSF/OPP Award #	PI Last Name	PI First Name	Project Title
BO-022-L/P	01-25181	Amsler	Charles	The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula
GO-092-O	99-09665	Berger	Glenn	Development of a luminescence dating capability for antarctic glaciomarine sediments: Tests of signal zeroing at the Antarctic Peninsula
OO-317-L	98-16226	Chereskin	Teresa	Shipboard acoustic doppler current profiling on R/V Nathaniel B. Palmer and R/V Laurence M. Gould
BO-037-L/P	00-89451	Detrich, III	H. William	Structure, function and expression of tubulins, globins, and microtubule-dependent motors from cold-adapted antarctic fishes
BP-013-L/P	02-17282	Ducklow	Hugh	Seabird component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-016-L/P	02-17282	Ducklow	Hugh	Phytoplankton ecology component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-028-L/P	02-17282	Ducklow	Hugh	Zooplankton component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-032-L/P	02-17282	Ducklow	Hugh	Bio-optical component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-045-L/P	00-87872	Ducklow	Hugh	LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment
BP-021-L	02-17282	Martinson	Douglas	Long Term Environmental Research (LTER): Climate migration, ecological response and teleconnections in an ice-dominated environment

BO-036-L/P	01-25890	Sidell	Bruce	Cold body temperature as an evolutionary shaping force in the physiology of antarctic fishes
OO-260-O	00-03618	Sprintall	Janet	Drake Passage XBT Program
OO-214-O	00-03609	Takahashi	Taro	Mesoscale, seasonal, and inter-annual variability of surface water carbon dioxide in the Drake Passage

2002-2003 Science Planning Summary

Research Vessel/Icebreaker Nathaniel B Palmer

(RV/IB NBP)

Event #	NSF/OPP Award #	PI Last Name	PI First Name	Project Title
GO-154-O	00-94078	Bart	Philip	CAREER: Relative frequency and phase of extreme expansions of the Antarctic ice sheets during the late Neogene
GO-071-O	01-26340 01-26334	Cande	Steve	Improved Cenozoic plate reconstructions of the circum-Antarctic region
OO-315-N	98-16226	Firing	Eric	Shipboard acoustic doppler current profiling on RVIB Nathaniel B. Palmer and RV Laurence M. Gould
OO-215-O	01-25172	Gordon	Arnold	ANSLOPE: Cross slope exchanges at the Antarctic slope front
BO-200-O		Jeffrey	Wade	Latitudinal Effects of UVR on bacterioplankton: BRIDE OF TABASCO science of opportunity cruise
GO-152-O	00-88143	Luyendyk	Bruce	Antarctic cretaceous-cenozoic climate, glaciation, and tectonics: Site surveys for drilling from the edge of the Ross Ice Shelf

Event #	NSF/OPP Award #	PI Last Name	PI First Name	Project Title
BO-034-E	99-09274	Emslie	Steven	Abandoned penguin colonies in Antarctica
IO-194-E	01-24014	Hall	Brenda	AMS Radiocarbon Chronology of Glacier Fluctuations in South Shetland Islands during Glacial/Interglacial Hemicycle: Implications Antarctica's Role in Global Climate Change
BO-025-E	02-34570 (SGER)	Hunt	George	Food web structure across a large-scale ocean productivity gradient: Top predator assemblages in the southern Indian Ocean
GO-080-L	01-26472	Taylor	Frederick	The Scotia Arc GPS Project: Focus on the Antarctic Peninsula and South Shetland Islands
BO-040-O	99-80641	Trivelpiece	Wayne	Foraging behavior and demography of pygoscelis penguins
OO-213-M		Walden	Von	Work at Dome C through NASA and the Italian/French program
BO-229-E	02-28895	Wilhelm	Steven	Viral dynamics and the Southern Ocean iron cycle

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-107-O

NSF/OPP 90-17805

Station: McMurdo Station

RPSC POC: Robbie Score

Research Site(s): Crary Lab, balloon facility

Study of polar stratospheric clouds by LIDAR

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Instituto De Fisica Dell'Atmosfera

Deploying Team Members: Francesco Cairo . Paola Massoli

Research Objectives: The appearance each spring of the stratospheric ozone hole above Antarctica is driven by chlorine compounds interacting on the surfaces of clouds known as polar stratospheric clouds (PSCs). This is one explanation for why ozone depletion is much more severe in polar regions than elsewhere.

This project uses an optical radar (LIDAR, LIght Detection And Ranging) to study the PSCs, stratospheric aerosol, and the thermal behavior and dynamics of the atmosphere above McMurdo Station. Continuous LIDAR observations provide insight into the formation, evolution, and other characteristics of these PSCs.

McMurdo LIDAR is part of the Network for Detection of Stratospheric Change (NDSC), a global set of high-quality remote-sounding research stations for observing and understanding the physical and chemical state of the atmosphere. McMurdo is considered a primary NDSC site for

LIDAR observations and for monitoring stratospheric aerosol and clouds. Such data also provide a complement to the information gained from balloon-borne instruments in project AO-131-O, and thus collaborative activities are being coordinated with the University of Wyoming.

Field Season Overview: The researchers will continue operation of the LIDAR (light radar) located in Phase II of McMurdo Station's Crary Science and Engineering Center (Crary Lab). Project team members will coordinate their LIDAR observations with Terry Deshler's (AO-131-O) ozonesonde and atmospheric aerosol balloon launches.

One team member will train the winter-over science technician in LIDAR operation. During the austral winter, the science technician will operate the LIDAR at regular, prearranged times. The McMurdo Station weather office will also support this project by taking winter meteorological soundings.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-031-O

NSF/OPP 01-25608

Station: McMurdo Station

RPSC POC: Howie Tobin

Research Site(s): Beaufort Islands, Cape Bird, Cape Royds, Cape Crozier, Ross Island

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Geographic structure of Adelie penguin populations: Demography of population expansion

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Dr. Grant Ballard
Point Reyes Bird Observatory

Deploying Team Members: David G Ainley . Grant Ballard . Michael L Beigel . Katie M Dugger . Carina Gjerdrum . Michelle M Hester . Hannahrose M Nevins . Benjamin L Saenz

Research Objectives: This group investigates the mechanisms responsible for the geographic structuring, the founding of new colonies, and the recent population expansion of the Adélie penguins of Ross and Beaufort Islands. Similar expansion has been occurring throughout the Ross Sea, where 30 percent of the world population of this species resides, and is in some way related to ameliorating climate. So far they have been examining:

• The relative importance of resources that constrain colony growth (the amount of nesting habitat versus access to food)

• Aspects of natural history that might be affected by exploitative or interference competition among neighboring colonies (breeding success and foraging effort)

• Climatic factors that influence the latter, especially extent and concentration of sea ice

• Behavioral mechanisms that influence colony growth as a function of initial size and location, emigration, and immigration.

None of the colonies are limited by nesting space, and the researchers have shown how sea ice extent and concentration affect diet, foraging effort, and winter survival. In addition, large colonies affect the foraging patterns of smaller ones within range and, perhaps, ultimately their size. The rate and direction of emigration also appear to be constrained by sea ice conditions, with reasonable concentrations of ice favoring growth of smaller colonies where foraging competition is minimal. Yet to be determined is the demographic mechanism of colony growth (or decline). Reproductive success does not appear to be important, however.

Using seven cohorts of marked penguins from each colony, researchers will assess juvenile survival, recruitment age, and age-specific fecundity and subsequent survival. These data will be compared with another demographic study, the only one for this species, conducted at Cape Crozier during the 1960s and 1970s when populations were declining.

Information will be related to sea ice as quantified by satellite images. Global climate is changing fastest in the polar regions. The Adélie penguin is tied to sea ice, a primary factor in rapid polar climate change (less sea ice, less reflection of solar energy). The extreme sensitivity of these penguins to climate change has been often noted. Understanding the demographic mechanisms behind this sensitivity will contribute greatly to knowledge of the effects of climate change on antarctic marine organisms.

Field Season Overview: Project team members will travel by helicopter to Cape Royds and Cape Crozier where they will set up their field camp. The work at Cape Bird will be conducted by biologists from LandCare Research New Zealand. Team members will travel by helicopter to two radio telemetry sites on Mount Bird. Both sites will be visited simultaneously, and there will be several visits over the course of a month. Penguins will be observed from these sites using remote radio telemetry to monitor their behavior.

The principal investigator and one or two other team members will travel by icebreaker and helicopter or zodiac to Beaufort Island where they will attach transmitters to penguins and leave a data logger, which they will recover about a month later. If conditions permit, the research team will study the impact of large grounded icebergs on penguin foraging behavior along the north shore of Ross Island. Chilled blood samples will be returned to the home institution for further study.

Glaciology

Dr. Julie Palais
Program Manager

IU-155-O **NSF/OPP** 98-14676
Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Traverse from Byrd Surface Camp to South Pole

U.S. ITASE: Snow and firn microstructure and transport properties

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: Not all valuable data are buried deep within the ice. The microstructure and bulk properties of snow and firn near and at the surface control the air/snow/firn transport processes. An example of such a process is the incorporation of heat, vapor, and chemical species from air into snow and polar firn. Since many of the snow and firn properties will also affect how radiation in different parts of the electromagnetic spectrum behaves, such field measurements provide a valuable baseline profile against which to range complementary efforts that use remote sensing to map the spatial variations of snow, firn, and ice properties.

This project does the field and lab work to characterize snow and firn properties along the U.S. ITASE traverses in West Antarctica. In the field, they provide measurements of snow and firn properties near the surface (down to 2 meters), ratio, and tortuosity. In the laboratory, they analyze firn cores from as deep as 20 meters for these properties and for their microstructures. Ultimately, this group will develop a transport model to elucidate the nature of the air/snow/firm exchange and the firnification process at the various sties along the traverse routes.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-022-L/P

NSF/OPP 01-25181

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Rob Edwards

Research Site(s): RV LMG, Palmer Station

The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula

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Dr. Bill Baker
University of South Florida

Dr. James McClintock
University of Alabama, Birmingham

Deploying Team Members:

Margaret O Amsler . Charles D Amsler, Jr. . Billy J Baker . V. Anne Fairhead . Lynn Hollyfield-Jerri . Yusheng Huang . Kevin J Peters . Stephanie T Weiss

Research Objectives: Many organisms are not mobile and so cannot escape from predators. One way they can keep from being eaten is to make themselves unappetizing by producing defensive chemicals known as secondary metabolites. However, the energy and other resources that go into making these compounds could instead have gone into growth or reproduction. This group studies the evolution of these tradeoffs in an effort to understand ways that organisms maximize the usefulness of their investments in defensive chemistry.

For marine plants, the environment of Antarctica is very different from most other places in the world's oceans because nutrients are plentiful but light is often limited. So the "currency" that "pays" for defense, growth, and reproduction is different than for plants in most other marine communities. This allows researchers to test theories about the costs and benefits of defense in ways not possible elsewhere in the world.

For marine animals, Antarctica is unique in that predation by sea stars is much more important than in other marine communities. Sea stars feed by extending their stomachs and digesting prey outside their bodies. These researchers predict that this should lead to a much higher investment in defensive metabolites in the outer layers of the prey. One of the main goals for the 2002–2003 season will be to test the hypothesis that sponges (a very important component of these communities) will maximize their investment in chemical defense by having the highest levels of defensive secondary metabolites in their outermost layers.

This research should also advance our general understanding of the evolution of chemical defenses. This group hopes to elucidate the nature and role of bioactive agents in the ecology of the antarctic marine benthos (that is, organisms living at the bottom of marine environments).

Field Season Overview: Project team members will travel to Palmer Station on board the R/V Laurence M. Gould. Divers and their tenders will travel in Zodiac inflatable boats to local sites, collecting marine invertebrates and macroalgae. The samples will be taken to the Palmer Station laboratory for analysis and bioassays will be conducted in the aquarium. Some samples will be returned to the home institutions for further analysis.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IO-205-O

NSF/OPP 00-86297

Station: McMurdo Station
RPSC POC: Joni English
Research Site(s): Onset D

Characterizing the onset of ice stream flow: A ground geophysical program

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Deploying Team Members: Sridhar Anandakrishnan . Peter Braddock . Irina Filina . Robert W Greschke . Bruce Long . Matthew A Nolan . Leo E Peters . Andy M Smith . Donald E Voigt . Paul Winberry

Research Objectives: Ice streams of the Ross Sea Embayment are the principle force by which the interior West Antarctic Ice Sheet (WAIS) is drained, moving vast quantities of ice rapidly to the front of the Ross Ice Shelf where they are calved off as icebergs. These ice streams provide a buffer between the interior ice and the floating ice shelves. For antarctic ice streams on the Siple Coast, the transition from no-sliding (that is, all internal deformation) to motion dominated by sliding is defined as the "onset-region." To fully understand and adequately model the WAIS, scientists need a better understanding of this onset region, which means learning the reasons for their fast flow and the factors controlling their current grounding-line, margin and head positions. The lateral margins of the ice streams are also a transition that needs better explanation.

Hypotheses on controls of the location of the onset region range from the "purely-glaciologic" to the "purely-geologic." Ice sheet models will remain incomplete until the basal boundary conditions (roughness, wetness, till properties) are specified and a good subglacial geologic map that shows the distribution, thickness, and properties of the sedimentary basins is drawn.

These parameters can be estimated from seismic, radar, and other geophysical methods. This group will study the transition region of ice stream D in detail with this coupled geophysical experiment. They will select other locations on ice streams C & D to study, compare, and contrast conditions with the main site on ice stream D. Site-selection for the main camp will be based on existing radar, GPS and satellite data, as well as input from the modeling community.

Field Season Overview: Project team members will travel by LC-130 aircraft to the Onset D Camp in Marie Byrd Land. Traveling from the camp on tracked vehicle and snowmobile, they will conduct GPS surveys and shallow and deep radar profiling of the ice along primary survey lines.

Team members will travel by Twin Otter aircraft to satellite locations on ice streams C and D. Using tracked vehicles and snowmobiles, they will conduct additional GPS surveys and radar profiles and collect additional firn cores

The field team will install geophones to record seismic data generated by detonations that will take place in 600 boreholes drilled by Ice Core Drilling Services (ICDS, TO-150-M/S) near Onset D camp and in 150 boreholes drilled by researchers at the satellite camps.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-311-O

NSF/OPP 98-14589

Station: McMurdo Station

RPSC POC: Kirk Salveson

Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: High resolution radar profiling of the snow and ice stratigraphy beneath the ITASE traverses

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: Ice core measurements provide historical profiles of snow accumulation and chemistry at only the point where the core was drilled – every 100 kilometers along the U.S. ITASE traverses. Subsurface radar, by contrast, provides reflection profiles of continuous horizons, generally related to density and chemistry contrasts. However their continuity strongly suggests that they are isochronal (demonstrate regularity of period). Thus, they can be used to track particular years between core sites and to provide a broad and more meaningful average of year-to-year accumulation rates, given the time versus depth calibrations from the cores.

This project is tracking these reflection horizons between core sites using high-resolution ground-penetrating, short-pulse radar. The main antenna system uses a pulse centered near

400 MHz, which provides vertical resolution of about 35 centimeters and records reflections from a depth in firn of about 60 meters. During the first year of U.S. ITASE, this group tracked some horizons for distances of more than 190 kilometers and found depth variations as great as 22 meters over a 5 kilometer stretch. The variations are caused by surface topography, which affects local accumulation rates and ice movement.

This group also uses a wide range of frequencies (as high as 10 GHz and as low as 100MHz to distinguish between conductivity and density as a cause of the reflections. The horizon tracking develops spatially averaged, historical accumulation rates. These can be correlated with GPS data to find the effects of topography upon local accumulation rates. The radar is also used for advanced crevasse detection for the traverses.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics	Dr. Vladimir Papitashvili Program Manager

AO-132-O **NSF/OPP** 98-75829

Station: McMurdo Station

RPSC POC: Robbie Score

Research Site(s): Arrival Heights

In situ measurements of halogen oxides in the troposphere

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Dr. Darin Toohey
University of Colorado, Boulder

Deploying Team Members: Linnea M Avallone . Anna G Hallar

Research Objectives: This project has two components, research and education. The research component examines the role of halogen oxides in tropospheric chemistry. The education component will develop two graduate courses, a laboratory experience and a professional development seminar.

In the research component, an instrument based on low-pressure chemical conversion/resonance fluorescence will be deployed at sites in the boundary layer and the free troposphere. The sites -- Niwot Ridge, Colorado, Bremen, Germany and McMurdo Station – have been chosen chosen because of their location, facilities and their potential for detecting halogen oxides under a variety of environmental and meteorological conditions. The instrument will be augmented by a meteorological measurement system providing data on temperature, pressure, relative humidity, and wind direction and speed, plus an ozone analyzer.

The education component will develop and implement two new courses in the atmospheric and oceanic science. The first will be an inquiry-based laboratory course for upper-division undergraduates and beginning graduate students. This course will build on the resources available within the campus and surrounding atmospheric sciences communities to acquaint students with the nature and practice of experimental science. The course will offer students opportunities to acquire and improve career skills in teamwork and in oral and written communication.

The second course, a seminar-style professional development class, will be designed to better prepare graduate students for the array of academic and nonacademic jobs available to them after they receive their degrees. This class will expose students to topics such as ethics in research, methods for writing and reviewing papers and proposals, and resources for improving teaching skills. Speakers from industry, national laboratories, community colleges, and more, will be invited to help students explore the diverse avenues their careers might take.

Field Season Overview: Project team members will install and operate ozone, nitrogen oxides and carbon dioxide sensors to track the effects of local pollution on the air quality at Arrival Heights, McMurdo Station. Another sensor will be installed at Arrival Heights to detect the presence of halogen oxides, which are rare ozone-destroying compounds. The existing halogen oxide sensor has been operational at Arrival Heights since mid-September.

Data collection will continue through October 2002, when the research team will conclude their science activities and disassemble their sensor suite for return to their home institution. This is a collaborative project with Dr. Terry Deshler (AO-131-O).

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-284-O

NSF/OPP 00-00957

Station: South Pole Station

RPSC POC: Paul Sullivan

Research Site(s): Shack downwind of the station

Dynamics of the Antarctic MLT (mesosphere-lower-thermosphere) region using ground-based radar and TIMED instrumentation

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Deploying Team Members: Susan Avery

Research Objectives: This is a propitious time to study a number of atmospheric phenomena, because of the recently-peaked 11-year solar cycle, and NASA's TIMED satellite mission. In addition to measurements derived from instruments on TIMED (Thermosphere-Ionosphere-Mesosphere-Energetics and Dynamics), this project will install a meteor radar at Amundsen-Scott South Pole Station. Concentrating on the dynamics of the mesosphere and lower thermosphere, this group looks at:

• The space-time decomposition of wave motions

• Delineation of the spatial climatology over Antarctica with emphasis on the structure of the polar vortex

• Dynamical response to energetic events

• Inter-annual variability

The proposed meteor radar is a VHF system capable of measuring the spatial structure and temporal evolution of the horizontal wind field over the South Pole. Spatial climatology data will also come from existing ground-based radars at Davis Station, Syowa Station, Rothera Station, and the Amundsen-Scott base.

As NASA's TIMED satellite orbits over the South Pole, wind and temperature data will provide counterpoint and corroborative information. Thus, experiments based both in space and on the ground may be mounted, and data that was previously reliant on a single source can be better validated.

Field Season Overview: Researchers will operate and collect data from the 46.3 MHz radar installed next to the radar shack a South Pole Station. Project team members and station operations personnel will install shielding in the control shack to reduce interference caused by the radar. Antennas and other components outside the shack will be repaired this season.

Throughout the austral winter, the support contractor's science technician will monitor the equipment, perform routine maintenance and repairs, and send data to the principal investigator.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-158-O **NSF/OPP** 98-14810

Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: Atmospheric photochemistry leaves valuable traces in snow, firn, and ice. It has been verified that the efficiency of atmosphere-to-snow transfer and the preservation of hydrogen peroxide and formaldehyde are both strongly related to temperature and to the rate and timing of snow accumulation. Thus, measurements of these components in the firn and atmosphere will provide data needed to study changes in the tropospheric chemistry of the boundary layer over West Antarctica.

This group will collect samples and take atmospheric measurements along the U.S. ITASE traverses. The wide-ranging extent of these traverses will train the scientific lens upon a variety of locations, covering much of the west antarctic region, and reflecting a range of different depositional environments.

In the study of atmospheric chemistry, it is necessary to estimate the inter-annual patterns of snow accumulation at sub-annual resolution in the pits and cores. This project will measure the concentration of seasonally dependent species (including hydrogen peroxide, nitrate, and chloride) on all samples, which together with stable isotope and ionic analyses by others will provide a highly resolved accumulation record. This project will use a recently developed, physically based, atmosphere-to-snow transfer model to elucidate the photochemistry that led to the concentrations in the snow/firn. These snow chemistry data will also shed light on the inter-annual variability of snow accumulation over a wide spatial range in West Antarctica.

Data developed on current atmospheric levels of hydrogen peroxide, higher peroxides such as methylhydroperoxide, and formaldehyde will constrain model boundary conditions and the state of photochemistry in the austral summer.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-051-O

NSF/OPP 01-25842

Station: McMurdo Station

RPSC POC: Karla College

Research Site(s): Dry Valleys

Multiple isotope analyses of soil sulfate and nitrate in the Antarctic Dry Valleys

Dr. Huiming Bao

Deploying Team Members: See Marchant (GO-054-O)

Research Objectives: The breakthrough that makes this project possible is the recent discovery of mass-independent oxygen-isotopic composition for sulfate and nitrate in Dry Valley soils which show that atmospheric deposition has contributed a significant amount of sulfate and nitrate to cold-desert soils over time.

The goal of this project is to quantify atmospheric deposition of sulfate and nitrate in the Dry Valleys region. Researchers will generate the first quantitative model describing the origin, distribution, and post-depositional alteration of atmospheric sulfate and nitrate in Dry Valley soils. In addition to testing the hypothesis that landforms in the Dry Valleys have been stable for millions of years, the group's results will provide a valuable reference for quantitative soil development in hyper-arid deserts elsewhere on Earth and on Mars.

Field Season Overview: Nine team members will participate in two collaborative projects with combined logistical support:

- Dr. David Marchant (GO-054-A)

- Dr. Huiming Bao (GO-051-O)

Project team members will erect camps in the Olympus and Asgard Ranges. With helicopter support, researchers will map moraines and collect soil samples. Soil excavations will be filled in and the desert pavement replaced, a technique that allows for rapid surface recovery. Researchers will also collect volcanic ash in the McKelvey Valley region and measure ancient sub-glacial meltwater channels at the head of Wright Valley.

Supported by the University NAVSTAR Consortium (UNAVCO) and support contractor personnel, two team members will acquire high-precision elevation data for up to 50 sites within the western Dry Valleys region. The data will be used to produce high-resolution, one-meter contour maps of selected study areas and to provide control for analyses of cosmogenic data. Rock and soil samples will be returned to the investigators' home institutions for analyses.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-154-O

NSF/OPP 00-94078

Station: McMurdo and RV/IB NBP

RPSC POC: Jim Holik

Research Site(s): RV/IB NBP, McMurdo Station

CAREER: Relative frequency and phase of extreme expansions of the Antarctic ice sheets during the late Neogene

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Deploying Team Members: Philip J Bart . Juan M Chow . David Egan . Juan Lorenzo

Research Objectives: Expansions and contractions of the antarctic ice sheets (AISs) have undoubtedly had a profound influence on Earth's climate and global sea level. However, the cryosphere in Antarctica is not a single homogenous entity. Science has yet to embrace its three primary components -- the East Antarctic Ice Sheet (EAIS), the West Antarctic Ice Sheet (WAIS), and the Antarctic Peninsula Ice Cap (APIC) -- into a unified theory. Among these systems may be found differences in ice volume, substratum elevation, ice-surface elevation, and latitude.

Various lines of evidence do show, however, that the extent of ice in all three ice sheets has undergone significant retreats and advances. Future episodes appear inevitable. But exactly how and why the ice has fluctuated is not certain. According to one line of reasoning, the land-based EAIS has been relatively stable, experiencing only minor fluctuations since forming in the middle Miocene. By contrast, the marine-based WAIS has been dynamic, waxing and waning frequently since the late Miocene. A conflicting hypothesis has the ice sheets advancing and retreating at about the same time.

Building on previous seismic-stratigraphic investigations of the continental shelves, this group uses high-resolution seismic technology to focus on the frequency and phase of extreme advances of the ice sheets to the continental shelf. The data suggest seversl useful scientific inquiries:

First, Did extreme advances of the EAIS and WAIS occur across the shelf occur at about the same times and frequencies? This evaluation is possible because the EAIS drains into the western Ross Sea continental shelf (Northern Basin), while the WAIS drains into the eastern Ross Sea (Eastern Basin). Existing regional grids of high-resolution seismic data have been collected but these are incomplete and cannot be used to determine the stratigraphic correlations from the Northern Basin to the Eastern Basin. Project team members plan to collect high-resolution seismic data (approximately 2,000 line-kilometers) to address this issue.

Second, Did the APIC advance frequently across the shelf? Some investigators have inferred that the APIC advanced across the continental shelf at least 30 times since the middle Miocene. If true, that activity would be an order of magnitude more frequent than advances of the EAIS and WAIS. Others interpret the seismic reflections differently and argue that the advances of the APIC were far fewer. The existing high-resolution seismic grids from the Antarctic Peninsula contain only one regional strike line on the outer continental shelf. Project team members plan to collect high-resolution seismic data (approximately 1,000 line-kilometers) during their science cruise in the Antarctic Peninsula.

Integrated into the project is a graduate-level course at Louisiana State University and an a pilot outreach program with a public high school. Responding to scientific standards the Louisiana Department of Education has recently adopted to reflect what ninth through twelfth grade students should be able to do and learn, this project team will frame an experience to convey the excitement of conducting scientific research as a way to encourage students to pursue earth science at the university level.

Field Season Overview: Researchers will use single and multi-channel seismic acquisition systems and multibeam sonar to evaluate the temporal relationships between East Antarctic and West Antarctic Ice Sheet expansion. Daily weather information from the onboard satellite systems will be used to help plan the activities around foul weather and ice conditions. In addition to the acquisition of seismic data, the researchers plan to conduct grab sampling and piston coring.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-092-O

NSF/OPP 99-09665

Station: RV Laurence M Gould

RPSC POC: Don Michaelson

Research Site(s): Andvord Bay, Lallemand Fjord, Brialmont Cove, King George Island

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Development of a luminescence dating capability for antarctic glaciomarine sediments: Tests of signal zeroing at the Antarctic Peninsula

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Deploying Team Members: Emily Backman . Glenn W Berger . Emily Constatine . Sarah Doane . Eugene W Domack . Sara E Draucker . Robert Gilbert . Amy R Leventer . Susan Morgan . Zack Norcross . Dave Tewksbury . Trevor Tompkins

Research Objectives: Paleoclimatology, the study and reconstruction of ancient weather, climate and their likely effects, is not an exact science. Climatic indicators, such as marine sediments that have been abundantly deposited in Antarctica over the last 2 million years, provide useful information about such phenomena as the waxing and waning of ice sheets but only to the extent that these fossils can be accurately dated.

Traditionally, radiocarbon dating with the naturally occurring isotope 14C (carbon 14) has proved reliable for specimens as old as 40,000 years, perhaps even up to 70,000 years, though problems such as the "reservoir effect" can also limit its reliability and range. However, increasing amounts of 14C in the atmosphere have compromised its precision. A more recently developed method, photon-stimulated-luminescence sediment dating (photonic dating), has been used in temperate latitudes for eolian and waterlain deposits and proved reliable over a larger span of Quaternary time -- from decades to hundreds of thousands of years. Can this method be reliably used in polar regions?

Marine sediments in and around Antarctica pose special difficulty because polar conditions can limit the sunlight that detrital grains are exposed to. Since the thermoluminescent test involves reflecting the last time a sample was exposed to light (what is known as the clock-zeroing process), antarctic glaciomarine depositional settings and processes could undermine the potential reliability of photonic dating of antarctic marine sediments, and ages could be overestimated if grains were not exposed to daylight before deposition. Other processes could also compromise photonic dating. For example, transport of terrigenous suspensions by neutrally buoyant "cold-tongue" (mid-water) plumes may be common around Antarctica, yet the effect of such transport on luminescence zeroing is unknown. Typical marine cores taken near Antarctica may contain an unknown fraction of detrital grains from cold-tongue and near-bottom suspensions.

Project team members will collect detrital grains from a variety of "zero-age" (modern) marine depositional settings within the Antarctic Peninsula, where representative antarctic depositional processes have been documented and where logistics permit access.

By systematically studying the effectiveness of luminescence-clock-zeroing in antarctic glaciomarine settings researchers hope to determine whether photonic dating can be reliably applied to antarctic marine sediments in the future. In the process, scientists expect to develop refined sedimentological criteria for selecting future samples. If photonic dating can be validated in this environment, scientists would gain a numeric geochronometer extending well beyond the age range of 14C dating, and be better able to answer a number of broader questions about the timing and extent of past glaciations near and on the antarctic shelves.

Field Season Overview: On this 18-day cruise researchers will investigate luminescence dating of silt-sized feldspar grains from representative glacio-marine deposits. Working aboard the R/V Laurence M. Gould, researchers will:

- Obtain water-column profiles of the conductivity, temperature, and depth using CTD casts,

- Collect sediment-suspension samples,

- Recover sediment-trap moorings from Brialmont Cove and Andvord Bay in the Antarctic Peninsula,

- Collect Kasten core samples from Brialmont Cove,

- Conduct bottom camera photography in Brialmont Cove,

- Collect sediment-suspension samples from Admiralty Bay,

- Collect core-top sediments and sediment-suspension samples from Lallemand Fjord (ice conditions prevented this on an earlier cruise).

- Obtain a Smith-MacIntyre (SM) grab (core-top) sample.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-120-M/S **NSF/OPP** 98-16129

Station: McMurdo and South Pole Stations

RPSC POC: Jesse Alcorta

Research Site(s): McMurdo Station, USCG Icebreaker, South Pole Station

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Solar and heliospheric studies with antarctic cosmic ray observations

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Deploying Team Members: Roger Pyle . Leonard M Shulman

Research Objectives: Cosmic rays -- atomic nuclei and electrons from outer space traveling near the speed of light -- continuously bombard the earth. When they collide with nuclei of molecules in the upper atmosphere, they create a cascade of secondary particles that shower the earth. Neutron monitors deployed in Antarctica provide a vital three-dimensional perspective on this shower of particles.

These data are used to advance our understanding of a variety of fundamental plasma processes occurring on the sun and in interplanetary space. Neutron monitor records, which begin in 1960 at McMurdo and in 1964 at South Pole, play a crucial role in efforts to understand the nature and causes of cosmic-ray and solar-terrestrial variations occurring over the 11-year sunspot cycle, the 22-year Hale cycle, and even longer time scales. At the other extreme, new methods of studying high time resolution (10-second) cosmic ray data will be used to determine the three-dimensional structure of turbulence in space and to understand the mechanism by which energetic charged particles scatter in this turbulence.

This project continues the year-round observations of cosmic rays with energies upwards of one billion electron volts at McMurdo and South Pole stations.

Field Season Overview: Two team members will visit the McMurdo CosRay Facilities for calibration, routine maintenance and training on the neutron monitors. They will perform routine maintenance of their instruments aboard the US Coast Guard Icebreaker when it arrives at McMurdo Station.

The same team members will visit the South Pole Skylab building in January for routine maintenance, calibration, installation of upgrades to the system, and finalizing the training of the winter science technician.

At both locations, the science technicians will maintain the neutron monitors throughout the austral-winter. The technicians will collect daily data, perform system checks, monitor and repair the system if necessary, and transmit data to the principal investigator.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-038-O

NSF/OPP 99-09271

Station: McMurdo Station

RPSC POC: Steve Alexander

Research Site(s): Granite Harbor, Cape Royds, Cape Evans

Investigation on deterioration in the Historic Huts of the Ross Sea region of Antarctica

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Deploying Team Members: Robert A Blanchette . Benjamin W Held

Research Objectives: During the first two decades of the 20th century -- Antarctica's "Heroic Era" -- Europeans mounted a handful of expeditions in hopes of reaching (and claiming) the geographical South Pole. Base camps established in the McMurdo Sound region by Scott at Cape Evans and by Shackleton at Cape Royds were abandoned once the expeditions were over, leaving behind thousands of artifacts, as well as the huts they built for shelter and storage. Over the intervening 90 years, the extremes of the polar environment have actually protected some of the artifacts from rapid decay, but conservators have recently become concerned about serious degradation of what is an important historical, archaeological site.

Some of the most exigent threats:

• Wood in contact with the ground is being destroyed by a specific wood-destroying fungus.

Various molds and cellulose-degrading fungi are attacking artifacts made of leather, textiles, and other organic materials.

• Exterior wood is being degraded by non-biological deterioration processes as well, including salt, ultraviolet radiation, and wind erosion.

• Chemical damage within the huts is apparent, and the soils on site are contaminated with aromatic hydrocarbons from petroleum products.

This is a collaborative project with the New Zealand Antarctic Program's K-021. The researchers plan to identify the biological and non-biological agents responsible for causing the deterioration, study the mechanisms and progressive sequence of events taking place during decay processes, test methods to be used to control future deterioration, determine the extent of environmental pollutants in soils at the historic sites, and evaluate chemical spills within the huts. The goal is to provide the scientific data required by conservators to help protect these important historic sites for future generations. But the project should also shed scientific light on these unique deterioration processes, as well as augment scientific understanding of the biology of antarctic microorganisms and the biodiversity of microbes present in this unusual environment.

Field Season Overview: American and New Zealand team members from both projects will travel by helicopter to their field camp site near the historic huts at Cape Evans and Cape Royds where they will collect soil and wood samples. They will also make a helicopter day trip to the site of a 1960s-era hut in the Dry Valleys, where they will take similar samples. Team members will also travel by helicopter to Mount Fleming in the upper Wright Valley where they will collect soil samples.

The soil and wood samples will be returned to the U.S. and to New Zealand, where they will be tested for microbial diversity. Microbe populations from the Dry Valleys will be compared to those collected at the hut sites. The researchers will attempt to determine the extent of both non-biological and biologically mediated deterioration in the huts, and then evaluate methods to control this decay.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-043-O
NSF/OPP 00-03639
Station: McMurdo Station
RPSC POC: Rob Robbins
Research Site(s): Explorers Cove

Seasonal dynamics of giant agglutinated foraminifera

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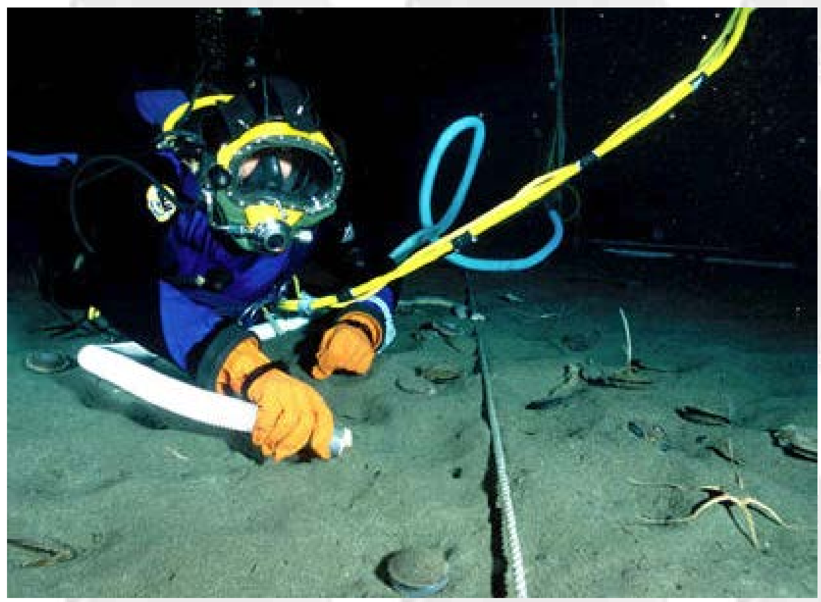

Deploying Team Members: Samuel S Bowser . Douglas H Coons . Philip E Forte . Steven D Hanes . Jan W Pawlowski . Karen H Sterling . Joseph G Tyson

Research Objectives: Found in all marine environments, foraminifera ("forams") are single-celled, shelled (agglutinated) creatures with a key role in the ocean food web. They may be planktonic (floating) or benthic (bottom-dwelling), living on shells, rock, seaweed, or in sand or mud at the bottom of the ocean. Their characteristic habitats, and the chemistry of their shells (which reflects qualities of the local water they live in) make them very useful to scientists as an indicator of when and under what conditions they lived. Antarctica and the Southern Ocean ecology is no exception.

Previous studies have shown that the forams assemblage in Explorers Cove in McMurdo Sound consume a wide variety of prey, ranging from bacteria through a taxonomically diverse group of metazoans, including juvenile invertebrates. These studies have been restricted to specimens collected from October through early December, immediately following the austral winter. In the succeeding months, the austral summer shows a burst of biological productivity, both under the ice and in the benthos. Lacking studies during this period, scientists do not know how the forams might be responding to this summer food pulse. This project's goal is to document changes in relevant abiotic and biotic factors in the Explorers Cove benthos from austral spring to late summer and to characterize how the agglutinated foram community structure responds, looking at such indices as species composition, densities, size distribution, and others. To accomplish these analyses project team members will use sediment cores, underwater microscopy, molecular tools, isotope analysis of lipids, and some other newly refined methods.

Researchers expect these combined approaches to elucidate the roles played by larger agglutinated forams in the Explorers Cove benthic food web, especially how these roles may change consequent to the summer food pulse. Further, the results of these studies should have wider significance in the ocean sciences because Explorers Cove and its agglutinated foram assemblage are comparable to many bathyal and abyssal deep-sea localities.

To enhance insight into marine processes associated with global climate change, this group collaborates with investigators from Russia to

• Test the universality of meltwater turbidity impacts documented in the Arctic,

• Assess changes (by adapting modern biochemical and molecular assays) in the living foraminiferal assemblage in response to glacial meltwater, and

• Explore ways of revealing the imprint of glacial proximity in the antarctic fossil record.

Field Season Overview: Project team members will travel by helicopter to Explorer's Cove and Marble Point and by snowmobile to the Ferrar Glacier fjord. Using a small box corer, divers will obtain undisturbed bottom samples to collect foraminifera.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-090-P/S
NSF/OPP EAR 00-04370
Station: Palmer and South Pole Stations
RPSC POC: Rob Edwards
Research Site(s): SPRESSO building and vaults, Palmer Station

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Global Seismograph Station: IRIS & USGS/ASL

Dr. Rhett G. Butler
Incorporated Research Institutions for Seismology
Global Seismograph Network Program Manager
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Deploying Team Members: Donald M Anderson . Kent R Anderson . Rhett G Butler . Edward P Kromer . John J Vineyard

Research Objectives: Seismology, perhaps as much as any other science, is a global enterprise. Seismic waves resulting from earthquakes and other events can only be interpreted through simultaneous measurements at strategic points all over the planet. The measurement and analysis of these seismic waves are not only fundamental for the study of the earthquakes, but also serve as the primary data source for the study of the Earth's interior. To help establish the facilities required for this crucial scientific mission, IRIS (the Incorporated Research Institution for Seismology) was created in 1985.

IRIS is a consortium of universities with research and educational programs in seismology. Ninety-seven universities are currently members, including nearly all U.S. universities that run seismological research programs. Since 1986, IRIS (through a cooperative agreement with the National Science Foundation (NSF) and in cooperation with the U.S. Geological Survey) has developed and installed the Global Seismographic Network (GSN). The GSN now has about 135 broadband, digital, high-dynamic-range, seismographic stations around the world, all with real-time communications.

The GSN seismic equipment at Amundsen-Scott South Pole Station and at Palmer Station, Antarctica, was installed jointly by IRIS and ISGS, who together continue to operate and maintain them. The GSN sites in Antarctica are vital to seismic studies of Antarctica and the Southern Hemisphere. The state-of-the-art seismic instrumentation is an intrinsic component of the NSF effort to advance seismology and Earth science globally.

Field Season Overview: At Palmer Station, the support contractor's science technician will perform year-round, daily, data tape changes and periodic maintenance of the project's three seismometers. The station's data acquisition system is maintained by U.S.-based researchers via the Internet.

At South Pole Station, the science technicians perform daily operations and maintenance of the existing seismic station at Vault #1-South Pole Antarctica (V1-SPA) and the new seismic station Quiet-zone South Pole Antarctica (QSPA) at the South Pole Remote Earth Seismic Observatory (SPRESO). Concurrent operation of these stations is planned for about a year to verify the quality of the new station relative to the existing station. Winter-over science technicians will be trained by the researchers at their facility in Albuquerque, NM prior to deployment. The project team members also plan to perform annual maintenance inspection and calibration of the seismometers in the existing seismic vault in the Quiet Sector. Twice a year, the support contractor science technician will calibrate this project's gravity meters.

Ice Core Drilling Services (ICDS) personnel will finish drilling three new boreholes for the placement of this project's seismometers during this field season.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-071-O

NSF/OPP 01-26340
01-26334

Station: RV/IB Nathaniel B Palmer
RPSC POC: Karl Newyear
Research Site(s): RV/IB NBP

Improved Cenozoic plate reconstructions of the circum-Antarctic region

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Deploying Team Members: Lauren K Annis . Manuel D Aragon-Arreola . John Behrendt . Steven C Cande . Robert W Clayton . Nathan J Downey . Peter H Molnar . Vincent Morton . Brian Savage . Kurt Schwehr . Joann M Stock

Research Objectives: Well-constrained Cenozoic plate reconstructions of the circum-antarctic region are critical for examining a number of problems of global geophysical importance. This group seeks to improve reconstructions involving the Antarctic and Pacific plates by surveying gravity, magnetics, and swath bathymetry on Palmer transit cruises of geological importance.

On transit cruise NBP 0207 they will take advantage of the planned track on the Pacific plate to survey across several major fracture zones, across part of the Manihiki Plateau and the

Osbourne trough (to test aspects of the Mesozoic plate motion history of this region, when it may have been much farther south, adjacent to Antarctica), and along the Hikurangi trench (to study the rheology of the downgoing plate).

Also during the cruise the principal investigators will conduct a formal class in marine geophysics for 16 graduate and undergraduate students from a variety of institutions. In this way teaching activities can be integrated with the real field work of a research project.

Field Season Overview: Field work for this project will take place over two cruises on the RV/IB Nathaniel B. Palmer, NBP 02-07 and NBP 02-09.

NBP 02-07 is a transit from California to New Zealand. The researchers will collect magnetometer, multibeam bathymetry, and gravity data. They will also do one to two days of multichannel seismic data collection, including launching sonobuoys. Expendable bathythermographs (XBTs) data will also be collected and used for processing the multibeam data. The RV/IB NBP's new magnetic gradiometer will also be tested during this cruise. During the cruise, the principal investigators will teach a formal class in marine geophysics to 16 graduate and undergraduate students.

The second cruise, NBP 02-09 will take place in the Ross Sea while McMurdo serves as home port for the RV/IB NBP. The researchers will have a party of 10 onboard. They will again collect magnetometer, multibeam bathymetry, sub-bottom profile, and gravity data. They will conduct one to two days of multichannel seismic data, including launching sonobuoys. Expendable bathythermographs (XBTs) will be launched every other day as for multibeam data processing. The cruise will also include continued testing of the new magnetic gradiometer.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics	Dr. Vladimir Papitashvili Program Manager

AO-373-O **NSF/OPP** 00-94541
Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

DASI (Degree Angular Scale Interferometer)

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Deploying Team Members: John E Carlstrom . Allan Day . John M Kovac . Erik M Leitch . Clement L Pryke . John K Cartwright . Amber D Miller . Dan Siegal . Miles Smith

Research Objectives: Researchers plan to continue cosmological observations with the degree angular scale interferometer (DASI) which was first deployed at the Amundsen–Scott South Pole Station during the 1999–2000 austral summer. DASI provides continuous high-quality measurements of the cosmic microwave background (CMB) radiation anisotropy over the critical range of angular scales spanning the first three acoustic peaks in the CMB power spectrum. The data are transferred daily to the University of Chicago, where analysis is keeping pace with the data rate. Plans are to publish the resulting power spectrum by the end of the year.

During the next austral winter, researchers will use DASI to measure the currently undetected polarization of the CMB anisotropy. The measurements will provide a critical test of the standard theory of the early universe. The observations will use full Stokes parameters, allowing a measurement of the cross-correlation of total intensity and polarization anisotropy. Project team members will construct new receiver components to reconfigure DASI from 30 giga-Hertz (GHz) to 100 GHz for intensity and polarization measurements of the fine-scale CMB anisotropy power spectrum. These new capabilities will allow detailed observations of the Sunyaev-Zel'dovich Effect (SZE) in nearby galaxy clusters and allow SZE surveys from massive clusters.

These proposed efforts complement other ongoing and planned CMB experiments with instruments in Chile and at the South Pole. These three instruments can view the same region of the sky and will provide detailed power spectra over this angular range, thereby gathering crucial data for understanding foreground contamination. Working together, these three instruments will allow this essentially unexplored but theoretically important portion of the CMB anisotropy power spectrum to be fully determined.

Outreach and education related to the project will be disseminated and implemented through established structures and mechanisms. These programs, which reach out to local and distant K–12 teachers and students, will use the excitement of exploring our universe to help attract women and minorities to science. Graduate and undergraduate education and research will be integrated into the construction of the instrumentation, as well as the data analysis.

Field Season Overview: This field season, project team members will perform annual cryogenic maintenance. The telescope, electronics and data acquisition system will be serviced and prepared for another winter season of observations. One team member will winter-over.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-199-O

NSF/OPP 01-30417

Station: McMurdo Station
RPSC POC: Curt LaBombard
Research Site(s): Sea ice camp

Effects of foraging on the lipid biochemistry of freely diving Weddell seals

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Deploying Team Members: Michael A Castellini . Leslie Cornick . Shawn Harper . Susan Inglis . Tamara L Mau . Lorrie D Rea . Stephen J Trumble

Research Objectives: Freely diving Weddell seals in Antarctica offer a unique opportunity to follow the biochemistry and physiology of nutrient utilization in a large carnivore.

A study of the in vivo nutritional biochemistry of foraging in a free-ranging, large mammalian carnivore has never been attempted because of the logistics of obtaining multiple blood samples, conducting turnover studies, and measuring digestive chemistry while the animal is actively foraging. Although such studies can be conducted in laboratory or zoo settings, they are limited to captive animals whose feeding times and diets are typically constrained by humans.

A unique opportunity exists in the Antarctic. For several decades, the Weddell seal has been the focus of natural diving physiology studies using isolated holes through the sea ice near

McMurdo Station. The seal has access to a single ice hole where it routinely returns to breathe, sleep, digest, and so on. With the use of blood-sampling catheters, this group has been able to collect serial samples whenever the seal returns to the surface between dives. During such experiments, these seals actively catch and digest their prey. However, all previous studies have focused on diving physiology per se because they were designed to examine how the animals tolerated long periods of holding their breath. Any observations on nutritional chemistry were incidental and not part of the study design.

This season, researchers will take this method in a new direction by examining how Weddell seals process nutrients while foraging. Like all seals, Weddell seals rely primarily on lipid metabolism for daily energy. Therefore, this group will examine the kinetics of lipid uptake and utilization during active foraging bouts. They will obtain blood samples from freely diving animals and use labeled traced experiments to quantify lipid turnover rates and separate the lipid pool into its various components. They will also compare lipid uptake and utilization in adult seals and in pups, which are biochemically adapted for massive and rapid lipid utilization while nursing.

This project will provide important insights into mammalian biochemistry. These data will be important not only to antarctic ecosystem studies, but also to the entire field of lipid metabolism in mammals and the study of carnivore biology.

Field Season Overview: Project team members will establish a sea-ice camp a few miles from McMurdo Station. A hole will be drilled in the ice and a hut erected over it. Seals will be captured at another location along the coastline and brought back to the camp. There, they will be allowed to dive through a hole in the sea ice under the hut. Since there is no nearby access to the surface, the seals must always come back to the hut to breathe and rest. The seals naturally hunt for fish and squid under these conditions and blood samples can be taken whenever the seal is at the surface. Researchers hope to study six adults (non-lactating females) in each of the first two seasons. Blood samples will also be collected from five seal pups after they have nursed in order to follow lipid disappearance curves.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-317-L **NSF/OPP** 98-16226

Station: RV Laurence M Gould

Research Site(s): Science of opportunity on cruises

Shipboard acoustic doppler current profiling on R/V Nathaniel B. Palmer and R/V Laurence M. Gould

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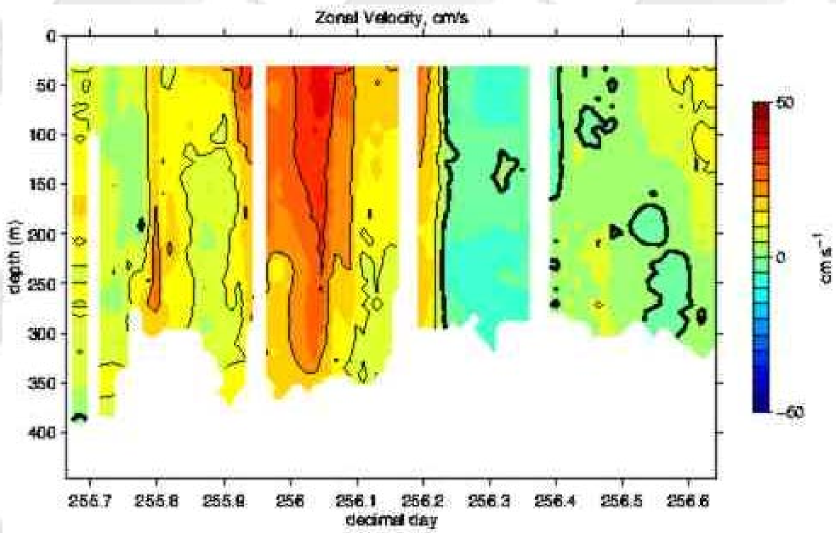

Deploying Team Members: Teresa K Chereskin . Eric Firing

Research Objectives: Currents in the Southern Ocean have a profound influence on the world's oceans, and therefore upon global temperature and the planet's ecosystem. Yet some remote regions receive little scientific attention. Using Doppler technology (sound-wave transmission and reflection), this project is exploring upper ocean current velocities. Researchers are building a quality-controlled data set in one such sparsely sampled and remote region, which nonetheless appears to play a significant role in global ocean circulation. They will develop and maintain a shipboard acoustic Doppler current profiler (ADCP) program on board the USAP research ships Nathaniel B. Palmer and Laurence M. Gould.

Part of the long-term science goal is to characterize the temporal and spatial velocity structure in the Southern Ocean. This entails measuring the seasonal and annual changes in upper ocean currents within the Drake Passage and then combining this information with similar temperature observations to see how the heat exchange varies and how it drives upper ocean currents.

Field Season Overview: For three years, this project's ADCP (Acoustic Doppler current profiler) and TSG (thermosalinograph) instruments have been installed on the RV Laurence M. Gould. During each cruise, data is collected and automatically transmitted to the home institution. Principal investigators maintain a website where they make the raw data available. Shipboard electronics technicians and computer support staff maintain and monitor the systems. This field season, project team members will deploy to the RV Laurence M. Gould to maintain and upgrade the system.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-019-O **NSF/OPP** 01-25611

Station: McMurdo Station

RPSC POC: Karla College

Research Site(s): McMurdo, temporary field camps, Taylor, Wright and Victoria Valleys

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Yeasts in the Antarctic Dry Valleys: Biological role, distribution, and evolution

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Deploying Team Members: Laurie B Connell . Scott D Craig . Regina S Redman . Russell J Rodriguez . Barbara E Shulz

Research Objectives: The soil community of the antarctic polar desert comprises few endemic species of bacteria, fungi, and invertebrates. Both filamentous and single-cell fungi have been isolated from a diversity of antarctic soil types, but only yeasts appear to be endemic to the polar desert soils. Although their ecological role in antarctic soils is undefined, yeasts may be the principal taxa synthesizing the sterols required by soil invertebrates. In addition, yeasts may be involved in accumulating and mobilizing growth-limiting nutrients such as phosphorus into the polar desert food web. Although yeasts have been well described in agricultural and industrial systems, little is known about their ecological role.

This multidisciplinary, collaborative research will characterize the role(s) soil yeasts play in the McMurdo Dry Valley ecosystem in order to better understand polar deserts and other extreme environments, as well as provide a foundation for incorporating yeasts into biogeochemical models of temperate environments. Soil microbiota mediate most processes such as decomposition, soil respiration, uptake and fixation of micro- and macronutrients, and detoxification of heavy metals and serve as major global carbon sinks. The complexity of soil communities in temperate regions poses difficulties in studying the relationships between biotic and abiotic parameters, and the factors controlling populations of soil microbiota remain poorly understood. The extreme climate and relatively simple community structure of the continental antarctic desert lend themselves to such studies.

Researchers will correlate the abundance and distribution of yeasts in polar desert soils with physical and chemical soil properties. Several physiological parameters will be explored in vitro to develop a basis for understanding the functional role(s) these organisms might play. Sterols synthesized by McMurdo Dry Valley soil yeasts, as well as their ability to survive multiple freeze-thaw cycles, will be characterized. The capacity of indigenous antarctic yeasts to use, compete for, and store phosphorus will be ascertained. The evolution of dry valley yeasts will be addressed by determining intra- and intervalley relatedness patterns based on DNA sequence.

Both soil samples and extracted DNA will be shared with other interested laboratories. Moreover, students from middle school (Biolab Inc.) through college (University of Maine) will be given the opportunity to collaborate on this project, as well as to develop their own projects.

Field Season Overview: Working along 10-kilometer transects in the Taylor valley, team members will collect soil samples from the valley floor and at increasing elevations along the valley sides. A temporary field camp will be established at New Harbor.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IO-209-O **NSF/OPP** 00-87345
Station: McMurdo Station
RPSC POC: Curt LaBombard
Research Site(s): Byrd Surface Camp

Western Divide WAISCORES site selection

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Deploying Team Members: Ginny Catania . Howard B Conway . Maurice E Conway . Felix S Ng . Erin C Pettit

Research Objectives: The West Antarctic Ice Cores (WAISCORES) community has identified the western divide, between the Ross embayment and the Amundsen Sea, as the region for the next deep-ice core. The Ice Core Working Group (ICWG) has developed a document (WAISCORES: Science and Implementation Plan, 2000) that outlines the objectives of the drilling and the physical and chemical properties the core must have to achieve those objectives.

The divide region spans more than 40,000 square kilometers, and preliminary site selection using airborne geophysical methods is now underway. This work has identified several potential drilling sites where the climate record should be best preserved throughout its long history of ice dynamics. Researchers will place a suite of ground-based geophysical measurements to map spatial variations of iceflow, accumulation rate, internal layering, and ice thickness at two of the most promising sites. The chief investigative tools include:

• High and low frequency ice-penetrating radar

• Repeat global positioning system surveys to calculate the present-day surface velocity field

• Synthetic aperture radar interferometry to calculate the regional velocity field

• Short firn cores to calculate present-day accumulation rates.

Beyond the initial mapping and interpretation of internal layers and surface velocity, the measurements will be used to constrain iceflow modeling. In particular, researchers will use these measurements and models to identify a site that is most likely to satisfy the following ICWG criteria:

• Minimal disturbance from an iceflow,

• A record that extends back at least 50,000 years

• Countable annual layers back 20,000 years.

A fourth criterion (the good preservation of chemical species) will be addressed by other projects.

The first criterion (minimal disturbances) will be evident from the patterns of radar-detected internal layers. To address the other two, researchers will use the measurements as input for time-dependent iceflow and temperature models that predict depth variations of age, layer thickness, and temperature. The mismatch between the model predictions and the data eventually recovered from the core will help infer thinning and climate histories for the region, in addition to yielding an estimate of expected conditions before drilling. The information gathered will help guide site selection for the drilling.

Field Season Overview: Project team members will travel to Byrd Surface Camp by fixed wing aircraft. From there they will traverse to a site selected last season and use radar and GPS to collect a suite of ground-based measurements to map detailed spatial variations of ice flow, accumulation, internal layering and ice thickness. The selected site is expected to yield a 3000 - 3500 meter long core.

2002-2003 Science Planning Summary

Glaciology	Dr. Julie Palais Program Manager

IO-161-O **NSF/OPP** 01-25579

Station: McMurdo Station

RPSC POC: Karla College

Research Site(s): Taylor Valley

Dynamics and climatic response of the Taylor Glacier system

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Deploying Team Members: Sarah Aciego . Andrew K Bliss . Kurt Cuffey . Jeffrey L Kavanaugh . David L Morse

Research Objectives: Taylor Glacier drains from Taylor Dome eastward and terminates in Taylor Valley at Lake Bonney. This glacier connects the Taylor Dome region, studied extensively in the early-mid 1990s, to the Taylor Valley ecosystem. Understanding the flow and response of this system is essential for interpreting the glacial geologic record in the southern Dry Valleys, and for understanding long-term changes in the Taylor Valley ecosystem physical environment (especially Lake Bonney).

This project's objective is to understand the Taylor Glacier: how it flows, and how it responds to climatic changes. Project team members will build a comprehensive set of measurements of surface velocity and ablation rates along Taylor Glacier, and also to map subglacial topography. The proposed work is an outgrowth of work done by the New Zealand Program in the mid-1980s

(Robinson) and by the University of Washington in 1992-93. Researchers on this project participated in that effort, and in that context completed cross-valley surveys of velocity and basal topography at several locations. In this project, they seek to vastly increase this data set for use in a modeling program to understand climatic response of the Taylor Glacier system. Surface velocities, strain rates, ablation rates, ice thickness, and subglacial topography will be measured.

Field Season Overview: Project team members plan to complete a traverse of the Taylor Glacier along a center flow line from about 400-meter elevation in Taylor Valley to about a 1,750-meter elevation on the flank of Taylor Dome. Using helicopter support and snowmobiles, the team will place a network of 264 GPS-located stakes along the traverse to measure glacier velocity and oblation and will collect a small amount of ice samples for shipment back to their home institutions. They will also conduct surveys using ice-penetrating radar to determine subglacial topography along the traverse route.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-087-M
NSF/OPP 00-03619

Station: McMurdo Station
RPSC POC: Joni English
Research Site(s): West Antarctica

A GPS network to determine crustal motions in the bedrock of the West Antarctic Ice Sheet: Phase I, Installation

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Deploying Team Members: Michael G Bevis . Ian W Dalziel . Eric C Kendrick . John R Roberts . Robert E Smalley, Jr

Research Objectives: The bedrock that underlies the West Antarctic Ice Sheet (WAIS) is not well described. Without a reliable evaluation of its history -- both tectonic and ice-induced crustal motions -- scientists will never fully comprehend the past, present and future dynamics of the WAIS. They cannot develop reliable global change scenarios for the future, nor accurately factor the antarctic region into global plate movements. Currently, permanent Global Positioning System (GPS) networks to measure bedrock movement are established only on the fringe of the WAIS. They cannot provide the data on subglacial volcanism, active tectonics, and ice streaming that are needed.

This project's goals re to establish baseline, long-term, reliable geodetic measurements of the crustal motion in the bedrock beneath the WAIS. The group is building a West Antarctica GPS Network (WAGN) of at least 15 GPS sites across the west antarctic interior (an area comparable to that from the Rocky Mountains to the Pacific coast) over two years beginning in the 2001-2002 austral summer.

This first summer, project team members installed the network and tested precision and velocities at the most critical sites. The network will begin to fill a major gap in GPS coverage by looking for potential bedrock movements. If crustal motions are relatively slow, meaningful results will only begin to emerge over the next 5 years or so. Once it is permanently established, however, the network should yield increasingly meaningful results with the passage of time. Indeed, the slower the rates turn out to be, the more important it is to start measuring early.

WAIS bedrock is so scattered and remote that to erect a continuous string of permanent GPS stations would rival the building of the American transcontinental railroad. Instead, the plan is to follow the Multi-modal Occupation Strategy (MOST). This entails "roving" receivers (based in permanent monuments set in solid rock outcrops) in place for only a short time at each site, providing data that can be ranged against permanent GPS readings elsewhere. Each of these "bases" can be converted in the future to a permanent, autonomous station when more logistics and satellite data linkage throughout West Antarctica are in place. When detectable motions occur, researchers can reoccupy the most critical sites, obtain more reliable velocities, and make decisions about reoccupying the entire network.

The results of this project are expected to establish important early indicators of crustal plate dynamics beneath the WAIS. As scientists take these into account in refining their models, future measurements and a time-series of the geodetic data should gradually produce a more constrained picture of WAIS subglacial dynamics. That is, plate rotations and both elastic and viscoelastic motions caused by deglaciation and ice-mass changes.

Field Season Overview: Project team members will travel by LC-130 aircraft to a base camp at Patriot Hills. From there, a Twin Otter aircraft will provide close support to a series of remote sites where researchers will establish temporary camps and deploy precision GPS receivers. One site is a reference station that operates continuously while the other receivers are deployed. Researchers will return to the temporary camps two to seven days later to retrieve the data and equipment. From there, they will be transported via LC-130 to Byrd Surface camp, and then to Siple Dome camp where Twin Otters will provide support to new GPS sites.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-017-O
NSF/OPP 99-09422
Station: McMurdo Station
RPSC POC: Curt LaBombard
Research Site(s): Sea ice camp

Hunting behavior and energetics of free-ranging Weddell seals

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Deploying Team Members: Randall W Davis . Lee A Fuiman . William H Hagey . Markus Horning . Jesse E Purdy . Matthew R Rutishauser . Theresa M Williams . Kate Willis

Research Objectives: Weddell seals (Leptonychotes weddellii) must locate and capture sparsely distributed and mobile prey in a cold, dark environment, while holding their breath and with limited access to breathing holes. These challenges form the basis of our primary question: What behavioral and energetic strategies enable free-ranging Weddell seals to forage in the antarctic fast-ice environment? In answering this question, this project's primary objectives are:

-Determine the foraging behaviors that Weddell seals use to locate and capture prey and how these behaviors vary with location, season, prey type and environmental conditions.

- Estimate the energetic costs, benefits and efficiency for different foraging behaviors, modes of locomotion and prey types.

Field Season Overview: Soon after arriving at McMurdo, the principal investigator will identify a location on the sea ice for the field camp. From the field camp, team members will travel on snowmobiles and tracked vehicles to natural cracks in the sea ice, where they will capture adult male and non-pregnant female seals with a purse-seine net. The seals will be transported back to the field camp in a seal sled towed behind a tracked vehicle. At the field camp, team members will weigh the seals, attach an instrument package (video recorder/data logger and transmitters), and release the seal to resume natural behavior.

Each instrument packet deployment will last three to seven days. The system is programmed to remain in stand-by mode for two days while the animal returns to normal behavior. After that the video recorder is triggered when the seal descends below 100 meters (an indication that the seal has begun foraging). The data logger records depth, speed, location, ambient temperature, light level, and dissolved oxygen for up to one week.

The satellite, VHF, and sonic transmitters allow researchers to locate instrumented seals. Seals' daily locations, accurate to one kilometer, are delivered by email to the field camp. Team members will travel by tracked vehicle, snowmobile, or helicopter, to re-capture the seals and remove the instrument package. Data and video footage will be analyzed at the field camp and at home institutions.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-005-M
NSF/OPP 99-09841
Station: McMurdo Station
RPSC POC: Rob Robbins
Research Site(s): McMurdo Sound

Antifreeze proteins in antarctic fishes: Ecological and organismal physiology, protein structure-function and mechanism, genetics, and evolution

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Deploying Team Members: Christina C Cheng-Devries . Paul Cziko . Arthur L De Vries . Clive W Evans . Kevin C Hoefling . Luke H Hunt . Nelyn E Soto

Research Objectives: Despite temperatures that can dip below 0°C, antarctic waters provide a life sustaining environment for a number of fish species. How are they able to take the most frigid waters on earth through their gills without themselves freezing? A primary reason are the so-called antifreeze proteins, an adaptation found in a number of polar and subpolar species. The Southern Ocean provides the ideal laboratory and molecular biology the ideal probe to study this phenomenon.

This group studies the physiology of fish and larvae from these waters to see how ice grows in biological tissues -- a crystallization process called nucleation -- and how antifreeze glycoproteins (AFGP) inhibit it. The antifreeze function has enabled the antarctic notothenioids to colonize their frigid habitats very successfully. These researchers are mounting comprehensive multidisciplinary analyses of this adaptation at the level of the gene as well as the protein.

This season, deploying team members will:

- Investigate the relationship between the severity of different antarctic marine environments (McMurdo vs. Peninsula) on notothenoid fish antifreeze capacity and function.

- Characterize the antifreeze capacity at both the gene and protein levels of representative species from the five antarcticfamilies of notothenoid fish.

- Characterize the evolution of AFGP gene families and the suborder Notothenoidei using molecular and cytogenetics techniques.

Field Season Overview: Project team members plan to establish fishing stations on the annual sea ice of McMurdo Sound. The support contractor's crew will drill new holes with the Reed Drill as fish captures dwindle at existing holes. Fish will be captured by diving and setting fish traps. Live specimens will be transported by tracked vehicle to the aquarium at McMurdo Station for further study.

Team members will make day trips by helicopter to the ice edge and to Bratina Island, where there they will deploy fish traps and take conductivity, temperature, and depth (CTD) readings at discrete depths to determine seawater conditions at the collection sites. CTD casts will also be conducted at other sites and at various depths in McMurdo Sound to determine the hydrographic conditions and level of iciness encountered by the McMurdo Sound fish species.

Researchers will travel by helicopter to Cape Bird, where they will deploy a temperature and pressure data logger in about 30 feet of water. The data logger will be left to collect data for one year.

Divers will retrieve developing dragonfish eggs or hatchlings from in situ cages set up during the 2000-2001 field season. They will also collect fertilized eggs of other species at sites in McMurdo Sound. Fertilized eggs will be hatched in the Crary Lab aquarium to study the expression levels of antifreeze glycoproteins during development. Some samples will be returned to the home institution for further analysis.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-131-O

NSF/OPP 99-80594

Station: McMurdo Station
RPSC POC: Robbie Score
Research Site(s): Balloon facility

In situ measurements of polar stratospheric clouds, condensation nuclei, and ozone during the austral winter and spring

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Dr. Chris Kroger
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Deploying Team Members: Terry L Deshler . Chris Kroger . Chuntao Liu

Research Objectives: The development of the antarctic ozone hole will be measured by balloon-borne instruments launched from McMurdo Station. Approximately 25 ozonesondes will provide concentration profiles of ozone from the surface to 30-35 km. This record will document the temporal and vertical development of the annual austral winter/spring ozone loss. Approximately 45 ozonesonde measurements are planned for the following austral winter.

The winter 2003 measurements will be part of an international campaign, "Quantitative Understanding of Ozone losses by Bipolar Investigations" (QUOBI), with instruments provided primarily by the European Commission, to compare measured and modeled ozone loss for the antarctic polar vortex. This campaign will include ozone measurements from numerous antarctic locations in addition to McMurdo -- Neumayer, Dumont d'Urville, Syowa, Belgrano, Rothera, South Pole, Marambio, and Davis. The ozone measurements at each station are overseen by the individual investigators responsible. The field measurements will be coordinated in terms of timing by the Alfred Wegner Institute, Potsdam, Germany. The goal is to repeatedly sample nearly the same air parcel, as it circulates over the antarctic continent. Trajectory forecast models identify appropriate times for a measurement from each station. When a number of measurements are completed on a similar air parcel, then the ozone amount measured within that air parcel, as a function of time and solar illumination, can be compared with the predictions of chemical transport models.

This experiment will test several issues concerning our quantitative understanding of polar ozone loss and will require the coordination of a number of research personnel. This experiment has been performed several times in the Arctic but this is the first attempt in the Antarctic. The measurements are planned to begin in June 2003 and will continue at the rate of about 4-5 measurements per week from each station until the end of the ozone loss period, October 2003.

Field Season Overview: This field season, researchers will launch balloon-borne instruments called ozonesondes from McMurdo Station. Ozonesondes are lightweight, balloon-borne instruments that are mated to a conventional transmitter-equipped meteorological instrument known as a radiosonde. This group cooperates with Alberto Adriani's LIDAR work (AO-117-O) and collaborates with Linnea Avallone's work with ozone-depleting bromine compounds (AO-132-O).

After flights, project team members travel by helicopter to recover the instruments which are expected to be scattered within a 100-nautical-mile-radius of McMurdo Station on the Ross Ice Shelf.

The winter-over science technician will receive training in instrument preparation, launching techniques, and data acquisition. The science technician and other support contractor personnel in McMurdo will carry out winter balloon launches.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-037-L/P

NSF/OPP 00-89451

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Alice Doyle

Research Site(s): Bransfield Strait, Dallman Bay

Structure, function and expression of tubulins, globins, and microtubule-dependent motors from cold-adapted antarctic fishes

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Deploying Team Members: H. William Detrich, III . Steve Hann . Sandra Parker

Research Objectives: As the Southern Ocean cooled during the past 25 million years, the fishes of antarctic coastal waters evolved biochemical and physiological adaptations that maintain their essential cellular processes. The long-range goals of this research are to determine, at the molecular level, the adaptations that enhance the assembly of microtubules, the function of kinesin motors, and the expression of globin and tubulin genes. Specific objectives are

• Determine the primary sequence changes and posttranslational modifications that contribute to the efficient polymerization of antarctic fish tubulins at low temperatures

• Evaluate the biochemical adaptations required for efficient function of their brain kinesin motor at low temperatures

• Characterize the structure, organization, and promoter-driven expression of globin and tubulin genes from an antarctic rockcod (Notothenia coriiceps) and a temperate congener (N. angustata).

Brain tubulins from antarctic fishes differ from those of temperate and warm-blooded vertebrates both in unusual primary sequence substitutions and in posttranslational C-terminal glutamylation. Potential adaptations of antarctic fish tubulins will be tested directly by production of wild-type and site-directed tubulin mutants for functional laboratory analysis. Researchers will determine the capacity of fish tubulins to form “cold-stable” microtubules, and test the role of the carboxy-terminal charge status of tubulin in cold adaptation of microtubule assembly after enzymatic manipulation.

Three unusual substitutions in the kinesin motor domain of Chionodraco rastrospinosus may enhance mechanochemical activity at low temperatures. To test the functional significance of these changes, fish residues will be converted to those found in mammalian brain kinesin. Reciprocal substitutions will be introduced into the framework of the mammalian kinesin motor domain. After production in Escherichia coli and purification, the functional performance of the mutant motor domains will be evaluated.

Molecular adaptation of gene expression in N. coriiceps will also be analyzed. Structural features that support efficient expression will be assessed. Comparison with N. angustata should help delineate elements of the regions that are important for high-level expression at low temperatures. The functions of possible regulatory elements will be tested by deletion analysis and by specific mutagenesis. Together, these studies should reveal the molecular adaptations of antarctic fishes that maintain efficient cytoskeletal assembly, mechanochemical motor function, and gene expression at low temperatures and advance the molecular understanding of the poikilothermic mode of life.

Field Season Overview: Coordinating with Bruce Sidell's work (BO-036), researchers will use the R/V Laurence M. Gould to collect fish in the Antarctic Peninsula. Fishing methods will include mobile trawls, buoyed and anchored fish pots and longlines. The primary collecting areas include Dallmann Bay, the south shore of Low Island and the southeast shore of Livingston Island. The aquarium room on board the vessel will maintain live specimens during transport to Palmer Station for subsequent experiments. Fish may also be collected in the local Palmer area from Zodiac inflatable boats using hook-and-line and fish traps. At Palmer Station, researchers will purify microtubule proteins and nucleic acids from fish tissues. Biochemical and molecular biology experiments will be conducted in the labs, and samples will be returned to the home institution for additional analysis.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-D

NSF/OPP 98-10219

Station: McMurdo Station

Research Site(s): Taylor Valley

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert

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Deploying Team Members: Peter T Doran . Peter J Glenday . Fabian Kenig . Jennifer L Lawson . David Mazzucchi . Maria Uhle . Bernd Wagner

Research Objectives: Paleoclimatology, paleoecology, meteorology component of McMurdo LTER. A critical part of the LTER legacy research will be carried out this season. The group will extract long sediment cores from the Taylor Valley lakes and analyzing sediment from these cores to directly assess legacy.

These analyses will also tie into another project that extracts paleoclimatic information from these sediment cores. This group also oversees the recollection of a sediment addition experiment (one of the original LTER experiments I) which is resampled by divers every other year.

Field Season Overview: The researchers plan to characterize carbon and nitrogen isotopic signatures and carry out hydrologic balance measurements in Dry Valley lakes. They will also maintain and collect data from long-term automated lake monitoring equipment and long-term benthic experiments.

In the Dry Valleys, project team members will collect lake ice and glacial ice cores. From lake and pond moats and from stream mouths, they will collect microbial mat samples, water samples, and moat sediment cores. Using precision GPS receivers, they will measure debris movement on the ice cover of Lake Hoare. From McMurdo Station, team members will travel by helicopter or tracked vehicle to the Ross Ice Shelf where they will collect ice cores.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BP-013-L/P

NSF/OPP 02-17282

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Karl Newyear

Research Site(s): Faure Islands, Petermann Island, Cape Monaco, Joubin Islands, Emperor Island, Dion Islands, Avian Islands

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Seabird component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment

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Deploying Team Members: Cynthia D Anderson . Heidi N Geisz

Research Objectives: The seabird component of the Long Term Ecological Research (LTER) project will continue studies of seabird communities within the LTER sampling grid with emphasis placed on species abundance and dietary components during summer.

Field Season Overview: Field work includes a Palmer Station program and a science cruise aboard the R/V Laurence M. Gould. During the Palmer Station program, several team members will travel daily via Zodiac inflatable boats from the station to local islands to monitor seabird (e.g., penguins, skua, kelp gull) communities. The researchers will observe banded penguins before they pick their nesting sites and will try to determine if the birds pick the same nesting sites and the same mates from year to year. Colony boundaries and nest locations will be mapped using differential Global Positioning System (GPS) equipment. The field-team members will weigh, size, and band hatchlings late in the season. Remote sensing via radio telemetry will be used to document the feeding behavior of Adelie penguins. Team members will work in the Palmer Station laboratory to analyze the dietary components of seabirds to determine the sources, quantity and quality of food consumed.

During the science cruise (LMG 03-01), two team members will conduct general observational studies of the foraging range of seabirds in the Bellingshausen Sea. They will also use Zodiac inflatable boats to follow feeding penguins and observe their foraging behavior.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BP-016-L/P

NSF/OPP 02-17282

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Karl Newyear

Research Site(s): RV LMG, Palmer Station

Phytoplankton ecology component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment

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Deploying Team Members: Jeffrey P Bechtel . Michelle E Ferrara . Wendy A Kozlowski . Lauren A Rogers . Karie A Sines . Maria Vernet

Research Objectives: The phytoplankton ecology component of the Long Term Ecological Research (LTER) project focuses on rates of primary production and phytoplankton community structure, particularly their relationship to physical forcing.

Field Season Overview: Field work includes a Palmer Station program and a science cruise aboard the R/V Laurence M. Gould. During the Palmer Station program researchers will travel by Zodiac inflatable boats to local sampling stations to collect water samples and related oceanographic parameters. Samples will be returned to the laboratory, analyzed for biochemical properties of phytoplankton and experiments carried out to estimate rate processes.

During the science cruise (LMG 03-01) the same types of sampling and analysis will be done. New experiments this field season include water-column measurement of delta 18-O.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BP-028-L/P

NSF/OPP 02-17282

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Karl Newyear

Research Site(s): British Antarctic Survey's Rothera Station, Avian Island

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Zooplankton component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment

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Deploying Team Members: Charles Boch . Michelle Fuller . Michael W Holmes . Emily Lindsey . Daniel L Martin . Lyndon Valicenti . Jennifer A White . Matthew Wright

Research Objectives: The zooplankton component of the Long Term Ecological Research (LTER) project is concerned with investigating and defining seasonal scale processes in krill demography and distribution in relation to the abiotic and biotic environment.

Field Season Overview: Field work includes a Palmer Station program and a science cruise aboard the R/V Laurence M. Gould. During the Palmer Station program researchers will travel by Zodiac inflatable boats to local sampling stations. In the lab, the group will perform process-level experimental research on antarctic krill (ingestion, growth).

During the science cruise (LMG 03-01) they will deploy a variety of nets at LTER grid stations to collect zooplankton, including antarctic krill and fish larvae. Bioacoustic surveys will be conducted with a towed BioSonics 120 kHz transducer to document spatial patterns in krill distribution. Other studies of the growth and spawning behavior of antarctic krill will be conducted in the vessel aquarium room.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BP-032-L/P

NSF/OPP 02-17282

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Karl Newyear

Research Site(s): Adelaide Island, Anvers Island

Bio-optical component of LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment

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Deploying Team Members: Kirk J Ireson . Kim Mc Coy

Research Objectives: The bio-optical component of the Long Term Ecological Research (LTER) project focuses on the space/time variability of ecological processes. They also investigate the linkage between shipboard surface observations and satellite observations relevant to these various processes including sea ice coverage and phytoplankton biomass and production.

Field Season Overview: Field work includes a Palmer Station program and a science cruise aboard the R/V Laurence M. Gould. During the Palmer Station program researchers will use autonomous profiling vehicles (APVs) to measure in-water bio-optical and hydrographic properties within LTER's small scale study area, 5 square kilometers around Palmer Station.

During the science cruise (LMG 03-01) they will make sea ice observations in accordance with international protocols and measure bio-optical properties using a free-fall profiling system. They make use of models and satellite data for the peninsula area including sea surface temperature, ozone concentration, cloud cover, and SEAWIFS.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BP-045-L/P

NSF/OPP 00-87872

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Karl Newyear

Research Site(s): RV LMG, Palmer Station

LTER (Long Term Environmental Research): Climate migration, ecological response and teleconnections in an ice-dominated environment

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Deploying Team Members: Eugene M Burreson . Hugh W Ducklow . Shannon Mc Callister . Estella Raulfs . Matthew K Reuer . Mary Turnipseed

Research Objectives: The overall objectives of Palmer LTER research are to document and understand the seasonal cycles of primary production, krill recruitment, Adele penguin breeding and microbial biogeochemical processes in the near shore regime of the coastal antarctic ecosystem. The specific objectives of the program in 2002-2003 include:

1. Establishing a microbial biogeochemistry component and initiating regular biweekly sampling at Stations A-E in Arthur Harbor, in conjunction with other groups, especially M Vernet (BP-016).

2. Sample for biomarkers of terrestrial vegetation, seabirds and marine bacterial, phytoplankton,

zooplankton in dissolved and particulate organic matter in the near shore environment.

The overall objective is to continue the now 10-year long LTER time series on our regional scale grid of hydrographic stations. Specific objectives include:

1. Occupy the full LTER grid of stations including the inshore, and offshore stations on all lines. This has not been fully accomplished in several years. Occupation of inshore stations is to characterize the cold, inner shelf biome away from Arthur Harbor. Outer stations are necessary to fully sample krill on-to-offshore migration gradients. North and South stations are needed to fully cover the penguin breeding area.

2. Recover and redeploy long-term sediment trap array.

3. Conduct replicated fine scale surveys of oceanographic properties and bird observations within the Adelie penguin foraging area near Palmer Station.

4. Sample deep water properties (CTD) at several far-field (off-grid) stations in the Antarctic Circumpolar Current in order to identify ACC water transport within the grid. This could be accomplished during the PUQ-PAL transit.

5. Sample deep water properties (CTD) on the grid in order to compute geostrophic currents and enable better estimates of absolute surface currents in the study region.

6. Visit Rothera Station (UK) on Adelaide Island to allow British colleagues to use LMG for one day of local hydrographic sampling.

7. Allow penguin biologists to visit Avian Island to conduct bird censuses and sample gut contents.

8. Occupy Arthur Harbor stations at least twice to maintain Palmer Station seasonal sampling (because all personnel normally at PAL are on the LMG).

Field Season Overview: Field work includes a Palmer Station program and a science cruise aboard the R/V Laurence M. Gould. During the Palmer Station program researchers will conduct replicated fine scale surveys of oceanographic properties within the Adelie penguin foraging area near Palmer Station. They will also recover and redeploy long-term sediment traps and sample deep water properties with CTD casts. Using Zodiac inflatable boats, Arthur Harbor LTER stations will be occupied at least twice to maintain Palmer Station seasonal sampling.

During the science cruise (LMG 03-01) they will visit the UK's Rothera Station on Adelaide Island to allow British colleagues to use the vessel for one day of hydrographic sampling. A visit to Avian Island will enable penguin researchers to conduct bird censuses and sample gut contents.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-027-O **NSF/OPP** 01-25893

Station: McMurdo Station
RPSC POC: Norm Wolfe
Research Site(s): McMurdo Station

Culture emergence and health in Antarctica

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Deploying Team Members: Nancy P Chin . Kathryn Donhauser . Timothy D Dye . Peter Fleming . Adam Rains

Research Objectives: The emergence of a long-term population in space will, in many ways, parallel the emergence of a sustained population in Antarctica, where development has expanded beyond the initial population of scientific and military personnel and now includes support staff and construction personnel. Experts speculate that a similar mix of residents may emerge as space populations develop. Such organizational and cultural merging in restricted environments undoubtedly creates new cultural landscapes (ethnoscapes) that could influence health and health behavior. Because of the extreme environmental circumstances, health risks and health care are particularly important. The study of cultural emergence in Antarctica as an analog to space could prove useful in the development of models of health and health behavior in an isolated confined environment (ICE) and could help planners better structure these environments to reduce health risks and identify factors that predispose people to those risks.

This group will

• Model the emergence of cultural stages in ICE ethnoscapes as experienced by both short- and long-term populations,

• Identify those elements of ICE ethnoscapes that are specific to an individual season and those that are repeated,

• Relate how the temporal and content stages of ICE ethnoscapes interact with risk, behavior, and injury, and

• Demonstrate the utility of electronic and distance-based assisted ethnography in the conduct of social research in ICE environments of Antarctica, and possibly in space.

Researchers will begin with key informant interviews and focus groups conducted throughout the United States with people who have spent at least one season on the ice within the past three years. The purpose is to elucidate the behaviors, risks, and health events that face residents, particularly in the emergence of ethnoscapes. During the next phase, researchers will reside in Antarctica for an extended period and conducting onsite participant observation and interviews at two different sites. This phase will include the Self-Disclosure Technique (SDT), an anthropological method for identifying the conceptual structure of a cultural event. SDT will be used to describe cultural dynamics in occupational, recreational, spiritual, and other group activities. Fieldwork will involve both short- and long-term residence. The data will be processed, and models will be tested for validity with informants on the ice.

This research could contribute to the development of screening procedures for long-term residence in ICEs and context-sensitive explanatory models of culture and injury risk, as well as illustrate the utility of distance-based ethnography.

Field Season Overview: Researchers will observe the unique culture of the Isolated Confined Environment (ICE) at McMurdo Station and study the way it develops during the season. They will solicit volunteers from the support contractor's staff to interview and track via e-mail and an interactive web-based program. Whenever possible, researchers will join occupational and social groups for the purposes of observation and study.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-253-O **NSF/OPP** 0126007

Station: McMurdo Station

RPSC POC: Howie Tobin

Research Site(s): McMurdo Station, McMurdo Sound

Measurements and improved parameterizations of the thermal conductivity and heat flow through first-year sea ice

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Deploying Team Members: Lars G Backstrom . Hajo Eicken . Margaret E Smith

Research Objectives: The sea-ice cover in the polar oceans strongly modifies ocean-atmosphere heat transfer. Most important, the ice cover thermally insulates the ocean, with sea-ice thermal conductivity determining the magnitude of the heat flow for a given ice-temperature gradient. Despite its importance (second only to ice albedo), knowledge of sea-ice thermal conductivity is limited to highly idealized models developed several decades ago. General circulation models (GCMs) and large-scale sea-ice models currently include overly simplistic parameterizations of ice thermal conductivity that are likely to contribute significantly to errors in estimating ice production rates.

Researchers will carry out a set of field measurements from which the thermal conductivity of first-year sea ice will be derived as a function of ice microstructure, temperature, salinity, and other parameters. Measurements will be carried out by letting thermistor arrays freeze into the McMurdo Sound fast ice, which represents an ideal natural laboratory for this type of measurement. To minimize errors and identify the most robust technique, the research team will collaborate with colleagues from New Zealand and compare different methodologies for measurement and analysis. They will also assess the impact of ice microstructure (spatial distribution of brine, crystal sizes) and convective processes on the effective rate of heat transfer.

Antarctic data will be compared with arctic thermal conductivity data sets to assess regional contrasts and the impact of different physical processes on heat flow and to arrive at a comprehensive, improved parameterization of ice thermal conductivity for large-scale simulations and GCMs. This component of the work will involve ice-growth modeling and collaboration with the Sea-Ice Model Intercomparison Project Team established under the auspices of the World Climate Research Program. This research will advance and improve

- The understanding of the processes and parameters controlling heat transfer and the thermal conductivity of first-year sea ice

- Techniques for deriving thermal conductivity and heat flow data from thermistor arrays

- The understanding of sea-ice processes and heat flow through the ice cover in McMurdo Sound

- Parameterizations of thermal conductivity for use in large-scale and high-resolution one-dimensional simulations

- The representation of first-year ice thermal properties (both antarctic and arctic) in GCMs.

Field Season Overview: In collaboration with New Zealand researchers, project team members plan to visit a set of thermistor strings frozen into the ice about 5 km off Arrival Heights near Scott Base. They will conduct in-situ measurements of sea ice parameters -- temperature, thermal properties and microstructure. Researchers will also take ice samples back to McMurdo Station for preparation of thick and thin sections in a cold room and measurements on melted ice samples. These measurements will be augmented by surveys of ice properties and heat transfer at other locations in the McMurdo fast-ice cover.

Researchers will work from a temporary sea ice camp that the New Zealand team will erect on the fast ice. Facilities at McMurdo Station will only be used for processing of ice core samples.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-117-O

NSF/OPP US-Japan

Station: South Pole Station

RPSC POC: Paul Sullivan

Research Site(s): Skylab building

All-Sky Imager at the South Pole

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Deploying Team Members: Yusuke Ebihara . Masaki Tsutsumi

Research Objectives: The South Pole is a unique platform for observing aurora during the austral winter. The pole provides a unique vantage point for observing the airglow and to discern the characteristics of acoustic gravity waves in the polar region as they vary in altitude and wavelength. The continuous observation available at the South Pole allows researchers to collect data on auroras that develop from precipitating low-energy particles entering the magnetosphere from the solar wind:

• Dayside polar cusp/cleft aurora,

• Afternoon aurora that are closely associated with the nightside magnetospheric storm/substorm activities,

• The polar cap aurora, which is dependent on the polarity of the interplanetary magnetic field.

Though data have been acquired at the South Pole since 1965 using a film-based, all-sky camera system, newer technology produces digital images and permits automatic processing of large amounts of information. This group uses the all-sky-imager (ASI), a digital CCD imager monitored and controlled by the Japanese NIPR (National Institute of Polar Research).

These international collaborations should enhance knowledge of the magnetosphere, the ionosphere and of upper/middle atmosphere physics. The HF (high frequency) radars at Halley Bay, Sanae, and Syowa Station provide the vector velocity of ionospheric plasma over the South Pole.

These studies should provide further insight into the physics of the magnetosphere, the convection of plasma in the polar cap, and solar wind effects - specifically dayside auroral structure, nightside substorm effects, and polar-cap arcs.

Field Season Overview: This field season, project team members will spend about a week at the Aurora Lab at South Pole Station performing maintainenance on the optical camera, workstation, and data recorder and calibrating the optical device.

During the polar night, the All-Sky Imager (ASI) is remotely operated through a satellite link by researchers at the National Institute of Polar Research in Japan. The South Pole science technician changes data tapes, monitors the condition of the glass radome, turns the "moon blocker" on/off, and performs maintenance and repairs.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-290-O

NSF/OPP 00-87919

Station: McMurdo Station

RPSC POC: Mike McClanahan

Research Site(s): Allan Hills, Coombs Hills

Ferrar basaltic tuff-breccias formed by direct eruption: Evaluating an hypothesis

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Deploying Team Members: Tim Cully . David H Elliot . Craig B Grimes

Research Objectives: The Jurassic pyroclastic rocks that constitute the Mawson Formation in south Victoria Land are unique in terms of the thickness and areal extent of tuff-breccia formed by explosive interaction in the sub-surface between magma and water in aquifers. They appear to represent a new style of eruption in which mixtures of volcanic particles, sedimentary debris from the aquifers and water are erupted directly from vents, forming mass-flows that may accumulate to great thickness given the right topographic setting.

The goal of this project is to evaluate the hypothesis of eruption-fed debris flows. The objectives are to understand the paleovolcanology of these tuff-breccias, the time-dependent changes in location of the magma/water interaction and the processes of eruption and accumulation, and the tectonic setting in which the volcanic activity occurred.

Field Season Overview: Project team members will travel by helicopter from McMurdo Station to Mount Dearborn where they will establish a field camp and travel on foot to examine geological structures and collect rocks. Team members will move their camp to Allan Hills and make day trips from there by helicopter to collect rocks. The team members will return by helicopter to McMurdo Station. Rock samples will be returned to the home institution for analysis.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-034-E **NSF/OPP** 99-09274

Station: Not based at a station

RPSC POC: John Evans

Research Site(s): Seymour Island and other peninsula locations

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Abandoned penguin colonies in Antarctica

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Deploying Team Members: Manuela Campo . Steven D Emslie . Rodney Hayward

Research Objectives: Climate change is assumed to be a pivotal factor in the success of many species. This project will investigate the history of Adélie penguins in late Holocene Antarctica. By locating and examining the fossil remains of former colonies, scientists hope to develop a model of when they thrived and when colonies were abandoned, and thus their success relative to climate change. This model could inform current science on the relationship between climate and population dynamics.

This study will integrate data from the ecological, geological and paleobiological records with satellite-imagery analyses. The climate factor will be inferred by data contemporaneous with the fossil evidence, in particular the extent of the sea ice and marine productivity. The population factor will be developed through field and laboratory investigations of abandoned colonies along coastal Antarctica.

Researchers will first collect surface and subsurface bones, feathers, and eggshell fragments preserved at these sites. Later in the lab, they can reconstruct the occupation history of each abandoned colony, through standard and radiocarbon analyses. Sediments from each site will be sifted to recover organic remains (such as squid beaks and fish otoliths) believed to be staples of the penguin diet. Statistical analysis of such indicators can trace the changing size of the colony at specific prehistoric times, and thus prey consumption becomes a proxy for population success. This timeline can then be matched to past episodes of climate change, which are well documented for the late Pleistocene and Holocene in ice-core and marine sediment records.

Researchers expect these ancient responses by penguins to climate change (as indicated by the paleoecological record) to parallel those observed in Antarctica today, where regional warming has been documented over the past 20 to 50 years. Ultimately they will be able to test the hypothesis that Adélie penguins - for decades and centuries - have been responding to climate change in a predictable manner and that those responses can be anticipated, relative to fluctuations in sea-ice extent and marine productivity.

Field Season Overview: The researcher will be joining a team from the Swedish Antarctic program, receiving logistical support through the Argentine Antarctic program. Dr. Emslie will travel from Argentina to Seymour Island in an Argentinean C-130 to:

- Locate and excavate abandoned penguin colonies on ice-free terrain,

- Collect organic remains (penguin bones, eggshell, fish bones, and otoliths) from ornithogenic sediments,

- Obtain radiocarbon dates on penguin bones and tissue to determine an occupation history for penguins in the Antarctic Peninsula,

- Sample active colonies of Adelie and chinstrap penguins to obtain similar information on occupation history and dietary remains from guano.

The sediments will be screened and washed in the field, coarse fractions will be sorted in the field, and fine sediments will be shipped back to the U.S. for further study.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-102-M/S **NSF/OPP** 99-09212

Station: McMurdo and South Pole Stations

RPSC POC: Jesse Alcorta

Research Site(s): McMurdo Station, South Pole Station

Conjugate and high time resolution studies of ULF waves and magnetospheric dynamics using ground based induction magnetometers at four high latitude manned sites

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Dr. Roger Arnodly
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Deploying Team Members: No Deployment

Research Objectives: Micropulsations are fluctuations in the earth's magnetic field caused by solar wind. They can be measured on time scales between 0.1 second and 1,000 seconds. Such magnetic variations can significantly affect large scale technological systems such as power grids and pipelines.

Since 1973 this project has been measuring the interaction between the Earth's magnetic field and the solar wind with ground magnetic pulsation detectors. The project's magnetometers are located at Arrival Heights (McMurdo Station), in the Quiet Sector at South Pole Station and in the Arctic.

Researchers study the variations and patterns of micropulsations over periods of time up to a complete solar cycle. Since satellite systems are now continuously observing solar activity and monitoring the solar wind, it is becoming feasible to develop models to predict the disruptions caused by magnetic anomalies. While this work is geared specifically toward a better understanding of the world and the behavior of human-made systems, it will also involve space weather prediction.

Field Season Overview: Science technicians at McMurdo and South Pole stations support this project on a year-round basis by performing daily equipment checks, troubleshooting, and repairing the equipment as necessary.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-315-N
NSF/OPP 98-16226
Station: RV/IB Nathaniel B Palmer
RPSC POC: Paul Olsgaard
Research Site(s): Science of opportunity on cruises

Shipboard acoustic doppler current profiling on RVIB Nathaniel B. Palmer and RV Laurence M. Gould

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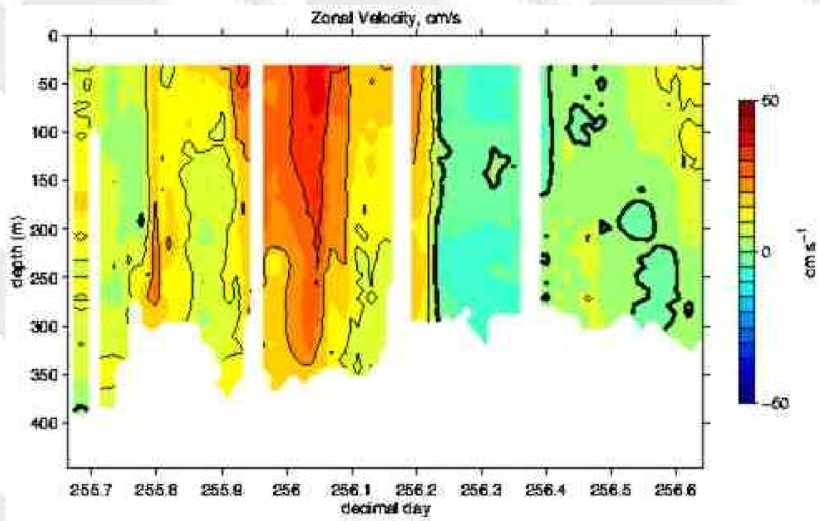

Deploying Team Members: Julia M Hummon

Research Objectives: Currents in the Southern Ocean have a profound influence on the world's oceans, and therefore upon global temperature and the planet's ecosystem. Yet some remote regions receive little scientific attention. Using Doppler technology (sound-wave transmission and reflection), this project is exploring upper ocean current velocities. Researchers are building a quality-controlled data set in one such sparsely sampled and remote region, which nonetheless appears to play a significant role in global ocean circulation. They will develop and maintain a shipboard acoustic Doppler current profiler (ADCP) program on board the USAP research ships Nathaniel B. Palmer and Laurence M. Gould.

Part of the long-term science goal is to characterize the temporal and spatial velocity structure in the Southern Ocean. This entails measuring the seasonal and annual changes in upper ocean currents within the Drake Passage and then combining this information with similar temperature observations to see how the heat exchange varies and how it drives upper ocean currents.

Field Season Overview: For three years, this project's ADCP (acoustic Doppler current profiler) and TSG (thermosalinograph) instruments have been installed on the RV/IB Nathaniel B. Palmer. During each cruise, data is collected and automatically transmitted to the home institution. Principal investigators maintain a website where they make the raw data available. Shipboard electronics technicians and computer support staff maintain and monitor the systems. This field season, project team members will deploy to the RV/IB Nathaniel B. Palmer to maintain and upgrade the system.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-062-O **NSF/OPP** 01-26106

Station: McMurdo Station

RPSC POC: Mike McClanahan

Research Site(s): Beacon Heights, Convoy Range, Victoria Land

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Emplacement of the ferrar mafic igneous province: A pilot study of intrusive architecture and flow directions in Southern Victoria Land

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Deploying Team Members: Calhoun M Andrew . Charles J Day . Thomas H Fleming . Stephen Marshak . Jess C Priest . Alan G Whittington

Research Objectives: The breakup of the Gondwanaland supercontinent 180 million years ago was associated with a very large region of mafic igneous activity extending across Africa (Karoo), Antarctica (Ferrar), and Australia (Tasmanian). Models linking the 3,000 kilometer long Ferrar province of Antarctica to a mantle plume, a magma conduit or other sources make testable predictions about magma transport patterns.

This project is a pilot study on Ferrar rocks in southern Victoria Land using a variety of different field and laboratory techniques (structural mapping, geochemical correlation, anisotropy of magnetic susceptibility, mesoscopic analysis, and petrofabric analysis). Its goal id to evaluate these models and provide a greater understanding of the emplacement mechanisms and magma flow directions in the Ferrar province.

Field Season Overview: Team members will travel via Twin Otter to a field camp in the Quartermain Mountains. From there, they will travel on foot, snowmobile and by helicopter to other areas in the upper Taylor Glacier Area. Their work includes making geological observations, surveying, coring, and collecting rock samples for analysis.

A second field camp will be established later in the season in the area of Shapeless Mountain with several helicopter supported day trips to the Convoy Range.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-F
NSF/OPP 98-10219
Station: McMurdo Station
Research Site(s): Dry Valleys

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.

Dr. Andrew G. Fountain

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Deploying Team Members: Chad Delany . Amy Lefebvre . Thomas H Nylen

Research Objectives: Glacier mass balance, melt and energy balance component of the McMurdo LTER.

Field Season Overview: The researchers plan to monitor the mass balance of selected glaciers in Taylor Valley and maintain weather stations and snow fences in Beacon, Taylor, Wright, and Victoria Valleys. Team members will set up a temporary meteorological station on Howard Glacier, install and refurbish satellite reflectors on Commonwealth Glacier, and measure glacier snow lines and ablation stakes on several glaciers with GPS.

Team members will also drill cryconite holes on the Canada Glacier, collect samples, and install conductivity and temperature probes in the holes for winter data collection. With the assistance of a support contractor mountaineer, team members will extract a snow core from the accumulation zone of Commonwealth Glacier.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-198-P **NSF/OPP** 01-30525

Station: Palmer Station
RPSC POC: Karl Newyear
Research Site(s): Dream Island, Biscoe Point

Monitoring the effects of tourism and environmental variability on Adelie penguins at Palmer Station, Antarctica

Dr. William R. Fraser
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Dr. Donna Patterson
Polar Oceans Research Group

Research Objectives: The potential consequences of antarctic tourism on Adélie penguins (Pygoscelis adeliae) have been debated for more than 20 years. However, the rapid proliferation of these activities since 1970, particularly on the Antarctic Peninsula, has not only forced an extension of these questions to wildlife populations in general, but also colored them with a sense of urgency and controversy that has polarized opinions. The key concern is that continued increases in these activities will eventually overcome the ability of research to address critical issues in a timely and biologically meaningful manner. This is a valid concern, since studies to examine human impacts have either not been implemented at critical sites or are limited in scope because of logistic and experimental constraints.

Understanding how tourism might affect Adélie penguins rests fundamentally on the need to quantify and understand the natural variability manifested by breeding populations over spatial and temporal scales. However, although it is generally recognized that without these data it will be difficult to critically assess any localized changes from tourism, this ecosystem approach is expensive and complex and is not likely to be justified by the need to understand tourist impacts.

This group will continue a tourist monitoring program underway at Palmer Station as part of a large ecosystem-scale study. Palmer Station mirrors current patterns in tourism and tourist–wildlife interactions in the western Antarctic Peninsula. It also provides unique opportunities for research on human impacts. This includes the presence of long-term databases that document environmental variability over time and space scales in both marine and terrestrial habitats, as well as the ability to examine potential tourist impacts as part of controlled experiments.

This research is expected to capitalize and expand on two key findings to date. One is the discovery of a previously unrecognized source of variability in the Adélie penguin population that results from interactions between landscape geomorphology and changing patterns of snow deposition due to climate warming. The other is the observation that penguins breeding in less desirable landscapes may be more susceptible to cumulative impacts induced by the presence of human activity.

These findings have important implications for understanding interactions between climate change and ecosystem response, and for detecting, mitigating, and managing the consequences of human activities such as tourism.

Field Season Overview: Research will be closely integrated with the schedule and activities of Dr. Fraser's ongoing LTER (Long Term Ecological Research) project, BP-013-P. Zodiac inflatable boats will be used to travel between Palmer Station and study sites on local islands. Seabird population and behavioral data will be collected from colonies subject to a range of human disturbance.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-100-O

NSF/OPP 01-38126

Station: McMurdo Station

RPSC POC: Jesse Alcorta

Research Site(s): Arrival Heights

The operation of an ELF/VLF radiometer at Arrival Heights

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Deploying Team Members: Dana Porrat

Research Objectives: Since it was discovered in the 1930s that natural phenomena emit the lowest frequency of electromagnetic energy -- radio waves -- the field of radio astronomy has joined the scientific effort to analyze both atmospheric and extraterrestrial signals. Arrival Heights near McMurdo Station is one of a network of eight radiometers operated by Stanford University for the Office of Naval Research. Because of its isolation from cities, which produce interference that propagates over considerable distance, Arrival Heights is almost unique as a measurement location for natural noise. The radiometers at McMurdo operate in both the extra-low- and very-low-frequency (ELF/VLF) ranges, monitoring radio noise from natural sources such as thunderstorms.

We have about two decades -- a remarkably long period -- of data measuring ELF/VLF radio signals and noise at Arrival Heights. These data enable scientists to look for weak effects, for example, those that might be associated with global warming, with some confidence. Since thunderstorms generate telltale ELF/VLF radio signals, analysis of these data can provide information on the weather and other global changes.

Field Season Overview: One team member will travel to McMurdo Station to upgrade the equipment and operation of the radiometer. The primary task is to convert the data recording media from analog and digital magnetic tape to DVD disk media. The upgrade requires installation of a new computer. This represents a major change in the equipment and operation of the radiometer and is expected to take about two weeks.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-109-O

NSF/OPP 99-80801

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): SPASE2 array

South Pole Air Shower Experiment - 2 (SPASE-2)

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Dr. Todor Stanev

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Deploying Team Members: Xinhua Bai . Vanja Bucic . Serap Z Tilav

Research Objectives: Cosmic rays consist of protons and other atomic nuclei, accelerated (scientists believe) to high energy levels in such distant astrophysical sources as supernova remnants. As cosmic rays from space arrive at the Earth, they interact in the upper atmosphere. The South Pole Air Shower Experiment-2 (SPASE-2) is a sparsely filled array of 120 scintillation detectors spread over 15,000 square meters at South Pole. This array detects the charged particles (primarily electrons) that are produced by interactions of these very high energy cosmic rays.

A nine-station subarray called VULCAN has been constructed to detect the Cherenkov radiation (light emitted by a charged particle moving through a medium at a higher speed than the speed of light within that material, analogous to the shock wave produced by objects moving faster than the speed of sound) produced high above the ground in the same showers. The SPASE array is located less than half a kilometer from the top of AMANDA and is designed to complement

AMANDA's (AA-130-OO) neutrino detecting capacity.

The first of SPASE's two goals is to investigate the high-energy primary cosmic radiation that comes from galaxies by determining the relative contribution of different groups of nuclei at energies greater than about 100 teraelectron volts. This can be done by analyzing coincidences between SPASE and AMANDA. Such coincident events are produced by high-energy cosmic-ray showers with trajectories that pass through SPASE (on the surface) and AMANDA (buried 1.5 to 2 kilometers deep). AMANDA detects high-energy muons penetrating the Earth in those same showers for which SPASE detects the low-energy electrons arriving at the surface. The ratio of muons to electrons depends on the mass of the original primary cosmic ray nucleus. The VULCAN detector further permits the calculation of two other ratios that also depend on primary mass in readings from the showers it detects.

The second goal is to use the coincident events as a tagged beam. This configuration permits investigation and calibration of certain aspects of the AMANDA response. This project cooperates with the University of Leeds in the United Kingdom.

Field Season Overview: The primary task for the researchers this season is to upgrade the data-acquisition system to Linux. Working from the computer room in the science building under the dome, team members will calibrate and optimize the SPASE-2 array, located on the surface in the Dark Sector of South Pole Station.

The station science technician will assist the researchers during the austral summer and will monitor the equipment and perform routine maintenance during the winter.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-009-O

NSF/OPP 02-25110

Station: McMurdo Station

RPSC POC: Kirk Salveson

Research Site(s): Turtle Rock, Hutton Cliffs, White Island, Scott Base, sea ice camp, Cape Royds, Cape Evans, field camp at Big Razorback

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Patterns and processes: Dynamics of the Erebus Bay Weddell seal population

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Deploying Team Members: Christine V Alfano . Michael F Cameron . Robert A Garrott . Gillian Hadley . Darren Ireland . Jay J Rotella . Brent S Stewart . Jeffrey Warren . Pamela K Yochem

Research Objectives: The study of the Erebus Bay Weddell seal population in eastern McMurdo Sound was initiated in 1968 and represents one of the longest intensive field investigations of a long-lived mammal in existence. Some 15,636 animals have been tagged, with 144,927 resighting records in the database.

This season, researchers intend to build on this foundation with two lines of investigation that combine the long-term database with new field initiatives. They will maintain the continuity of the demographic data by annually marking all pups born, replace lost or broken tags, and perform multiple mark-recapture censuses. The new data will be combined with the existing database, and a complex series of demographic analyses will be performed. These analyses will allow researchers to test hypotheses about population regulation, as well as temporal and spatial patterns of variation in vital rates among colonies within the population.

A sample of adult female seals and pups will be weighed, and body morphometrics will be obtained using digital photography combined with image analysis software. Regression equations will be developed from these data to predict body mass. At each major colony within Erebus Bay, these regression equations will be used to estimate annually the parturition and weaning mass of a large sample of adult female seals and their associated pups. Project team members will also use satellite imagery to track sea-ice extent in McMurdo Sound. The extent of sea ice affects regional primary productivity, which may increase marine resources, thereby having a positive effect on foraging efficiency and leading to increased body mass. These data, combined with the large proportion of known-aged seals in the current study population (more than 60%), will comprise a powerful database that can be used to test specific hypotheses.

Learning about the mechanisms that limit and/or regulate Weddell seal populations and the specific biophysical links between climate, oceans, ice, and antarctic food webs can make an important contribution toward understanding pinniped population dynamics, as well as add to the understanding of population, community, and ecosystem patterns and processes. Continuation of this long-term study may also contribute toward understanding the possible detrimental impacts of human activities such as global climate warming and the commercial exploitation of antarctic marine resources. This study can contribute significantly to the development and testing of new research and analytical methodologies that will almost certainly have other applications.

Field Season Overview: Researchers will set up a camp of sea ice huts near Big Razorback Island, which will serve as their base for the field season. Within the study area, stretching from Cape Evans to Pram Point, all newborn pups will be tagged and tags will be replaced on previously marked adults. Team members will travel by snowmobiles and tracked vehicle to conduct a weekly census to count and record the tag number of all seals. At Big Razorback, a remotely operated underwater camera will be used to examine the spacing patterns of adult females on the ice surface and underwater.

The team members will travel by helicopter and Twin Otter aircraft to tag seals and collect information on marked seals outside the study area. This will include areas around Ross Island, parts of the continental coast on the western side of McMurdo Sound, Cape Washington, Markham Island, and White Island. The researchers will attach satellite-linked radio transmitters to seals to investigate the emigration of weaned pups and adults, as well as monitor their movements on the ice and underwater. Team members will travel by helicopter and use radio telemetry to track and locate radio-tagged seals.

A new program for estimating the mass (weight) dynamics of adult female seals and their pups will be initiated this season. The first season’s work will primarily involve technique development and testing. Each seal will be photographed from several angles and weighed on a livestock scale mounted on a sled. From these data, researchers will develop equations to estimate mass based on body measurements. Next season the team will collect sequential mass measurements of seal mother and pup pairs at all colonies. Ultimately, mass dynamics will be correlated with other factors such as survival, reproduction, colony, sea ice conditions, and climate.

The research team will also collect blood, scat, and diet samples for collaborative work with scientists studying Weddell seal blood chemistry, health parameters, blood parasites, and diet. In conjunction with these studies, the researchers will continue their investigations of anesthetic agents used in handling Weddell seals. Frozen seal blood and tissue samples will be prepared in the Crary lab and returned to the home institution for further studies.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-215-O

NSF/OPP 01-25172

Station: RV/IB Nathaniel B Palmer
RPSC POC: Karl Newyear
Research Site(s): RV/IB NBP

ANSLOPE: Cross slope exchanges at the Antarctic slope front

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Deploying Team Members:

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Research Objectives: The AnSlope project seeks to determine the role of the Antarctic Slope Front (ASF) and continental slope morphology in the exchanges of mass, heat, and freshwater between the continental shelf and oceanic regimes, in particular those leading to outflows of dense water into intermediate and deep layers of the adjacent deep basins and world ocean circulation.

AnSlope has four specific objectives: (1) Determine the ASF mean structure and the principal scales of variability, and estimate the role of the front in cross-slope exchanges and mixing of adjacent water masses, (2) Determine the influence of slope topography on frontal location and outflow of dense shelf water, (3) Establish the role of frontal instabilities, benthic boundary layer transports, tides and other oscillatory processes on cross-slope advection and fluxes, and (4) Assess the effect of diapycnal mixing, lateral mixing identified through intrusions, and nonliearities in the equation of state on the rate of descent and fate of outflowing, near-freezing shelf water.

Three AnSlope science cruises will deploy on the Research Vessel/Icebreaker Nathaniel B. Palmer. The objectives for the first cruise, NBP 03-02 are to:

- Conduct a rapid survey of the ASF in the northwest Ross Sea using T7 and T5 XBT's (expendable bathythermographs

- Obtain high resolution swath bathymetry via multibeam in the ASF region,

- Deploy, recover and redeploy nine instrumented moorings in a concentrated array at a site to be selected upon completion of the above surveys, and

- To conduct approximately 120 CTD (conductivity, temperature, depth) casts with LADCP, microstructure sensors, and tracer chemistry at specific stations along and across the ASF region.

Field Season Overview: Researchers on this R/V Nathaniel B. Palmer cruise will conduct a rapid survey of the Antarctic Slope Front (ASF) in the northwest Ross Sea using eXpendable BathyThermographs (XBTs), Acoustic Doppler Current Profiler (ADCP), and multibeam sonar. The survey will be followed by the deployment of nine ocean-bottom moorings.

A series of Conductivity-Temperature-Depth (CTD) and researcher-provided Lowered Acoustic Doppler Current Profiler (LADCP) casts will be conducted at 10-kilometer increments along the ASF from the mooring array to the Italian CLIMA program site east of the array. This will be followed by a series of CTD/LADCP casts near the mooring array every 5 to 10 kilometers.

At the end of the cruise, all moorings and their will be recovered. The moorings and instruments will then be serviced and redeployed.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IO-196-M
NSF/OPP 01-24014

Station: McMurdo Station
RPSC POC: John Evans
Research Site(s): Lakes Vanda, Joyce, Bonney, Fryxell

Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change.

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Dr. Glenn Berger
Desert Research Institute

Deploying Team Members: Sean Birkel . Mary A De Mello . Amber Hawkins . Aaron Schlosser . Thomas Whittaker

Research Objectives: A key unresolved question in antarctic glaciology concerns the stability of the West Antarctic Ice Sheet (WAIS). The WAIS is marine-based, meaning that its substratum is a series of archipelagoes in the northwestern Ross Sea Embayment off the northern Scott Coast. At its relatively fixed position, the WAIS is grounded on the continental shelf with plate boundaries nearby. In contrast, the East Antarctic Ice Sheet sits on a stable lithospheric plate.

As deglaciation began after the last glacial maximum (LGM), the WAIS became unmoored. Scientists believe this was likely the first area of the shelf to become free of grounded ice. Learning how and when and in what sequence this occurred is a critical step towards isolating the mechanisms (sea level, climate, ocean temperature, and internal dynamics) that control

WAIS dynamics.

The northern Scott Coast is of particular interest to researchers looking for mechanisms that may have triggered the key stages of deglaciation. An important first step is to better constrain the age of structures where the inquiry is focused. The Barbados coral record suggests the initial retreat from the Ross Sea Embayment may have begun as early as 17,000 years ago. In contrast, recent glacial geologic mapping and relative sea-level suggests that deglaciation on the southern Scott Coast occurred more recently. Using carbon-14 dating (14C), it appears that deglaciation occurred there during the Holocene (the last 11,000 years) with southward grounding-line migration past Ross Island shortly before 6,500 years ago. This chronology suggests that rising sea level could not have driven grounding-line retreat to the Siple Coast, because deglacial sea-level rise essentially would already have occurred by mid-Holocene.

To begin to resolve this conflict, one deficiency in the data from the southern Scott Coast might be corrected. Those data cannot differentiate among the possible triggering mechanisms because they come from 450 kilometers south of the LGM grounding-line position. The goal of this project is to try to overcome this by constructing relative sea-level curves on a transect along the northern Scott Coast. Researchers hope to get the ages for this work from accelerator mass spectrometer 14C dates of seal skins and shells within raised beaches. These curves should reveal when the grounded ice from the northwestern Ross Sea Embayment cut loose.

Field Season Overview: Project team members will travel by helicopter to the Dry Valleys where they will establish a field camp and conduct sediment coring operations in the bottoms of Lakes Fryxell, Bonney, Joyce and Vanda. At Lake Joyce, glacial geology work will be conducted. This group collaborates closely with a New Zealand research team led by Dr. Chris Hendy.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IO-194-E **NSF/OPP** 01-24014

Station: Not based at a station

Research Site(s): South Shetland Islands

AMS Radiocarbon Chronology of Glacier Fluctuations in South Shetland Islands during Glacial/Interglacial Hemicycle: Implications Antarctica's Role in Global Climate Change

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Deploying Team Members: Brenda L Hall

Research Objectives: What drives glacial cycles? Most researchers agree that Milankovitch seasonal forcing paces the ice ages, but how these changes are leveraged into abrupt global climate change remains unknown. A current popular view is that the climate of Antarctica and the Southern Ocean leads that of the rest of the world by a few thousand years or more. The character of deglaciation in Antarctica is that of a long gradual warming, rather than an abrupt change, although the paleoclimate record is not well defined. The most persistent challenge to the asynchrony hypothesis is the Taylor Dome ice core. Revision to the chronology has shown that the original interpretation of rapid climate change synchronous with deglaciation in Greenland was probably an artifact of very low accumulation rates.

Millennial-scale fluctuations of high-level, closed-basin, amplifier lakes in the dry valleys of Antarctica can shed some light on this issue: 150 radiocarbon dates of algae from deltas and shorelines record rapid oscillations of these high-elevation lakes that extend through the Holocene. This record has the potential to form an independent data set with which to test the synchrony of abrupt climate changes in Antarctica. However, this approach has several shortcomings, including the fact that the record in the Holocene and earlier is unclear, a lake-level record based on geomorphological features alone is discontinuous, and only levels higher than the present lakes are recorded.

The ideal way to address these problems is to integrate the geomorphological record with a series of cores taken from lake bottoms. Researchers will obtain transects of long cores from Lakes Fryxell, Bonney, Joyce, and Vanda, using an approach designed to extract the greatest possible amount of data. Estimates of hydrologic changes will come from different proxies. Chronology will come from dating of carbonates, as well as luminescence sediment dating. Evaluation of the link between lake level and climate will come from modeling

Combination of the more continuous lake-core sequences with the spatially extensive geomorphological record will result in an integrated data set that extends back at least 30,000 years. This record will be compared with dry valley glacier records and ice cores to address questions of regional climate variability and then with other Southern and Northern Hemisphere records to assess the interhemispheric synchrony or asynchrony of climate change.

Field Season Overview: This project will work in close collaboration with a compatible GPS-based geophysics project under Dr. Frederick W. Taylor (GO-080-O).

Researchers will accompany Dr. Taylor's party ashore at each of the eight island GPS locations, where they will assess the suitability of glaciologic observations. They may establish a tent camp at locations they consider to be of interest. Other locations will be visited and studied as time permits.

Zodiac support from the R/V Laurence M. Gould will be provided, as well as enough camping equipment to remain ashore for two to three days at each site.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-053-O **NSF/OPP** 97-26139

Station: McMurdo Station
RPSC POC: Curt LaBombard
Research Site(s): Dry Valleys

Stability of land surfaces in the Dry Valleys: Insights based on the dynamics of sub-surface ice and sand-wedge polygons

Dr. Bernard Hallet

Dr. Ronald Sletten
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Department of Quaternary Studies

Deploying Team Members: Jennifer Horwath . Ronald S Sletten

Research Objectives: The dynamic nature of climate has received more public attention as concerns grow about warming and the recent occurrence of seemingly extreme weather events. In this context, understanding the inherent variability of Earth's climate and how humans can and do affect the environment, is becoming increasingly important. This project focuses on the landscape features and soils of Antarctica's dry valley region to provide a more complete understanding of past climatic and environmental conditions.

One important means of improving our understanding of the planetary climate system is to examine its past behavior, using the Earth as a natural laboratory. One of the most extreme changes in the climate system during the last few million years was the transition from a warm period in the Pliocene to an ice-age world. Scientists believe that during this interval relatively mild conditions in Antarctica gave way rapidly to intense glacial conditions, catalyzing the growth of what has become the largest ice sheet on Earth. This inference is based on geologic indicators of past climate, from which some scientists suggest that East Antarctica was relatively warm and largely free of glaciers about 3 to 4 million years ago (during parts of the Pliocene). The mild conditions ended abruptly, with rapid ice-sheet growth and development of the very cold, dry climate that now characterizes this region. A contrasting view, based on substantial geologic evidence, suggests that East Antarctica has been cold and the ice sheet stable for at least 8 million years, and perhaps considerably longer. These views lead to drastically different interpretations of the stability of Earth's climate.

This project's goal is to help resolve this important dilemma by introducing independent new evidence and insights derived from studies of the stability of ground ice and land surfaces in the McMurdo Dry Valleys of Antarctica. The researchers will study modern-day processes that have important implications for understanding the occurrence of buried ice found recently in Beacon Valley. This specimen may be the oldest ice on Earth. If so, it will provide strong evidence of long-term stability of the East Antarctic Ice Sheet, and may also afford a rare glimpse into atmospheric conditions millions of years ago. Specific processes to be investigated include:

• Exchange at the ground surface that affects ground temperature,

• Water-vapor transport and other processes leading to the formation or loss of ice in the soil, and

• Frost cracking due to contraction during rapid cooling of the frozen ground in the winter, and resulting disruptions of the soil.

Field Season Overview: The researchers plan to study the polygon dynamics, water and energy balances of soils. They will travel by helicopter from McMurdo Station to Beacon Valley where they will take samples from a massive ground ice deposit along the Onyx River in the Wright Valley that became exposed during the summer of 2001-2002.

The team members will return to McMurdo Station via helicopter and work in the Crary laboratory to process samples for return to their home institution.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-178-O **NSF/OPP** 98-15510

Station: McMurdo Station

RPSC POC: Kirk Salveson

Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: Mass balance and accumulation rate along US ITASE routes

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: The polar ice sheets and the snow falling on them are important components of the global hydrological cycle. Yet, because of their very large size and remote locations, scientists have only a limited understanding of their mass balance (rate of thickness change) or the spatial distribution of snow accumulation. Work conducted as part of the U.S. ITASE seeks to improve this understanding.

This five-year project is beginning its fourth year in the 2002-2003 field season. Researchers will measure the rate of ice sheet thickening (or thinning) at selected sites along flow lines, on ice divides, and along elevation contours. The vertical velocity of ice is obtained from precise GPS surveys of markers buried 5-20 meters deep in the surface firn. The velocity measurements are compared with the local, long-term average snow accumulation rate evident in ice core stratigraphy. Earlier work demonstrates that very precise rates of thickness change can be measured using this technique.

This group is also studying spatial variations in accumulation rates, probing the link between snow accumulation and surface topography. Continuously operating, autonomous instruments will be deployed at several closely spaced sites that have very different slope gradients. The instruments will record snow accumulation, wind speed, and direction, firn compaction, and firn temperature. These results will enable this group to test hypotheses of the physical processes of snow deposition and erosion.

This project will also investigate the ice flow effects on accumulation rates derived from U.S. ITASE ice core records. At sites along flow lines, ice cores record the integrated accumulation rate history for a certain distance up-glacier of the core site. Changes in surface topography along this flow line will lead to apparent accumulation rate variations in the ice core record. By studying local ice dynamics (horizontal velocities, surface slope) around each ice core site, researchers will be able to better understand the cause of accumulation rate variations in the core records.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-314-O

NSF/OPP 98-15140

Station: McMurdo Station
RPSC POC: Curt LaBombard
Research Site(s): Dry Valleys

Measurement of combustion effluent carbonaceous aerosols in the McMurdo Dry Valleys, Antarctica

Dr. Anthony D. Hansen

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Deploying Team Members: Anthony D Hansen . Joseph D Mastroianni

Research Objectives: Though Antarctica remains comparatively pristine, there is heightened awareness of the impact the human presence and scientific work being undertaken there could have. To continue a series of assessments of the long-term environmental impact of the U.S. Antarctic Program's operations, project team membes plan to generate a database detailing the abundance of carbonaceous aerosols in the McMurdo Dry Valleys.

The Mcurdo Dry Valleys support a fragile, nutrient-limited ecosystem that could be significantly affected by human activities. Of special concern are deposits of particles from carbonaceous aerosols ("black carbon"). These could result from the exhaust of diesel power generators and helicopter operations that support the Long Term Ecological Research (LTER) in the Dry Valleys. It is even possible that combustion products from McMurdo Station about 100 kilometers away could migrate to the study area. For three austral summers, this group will install air-pollution monitoring equipment at the Lake Hoare and Lake Bonney camp sites in the McMurdo Dry Valleys LTER study region to detect emissions from camp activities, diesel generator use, and helicopter exhaust. This data will help assess the environmental impact of human activities in this fragile ecosystem, and will help quantitate the environmental benefit of conversion to solar power at the camps.

In this final year of the project, the equipment will be deployed in autonomous, solar-powered "Instrumentation Support Units." These units will include radio communications interfaced directly to the Internet, allowing a remote user to download data and monitor the performance of the thermal and electrical systems as well as the scientific payload.

Field Season Overview: Upon arrival at McMurdo Station, researchers will test their solar-powered Transportable Autonomous Instrumentation Support Units (TAISUs) to ensure they are operational. The field team will then travel by helicopter to the Dry Valleys, beginning with Lake Hoare. There they will install, test, and connect the TAISU by local radio modem to the Internet network interface at McMurdo Station. The field team will then move to Lake Bonney and set up a second TAISU.

When both units are functioning and connected to the Internet, the field team will return to McMurdo Station. One team member will remain at McMurdo Station for a week to finalize the software interface and any communications issues. The instrument modules will run automatically until the end of the 2002-2003 summer season. Support contractor personnel will remove both instruments at the end of the season and return them to the research team's home institution.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-058-O

NSF/OPP 99-80452

Station: McMurdo Station

RPSC POC: Joni English

Research Site(s): Pecora Escarpment, Beardmore Glacier, Allan Hills, LaPaz Icefield

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The Antarctic search for meteorites (ANSMET)

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Deploying Team Members: Carlton C Allen . Philip A Bland . Andy Caldwell . Nancy Chabot . Diane E Di Massa . Dean B Eppler . Ralph P Harvey . Dante Lauretta . Scott Messenger . Jamie L Pierce . John W Schutt . Linda C Welzenbach . Sunita Williams

Research Objectives: Since 1976, ANSMET (the Antarctic Search for Meteorites program) has recovered more than 10,000 meteorite specimens from locations along the Transantarctic Mountains. Antarctica is the world's premier meteorite hunting ground for two reasons:

• First, although meteorites fall all over the globe at random, the likelihood of finding a meteorite is enhanced if the background material is plain and the accumulation rate of terrestrial sediment is low. This makes the East Antarctic Ice Sheet the perfect medium.

• Second, along the margins of the sheet, ice flow is sometimes blocked by mountains, nunataks, and other obstructions. This exposes slow-moving or stagnant ice to the fierce katabatic winds, which can deflate the ice surface and expose a lag deposit of meteorites (a representative portion of those that were sprinkled throughout the volume of ice lost to the wind). When such a process continues for millennia, a spectacular concentration of meteorites can be unveiled.

It is important to continue recovering antarctic meteorites because they are the only currently available source of new, non-microscopic extraterrestrial material. As such, they provide essential "ground truth" about the composition of asteroids, planets, and other bodies of our solar system. ANSMET recovers samples from the asteroids, the Moon and Mars for a tiny fraction of the cost of returning samples directly from these bodies.

Field Season Overview: During the 2001-2002 field season, ANSMET's main field party visited the Meteorite Hills region near the headwaters of the Darwin Glacier. Systematic searching at this site resulted in the collection of 740 meteorites. This season will extend systematic searches to regions visited only sporadically last year, including the nearby Finger Ridges, where three meteorites were recovered in 2000-2001.

From McMurdo Station, the systematic search party will travel by LC-130 aircraft to Beardmore South Camp. From there they will make at least three overland traverses to Goodwin Nunataks and MacAlpine Hills where they will conduct systematic searches for meteorites. Mid-season Twin Otter flights will re-supply the team, remove trash, empty fuel drums, and transfer personnel. At the end of the season, researchers will make a day trip by helicopter to the Allan Hills region.

A second field party dedicated to high level reconnaissance will be ferried to and from South Pole Station by LC-130 flights. Twin Otter flights will support put-ins, re-supply, and camp moves of this team in the Pecora/La Paz region. Samples will be returned to the home institution for analysis.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-110-M/S **NSF/OPP** 99-09743

Station: McMurdo and South Pole Stations
RPSC POC: Curt LaBombard
Research Site(s): Arrival Heights, South Pole Station

High-latitude Antarctic neutral mesospheric and thermospheric dynamics and thermodynamics

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Deploying Team Members: Stephen T Barlow . Gonzalo Hernandez . Michael P Mc Carthy . Bryan J Venema . Ruth T Wilton-Godbefforde

Research Objectives: The South Pole is a unique and interesting spot from which to observe the dynamic motion of the atmosphere. It's position on the earth's axis of rotation strongly restricts the types of wave motion that can occur there compared to lower latitude sites.

This project uses a high-resolution Fabry-Perot interferometer at South Pole Station to make simultaneous azimuthal observations of the individual line spectra of several upper atmospheric trace species, most importantly the hydroxyl radical (OH) and atomic oxygen. The observed Doppler shift of the emission lines provides a direct measure of the line-of-sight wind speed, while the wind field structure can also be derived from these multi-azimuth measurements. The simultaneously observed line widths also provide a direct measurement of kinetic temperature.

The goal of this project is to observe, characterize and understand high-latitude mesospheric motions and thermospheric persistent vertical winds near Arrival Heights simultaneously with those at South Pole. In both locations, observations are made during the austral winter.

Field Season Overview: Project team members will perform routine service on the FPI (Fabry-Perot interferometer) and ancillary equipment at McMurdo's Arrival Heights facility. A LIDAR (light radar) installed last season at McMurdo Station will also be serviced this season. Researchers plan to do most of their calibration and maintenance at Arrival Heights, then proceed to the South Pole.

The same team members will perform maintenance tasks on the system in South Pole Station's Aurora Lab. Upon return to McMurdo Station, the researchers will conduct any further maintenance needed at Arrival Heights.

During the rest of the year, station technicians operate the instruments, which are in self-calibration mode during the austral summer and in 24-hour data-acquisition mode during the austral winter.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-134-O

NSF/OPP 00-87971

Station: McMurdo Station

RPSC POC: Steve Alexander

Research Site(s): Sea Ice, McMurdo Sound, Cape Evans, New Harbor, Ross Ice Shelf, Wohlschlag Bay

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Evolutionary loss of the heat shock response in antarctic fishes

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Deploying Team Members: Timothy Crombie . Bev Dickson . Gretchen E Hofmann . Sean P Place . Allsion C Whitmer . Mackenzie L Zippay

Research Objectives: Evolution has crafted a way for organisms to respond to the stress of abrupt environmental changes, in particular a sudden elevation of temperature. Commonly viewed as a "universal" characteristic of organisms, the heat-shock response (HSR) triggers previously inactive genes to synthesize one or more classes of molecular chaperones, known as heat-shock proteins (Hsps). But what about Antarctica, where such a sudden burst of heat is so unlikely? In previous studies on a cold-adapted, stenothermal antarctic teleost fish, Trematomus bernacchii, it was determined that this adaptational response has been lost over evolutionary time.

If evolution at subzero temperatures has indeed altered the gene expression patterns for molecular chaperones in antarctic fish, then the study of how cells respond to temperature at a molecular level may be a legitimate, new frontier in biology . At this stage, however, though HSR - perhaps the quintessential example of the environmental regulation of gene expression - has been well-described at the cellular level, there is little information on how the response is actually regulated in ectothermic animals in a natural environment.

This project's goal is to build upon that evolutionarily significant observation by examining this profound change in the environmental regulation of gene expression on two levels. First, researchers will try to establish how widespread the loss of the HSR might be in the suborder Notothenoidei, including antarctic and non-antarctic members of the group. Second, they will try to determine the nature of the lesion in gene expression that accounts for the loss of the expression of stress-inducible genes in antarctic species. Both of these objectives will entail experiments on closely related, cold temperate species from New Zealand waters.

Ultimately, the lesions in the Hsp gene expression in antarctic notothenioids may serve to highlight aspects of the "cellular thermostat" and to provide key information about the actual molecular response mechanism triggered by environmental stress. The results should contribute to our knowledge of the environmental physiology and evolutionary biology of the antarctic notothenioid fishes, as well as enhance our understanding of the extreme stenothermality in these fish.

Field Season Overview: Support contractor personnel will drill fishing holes through the sea ice near McMurdo Station. Project team members will travel by snowmobile, tracked vehicle and helicopter to these fishing holes to collect fish using line and bottom traps. Specimens will be transported to the Crary Lab aquarium for biochemical and genetic analyses. Some samples will be returned to the researcher's home institution for further analysis.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-257-O
NSF/OPP 90-17842

Station: McMurdo Station
RPSC POC: Paul Sullivan
Research Site(s): ARO

South Pole monitoring for climatic change -- U.S. Department of Commerce NOAA climate monitoring and diagnostic laboratory

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Dr. Russ Schnell
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Deploying Team Members: Timothy A Berkoff . Andrew D Clarke . Bradley Hall . Redgie Lancaster . John Ogren . Russell C Schnell . Bryan Vasel

Research Objectives: The National Oceanic and Atmospheric Administration (NOAA) has been conducting studies to determine and assess the long-term buildup of trace atmospheric constituents that influence climate change and the ozone layer. Time-series analyses of long-term data provide insight into several phenomena of particular interest. These include:

- Seasonal and temporal variations in greenhouse gases,
- Stratospheric ozone depletion,
- Transantarctic transport and deposition,

• The interplay of the trace gases and aerosols with solar and terrestrial radiation fluxes that occur on the polar plateau, and

• The development of polar stratospheric clouds over Antarctica.

Project scientists measure carbon dioxide, methane, carbon monoxide, stable isotopic ratios of carbon dioxide and methane, aerosols, halocarbons, and other trace constituents. Flask samples are collected and returned for analysis, while concurrent in situ measurements are made of carbon dioxide, nitrous oxide, selected halocarbons, aerosols, solar and terrestrial radiation, water vapor, surface and stratospheric ozone, wind, pressure, air and snow temperatures and atmospheric moisture. Air samples at Palmer Station are also collected.

These measurements allow researchers to determine the rates at which concentrations of these atmospheric constituents change. They also point to likely sources, sinks, and budgets. This group collaborates with climate modelers and diagnosticians to explore how the rates of change of these parameters affect climate.

Field Season Overview: Early in the field season, project team members will relieve the 2001 winter-over personnel and continue the atmospheric monitoring program, which includes monitoring surface and stratospheric ozone, carbon dioxide, water vapor, ozone-depleting compounds, and other trace constituents of the atmosphere. At various times during the season, the team members will conduct the following experimental procedures:

- Sample air upwind of the station, in the Clean Air Sector,

- Measure ozone in the atmosphere optically, using a Dobson UV spectrometer operating through a window in the ARO,

- Sample ozone in the upper air (from the surface to over 30 kilometers), using ozonesonde payloads on high-altitude balloons launched from the BIF,

- Collect air samples in the Clean Air Sector near the snow surface and upwind of the ARO.

Samples and data will be returned to the home institution for analysis. Two project team members will remain at the station during the 2002 austral winter to operate and maintain the equipment and continue the research.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-264-O
Station: Palmer Station
RPSC POC: Rob Edwards
Research Site(s): Palmer Station

NSF/OPP NSF/NOAA agreement

Collection of atmospheric air for the NOAA/CMDL worldwide flask sampling network

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Dr. Thomas Conway
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Deploying Team Members: David J Hofmann

Research Objectives: The National Oceanic and Atmospheric Administration (NOAA) has been conducting studies to determine and assess the long-term buildup of trace atmospheric constituents that influence climate change and the ozone layer. Time-series analyses of long-term data provide insight into several phenomena of particular interest. These include:

• Seasonal and temporal variations in greenhouse gases,

• Stratospheric ozone depletion,

• Transantarctic transport and deposition,

• The interplay of the trace gases and aerosols with solar and terrestrial radiation fluxes that occur on the polar plateau.

Personnel at Palmer Station will collect air samples to be analyzed for carbon dioxide, methane, carbon monoxide, stable isotopic ratios of carbon dioxide and methane. Flasks will also be collected for analysis of halocarbons, nitrous oxide, and other trace constituents.

These measurements allow researchers to determine the rates at which concentrations of these atmospheric constituents change. They also point to likely sources, sinks, and budgets. This group collaborate with climate modelers and diagnosticians to explore how the rates of change of these parameters affect climate.

Field Season Overview: No project team members will deploy to Antarctica this field season. The Palmer Station physician will collect one or two air samples per week and log environmental conditions. All samples are returned to the NOAA laboratory on a regular schedule.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-378-O

NSF/OPP 00-91840

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

ACBAR (Arcminute Cosmology Bolometer Array)

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Department of Physics

Deploying Team Members: William L Holzapfel

Research Objectives: Advances in detector technology are enabling a revolution in cosmology. Arrays of bolometric detectors on the ground have recently been used to image large regions of the cosmic microwave background (CMB) sky from balloons and are detecting luminous dusty galaxies at high redshift. The arcminute cosmology bolometer array receiver (ACBAR) is a 16-element, 250-micro-Kelvin detector system that was deployed at the South Pole in November 2000 and is designed to be used with the Viper telescope there. ACBAR will image the sky in four bands, filling an important niche in angular-scale and frequency coverage between existing millimeter-wave balloon-borne and ground-based instruments. These four frequency bands were chosen to take full advantage of the excellent millimeter (mm) and submillimeter atmospheric windows available for observations from the South Pole.

ACBAR is designed to probe the universe in two distinct ways: First, the measurement of small angular-scale structure in the CMB will complement the large angular scales probed by various satellites and balloon-borne instruments, leading to improved constraints on cosmological models. Second, the imaging and discovery of galaxy clusters with the Sunyaev-Zel'dovich Effect (SZE) will provide a wealth of new cosmological information. ACBAR's broad frequency and angular-scale coverage enable enormous leaps forward in both of these directions. The receiver also serves as a test bed for the detector and optics technology that will eventually fly on the European Space Agency's Planck satellite in 2007.

With this combination of sensitive detectors, high-angular resolution, and broad frequency coverage, ACBAR will advance cosmology research on several fronts. Observations of the CMB provide a glimpse of the universe at the time when it was only about 300,000 years old. Only recently have technological advances made observations of the SZE possible. To separate the thermal and kinematic components of the SZE, observations must be made at several mm-wavelength frequencies. Other experiments are producing detections of the SZE in x-ray-discovered distant clusters. ACBAR will significantly advance these efforts. This second season of observation will see the analysis and publishing of the results of two previous years of observation.

Field Season Overview: The ACBAR receiver shares time with other instruments on the Viper telescope at the South Pole. Project team members will install and remove the instrument twice to accommodate the share schedule. They will also prepare the receiver for winter observations, calibrate the previous winter's observations and install minor upgrades.

During the second half of the field season, new observations will begin. During the austral winter, the station science technician monitors the equipment and performs routine maintenance.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-025-E **NSF/OPP** 02-34570 (SGER)

Station: Not based at a station

Research Site(s): Reunion Island, Indian Ocean

Food web structure across a large-scale ocean productivity gradient: Top predator assemblages in the southern Indian Ocean

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Dr. K. David Hyrenbach
Duke University

Deploying Team Members: George Hunt . K D Hyrenbach

Research Objectives: During an Océan Indien Service d'Observation cruise, this group will test the hypothesis that the dispersion and community of top predators vary with large-scale differences in physical structure and ocean productivity by conducting an interdisciplinary survey of marine bird and mammal use of distinct domains in the southern Indian Ocean. French team members will sample physical oceanography and ocean productivity while USAP participants survey top predator distributions across a 35º latitudinal gradient from subtropical to subantarctic waters.

Project team members will address the primary hypothesis that top predator assemblages are structured by spatial gradients in hydrographic properties and ocean productivity patterns known to influence the distribution and patchiness of their zooplankton, fish, and squid prey. The researchers hypothesize that the overall abundance of marine top predators within a specific domain is largely determined by ocean productivity. They also hypothesize that the energetic costs of foraging determine which types of marine top predators inhabit specific domains. Species with high foraging costs must exploit dense prey aggregations within highly productive areas. Conversely, taxa with low foraging costs are able to inhabit areas of low productivity, where they exploit more dispersed prey.

To test these hypotheses, researchers will quantify the spatial association of top predator assemblages with specific water masses and the aggregate response of top predators at hydrographic and bathymetric domains. Because top predators respond to oceanographic variability at multiple scales of time and space, project team members will assess their responses to habitat variability at two specific scales, mega-macro and coarse. At the mega-macro scale (thousands of kilometers), faunal associations with specific water masses and ocean productivity domains will be characterized. At the coarse scale (tens of kilometers), top predator aggregations at frontal systems and continental shelf margins will be quantified.

The analytical methods used will include compositional analysis of coarse-scale habitat preferences, generalized additive models, recurrent group analysis, ordination of hydrographic data and top predator assemblages, and measurement of top predator aggregation using Lloyd's index of dispersion and autocorrelation statistics.

More specifically, project team members will study how overall top predator abundance and the distributions of distinct assemblages and feeding guilds change across spatial gradients in physical and biological properties. This interdisciplinary perspective will enhance the current understanding of the way physical and biological processes structure pelagic communities in the southern Indian Ocean.

Field Season Overview: Working from the bridge of the French research vessel Marion Dufresne, project team members will observe the distribution and abundance of marine birds and mammals in the research area.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-106-S

NSF/OPP 99-09872

Station: South Pole Station
RPSC POC: Rob Edwards
Research Site(s): South Pole Station

ELF/VLF waves at the South Pole

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Deploying Team Members: No Deployment

Research Objectives: The Very Low Frequency (VLF) Research Group at Stanford University investigates the earth's electrical environment, lightning discharges, radiation belts, and the ionized regions of the earth's upper atmosphere known as the ionosphere and magnetosphere. Much of the work involves very low frequency (VLF) electromagnetic waves which are generated by lightning discharges, by radio transmitters and by electrons in the energetic radiation belt. The researchers investigate the generation of these waves and the manner in which they propagate in and are scattered from various regions of the upper atmosphere. VLF waves are diagnostic tools to investigate physical processes in the vicinity of the earth's low and high altitude plasma environment. Instruments record data from a magnetic loop antenna using continuous and synoptic digital recording systems.

Field Season Overview: The support contractor's science technician will provide year-round support to the system including changing data tapes, conducting routine instrument checks, and performing monthly calibration on this project's ELF/VLF recording equipment in South Pole Station's Cusp Lab.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-108-O
NSF/OPP 00-93381

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

A VLF beacon transmitter at South Pole (2001-2004)

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Deploying Team Members: Jeffrey Chang . Robert Moore . Evans Paschal

Research Objectives: Relativistic electrons -- measured at geosynchronous orbit with energies of more than 300 kiloelectron volts -- appear to fluctuate in response to substorm and solar activity. During such events, these highly energetic electrons can penetrate as low as 30 to 40 kilometers above the Earth's surface. At that altitude, they can wreak havoc in the atmosphere, ionizing chemical species, creating X-rays, and perhaps influencing the chemistry that produces ozone.

This is a 3-year project to establish and operate a very-low-frequency (VLF) beacon transmitter at South Pole to measure solar effects on the mesosphere and lower ionosphere. The extent of relativistic electron precipitation can be calculated from variations in amplitude and phase of the VLF signals at different antarctic stations. The transmitter will also produce other data as well - on solar proton events, relativistic electron precipitation from Earth's outer radiation belts, and on the Joule heating components of high-latitude/ polar-cap magnetosphere/ionosphere coupling processes.

VLF data from the South Pole beacon provides a valuable complement to two other efforts: The southern hemisphere coherent HF radar network, Super4 Dual Auroral Network (SUPERDARN), and the Solar Anomalous and Magnetospheric Particle Explorer (SAMPEX), ongoing satellite-based measurements of trapped and precipitating high-energy electrons at high and low altitudes.

Field Season Overview: This field season is the project's second year. Assembly and construction of the transmitter will begin in early December 2002. One team member will remain in residence at South Pole Station for the duration of the summer season to oversee construction, ensure the structure's scientific integrity, and prepare the electronic components of the system for final installation in January, 2003. Two team members will travel to South Pole Station for three-weeks in December to complete the installation of electronic components controlling the beacon system, to perform system tests, and to make comprehensive diagnostic measurements.

The South Pole science technician will assist the researchers during the austral summer and will monitor the equipment and perform routine maintenance during the winter.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-306-P

NSF/OPP 99-10565

Station: Palmer Station

Research Site(s): Palmer Station

Global thunderstorm activity and its effects on the radiation belts and the lower ionosphere

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Deploying Team Members: Umran S Inan

Research Objectives: Tracking dynamic storms is a challenge, but lightning associated with thunderstorms can provide scientists an indirect way of monitoring global weather. This project employs very-low-frequency (VLF) radio receivers at Palmer Station, operated in collaboration with the British and Brazilian Antarctic Programs, both of which operate similar receivers. All are contributors to the Global Change Initiative.

The VLF receivers measure changes in the amplitude and phase of signals received from several distant VLF transmitters. These changes follow lightning strokes because radio (whistler) waves from the lightning can cause very energetic electrons from the Van Allen radiation belts to precipitate into the upper atmosphere. This particle precipitation then increases ionization in the ionosphere, through which the propagating VLF radio waves must travel. Because the orientations to the VLF transmitters are known, it is possible to triangulate the lightning sources that caused the changes. Once the direction of the lightning source is known, it can be subjected to waveform analysis and used to remotely track the path of thunderstorms.

The data will be correlated with data from the antarctic Automatic Geophysical Observatory network and will be used by scientists studying the magnetosphere and the ionosphere.

Field Season Overview: The VLF radiometer will continue to operate year-round in the Clean Air/VLF Hut at Palmer Station. One team member will travel to and from Palmer Station on the R/V Laurence M. Gould (cruise LMG 03-04) to upgrade the project's recording equipment. During the rest of the year, the station science technician will maintain and calibrate the equipment, archive the data and send it to the principal investigator.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-133-O **NSF/OPP** 98-14574
Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: Radar studies of internal stratigraphy and bedrock topography along the traverse

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: The U.S. component of ITASE conducts radar studies to determine the internal stratigraphy and bedrock topography of the terrain along the traverses. This austral summer, team members plan to use one of the traverse tractors to tow a low-frequency, ice-penetrating radar system along the traverse routes. The radar data will depict bedrock topography and internal layers along more than 1,200 kilometers of the West Antarctic Ice Sheet. The researchers will also conduct more detailed studies on grids surrounding each of the ITASE 200-year ice core sites to characterize accumulation and bedrock topography in these areas. The grids will require 60 to 80 kilometers of radar profiles each, depending on ice thickness and bed topography.

This radar system works as a complement to that operated by the Cold Regions Research and Engineering Laboratory (CRREL). Their's is a high-frequency radar, most suited to the shallower portion of the record down to about 60 meters. It can detect near-surface crevasses. The radar system of this project is most sensitive at depths below 60 meters and can depict deep bedrock and internal geological layers deep in the ice.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-115-O
NSF/OPP 00-87541
Station: S
RPSC POC: Paul Sullivan
Research Site(s): Pomerantzland

Mapping the sound speed structure of the sun's atmosphere

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Deploying Team Members: Vincenzo Di Martino . Wolfgang Finsterle . Cindy Giebink . Stuart M Jeffries . Allister Knox . Paolo Rapex

Research Objectives: This group studies the velocity and intensity of signals from the solar surface using magneto-optical filters tuned to the solar absorption lines at 589nm and 770nm, a small telescope, and digital cameras. These observations require uninterrupted viewing of the sun for many days through a "stable" atmosphere. These conditions are obtained by viewing the sun from a remote site well away from any heat sources or other disturbances of the atmosphere (e.g. airplane contrails, station activities). Depending on activity level at the station, the experiment will be located between 2 and 8 kilometers away from the station. To reduce local heat sources and to minimize the amount of heat escaping into the atmosphere from the instrument building at the remote site, the instrument building is buried under the ice 400 meters away from the generators.

Field Season Overview: A remote observing site will be constructed between two- and eight kilometers from South Pole Station. The exact distance will depend on the level of activity at the station, and the final decision will be made within a couple of days of arriving. This project includes close collaboration with the University of Rome for the building of the instrument, which provided more than 60% of the instrument components and construction. One of the team members is from the University of Rome and funded by the Italian Antarctic agency.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-200-O
Station: RV/IB Nathaniel B Palmer
Research Site(s): RV/IB NBP

Latitudinal Effects of UVR on bacterioplankton: BRIDE OF TABASCO science of opportunity cruise

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Field Season Overview: Research team members will board the RV/IB Nathaniel B. Palmer in Punta Arenas, Chile for the semi-annual transport of hazardous waste to the United States for disposal. During the 26-day trip, researchers will use several methods to collect water samples, including CTD casts, a submersible pump lowered from the starbord A-frame, and Go-Flo bottles deployed mannually. On-deck incubators will be used to conduct experiments and shipboard lab equipment and space will be used for analysis.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-295-O **NSF/OPP** EAR-99-03413
Station: McMurdo Station
RPSC POC: Karen Joyce
Research Site(s): McMurdo Station

University NAVSTAR Consortium (UNAVCO) GPS survey support

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Deploying Team Members: Bjorn L Johns . Charles W Kurnik . Shad R O' Neel

Research Objectives: UNAVCO provides year-round support for scientific applications of the Global Positioning System (GPS) to U.S. Antarctic Program, supported and managed by the National Science Foundation's Office of Polar Programs. This support includes pre-season planning, field support, and post-season follow-up, as well as development work for supporting new applications. UNAVCO maintains a "satellite" facility at McMurdo Station during the austral summer research season, providing a full range of support services, including geodetic GPS equipment, training, project planning, field support, technical consultation, data processing, and data archiving.

UNAVCO also operates a community differential GPS (DGPS) base station that covers McMurdo Sound and Taylor Valley, provides maintenance support to the MCM4 continuous GPS station as contractual support to the NASA GPS Global Network (GGN), and supports remote continuous GPS stations for scientific investigations.

Using GPS, vector baselines between receivers separated by 100 kilometers or more are routinely measured to within 1 centimeter (that is, 100 parts per billion). UNAVCO is also able to support researchers who are investigating global, regional, and local crustal motions where maximum accuracy (in the millimeter range) of baseline measurement is required. GPS measurements using portable equipment can be completed in a few hours or less. Such expediency lends itself to research applications in global plate tectonics, earthquake mechanics, volcano monitoring, and regional tectonics.

Field Season Overview: Each field season, the UNAVCO team manages the GPS equipment pool and provides technical support to research projects. Project team members will occasionally travel to field sites and assist researchers with GPS operations.

UNAVCO maintains the differential GPS (DGPS) system used in and around McMurdo Station and the Taylor Valley, as well as continuous GPS stations on Mt Erebus. Throughout the season, team members will work in Crary Lab testing, repairing, and staging GPS equipment.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-018-O

NSF/OPP 01-25475

Station: McMurdo Station

RPSC POC: Curt LaBombard

Research Site(s): Sea ice camp

Ontogeny of aerobic capacity, lipid metabolism, and elevated myoglobin concentrations in the skeletal muscles of Weddell seals

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Dr. Randall Davis
Texas A & M University
Dept. of Marine Biology

Deploying Team Members: Shane B Kanatous . Rebecca Watson

Research Objectives: What is the temporal development of aerobic capacity, lipid metabolism, and oxygen stores in the skeletal muscles of young Weddell seals, and which aspects of the cellular environment are important in the genetic regulation of myoglobin expression during maturation? This group will address this broad question during a 2-year study that will collaborate with Randall Davis' ongoing study (BO-017) of the diving and hunting behavior of free-ranging adult and subadult Weddell seals. Results from the previous collaboration characterized the enzymatic, ultrastructural, and vascular adaptations for diving that occur in the skeletal muscles of adult Weddell seals. This study builds on those results to investigate the ontogeny of these adaptations and the genetic control of their development.

The first objective is to characterize the ontogenetic changes in aerobic capacity, lipid metabolism, fiber type, and myoglobin concentration and distribution using enzymatic, immunohistochemical, and myoglobin assays in newborn, newly weaned, subadult, and adult seals. The second objective is to determine the molecular controls for changes in the concentration and distribution of myoglobin in skeletal muscles during maturation. Through subtractive hybridization and subsequent analysis, researchers will determine the differences in mRNA populations in the swimming muscles of the different age classes of Weddell seals. These techniques will allow researchers to identify the proteins and transcription factors that influence ontogenetic changes in myoglobin concentration. The results will increase our understanding of both the ontogeny and molecular mechanisms by which young seals acquire the physiological adaptations they need to become competent divers and marine predators.

In addition, this study will advance our knowledge of the molecular regulation of myoglobin in skeletal muscle, which has broader applications for human medicine. The collaboration with research on the diving and hunting behavior of Weddell seals will enhance the results of both studies, minimize the number of adult animals handled, share personnel, and reduce the need for additional logistical support.

Field Season Overview: Sharing a field camp with Randall Davis' group (BO-017-O), project team members will travel on snowmobiles and tracked vehicles to nautral cracks in the sea ice. Using a purse-seine net they will capture adult male and non-pregnant female Weddell seals and transport them to the field camp.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-204-O
NSF/OPP 95-Okeel
Station: Palmer Station
RPSC POC: Rob Edwards
Research Site(s): Palmer Station

A study of atmospheric oxygen variability in relation to annual to decadal variations in terrestrial and marine ecosystems

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Deploying Team Members: No Deployment

Research Objectives: Oxygen, the most abundant element on the Earth, comprises about a fifth of the atmosphere. But much of the Earth's oxygen resides in other chemical species (in water, rocks, and minerals) and, of course, in flora and fauna that recycle it (both directly and as carbon dioxide) through the processes of photosynthesis and respiration. Thus scientists are interested in measuring the concentration of molecular oxygen and carbon dioxide in air samples. This project includes a subset of sample collections being made at a series of baseline sites around the world.

These data should help to improve estimates of the processes whereby oxygen is cycled throughout the global ecosystem, specifically, through photosynthesis and atmospheric mixing rates. They improve predictions of the net exchange rates of carbon dioxide with biota, on land and in the oceans. An important part of the measurement program entails developing absolute standards for oxygen-in-air, to ensure stable long-term calibration. This group will also conduct surveys of the oxidative oxygen/carbon ratios of both terrestrial- and marine-based organic carbon, hoping to improve the quantitative basis for linking the oxygen and carbon dioxide geochemical cycles.

These results should help enhance understanding of the processes that regulate the buildup of carbon dioxide in the atmosphere and of the change processes -- especially climate change -- that regulate ecological functions on land and in the sea.

Field Season Overview: No project team members deploy to Antarctica this field season. The Palmer Station physician will collect bi-weekly air samples and return the air-tight flasks to the principal investigator's home institution for analysis.

Artists & Writers

Mr. Guy Guthridge
Program Manager

WO-221-O **NSF/OPP** (none)

Station: Palmer Station

RPSC POC: Elaine Hood

Research Site(s): Palmer Station vicinity

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terra incognita: anvers island and surrounding area

Mr. Scott M. Kelley
Groundfish, Inc.
quahog2001@hotmail.com

Deploying Team Members: Scott Kelley

Research Objectives: In the artists words, "even though i am an artist, not a scientist, i look at things in terms of scientific exploration. i simply want to observe and document as much as possible during my time on the peninsula, from flora to fauna, landscape to seascape, icebergs and glaciers. ultimately, they will all find their way into my work, either through painting or drawing, books or photographs."

Mr. Kelley's recent painting has featured meticulously crafted watercolors of the flotsam and jetsam of the U.S. Atlantic seaboard. He will apply this medium to the Antarctic, painting icebergs, rocks, fishes, and other found objects with the "ironic antiquity" that is characteristic of his Montauk work. The artist expects to produce one or more exhibitions and a catalog or a small book from his antarctic work.

Field Season Overview: Mr. Kelley will work at Palmer Station and vicinity, joining science teams at their field sites. He and the other artist on station at the same time, James Woodside (WO-223-O), will travel to and work at field locations together, as practicable.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-078-O

NSF/OPP NSF/OPP-DoD MOA

Station: McMurdo Station

RPSC POC: Doug Miller

Research Site(s): Dry Valleys, Mount Newall

AFTAC Dry Valley seismic project (Air Force Technical Applications Center)

Dr. Robert C. Kemerait
United States Air Force
AFTAC
kemerait@tt.aftac.gov

Deploying Team Members: William C Burk . Kevin L Filiatrault . Ralph C Himmelsbach . Jimmy L Jackson . Aaron J Jones . Douglas K Mac Donald . Alan M Yerington

Research Objectives: The Dry Valleys Seismic Project monitors regional and global seismicity. This station is an element in the Air Force Technical Applications Center (AFTAC) Southern Network (ASN). The network provides near real time data from nine locations within the southern hemisphere. The data is telemetered to the National Data Center in Florida and is available to the international scientific community.

Field Season Overview: The project team members will perform corrective maintenance and repairs on the seismic stations at the Vanda borehole site and on Mount Newall. Researchers will travel by helicopter from McMurdo Station to the Dry Valleys where they will establish field camps at Lake Vanda and Mt. Newall. A helicopter will bring fuel to the remote sites by slingload and team members will transfer it to the seismic stations using an electric pump. The team plans to replace the wind generator mast at Mount Newall, and service the diesel generator systems.

The team members will return to McMurdo Station where they will work with the support contractor's staff to re-route the data signal to the CTBT hub room in building 159.

The team leader will train the winter-over science technician in the operation of the seismic and remote power systems. Data from the stations will be collected year round and transmitted to the International Data Centre in Vienna.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-010-O

NSF/OPP 01-26319

Station: McMurdo Station

RPSC POC: Rob Robbins

Research Site(s): Cinder Cones, sea ice, Cape Armitage, Cape Evans, Cape Chocolate, Turtle Rock, New Harbor

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Community dynamics in a polar ecosystem: Benthic recovery from organic enrichment in the Antarctic

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Deploying Team Members: Aaron Carlisle . Kathleen Conlan . Stacy L Kim . Dan Malone . John S Oliver . Andrew R Thurber

Research Objectives: In 2002–2003, McMurdo Station, the U.S. base that houses over 1,100 people during the summer season, is installing a sewage treatment plant that will be online in 2003. The existing outfall is a large source of organic enrichment (135,150 liters per day of untreated sewage). The new plant will output a small fraction of this amount. The organically enriched outfall area and surrounding unperturbed areas have been well described. Detailed community descriptions of the epi- and infaunal community at the outfall location before effluent release are available and were collected over a long period (1988 to 1998), which minimizes the interannual variability.

This group will examine community responses in a polar soft-bottom subtidal system to test the generality of an already elucidated paradigm. Community recovery rates from iceberg scours and anchor ice have been described. These researchers hypothesize that recovery rates following cessation of organic input will be on the same scale as benthic community recovery from seasonal ice-mediated disturbances and as recovery rates in temperate systems. This research builds on a 10-year time series that follows benthic community degradation resulting from a sewage outfall. Sampling will span the implementation of sewage treatment. To test the generality of recovery patterns, the data will be incorporated in a meta-analysis of community recovery from organic disturbance in a variety of habitats. Experimental manipulations will compare the roles of burial and patch size. In addition, efforts will be directed at microbial biochemical response and diversity, in tandem with the recovery of the infaunal community.

The knowledge gained from this research can be applied to any high-organic loading in polar habitats. Significant anthropogenic inputs in high latitudes include pulp mills and increases in human occupation and visitation (gray water dumping from boats). Natural sources, including woody debris in river outputs and carcass-falls from the productive surface waters above, also present significant carbon input. In the McMurdo area, marine mammals and large fish are abundant and add fecal material to the system. Supply vessels dock in Winter Quarter’s Bay, and the number of tourist cruises is increasing. By using an integrated approach to evaluate the recovery of the microbial, infaunal, and epifaunal assemblages after a massive, 10-year carbon-loading perturbation, this study will further the understanding of anthropogenic impacts in polar environments.

Field Season Overview: Project team members will initiate a large scale experiment to study the effect of the installation of the new secondary sewage treatment plant. Smaller scale experiments on biodiversity, physical disturbance and patch dynamics will be conducted across McMurdo Sound, near Cape Armitage, and north of McMurdo Station.

Researchers will be diving to perform experiments and collect benthic samples. Support contractor personnel will drill holes and transport huts to the dive locations. Researchers will travel by tracked vehicle to diving locations at Cinder Cones and Cape Evans, by snowmobile to Cape Armitage and Winter Quarters Bay, and by helicopter to reach sites around New Harbor. The aquarium, darkroom and freezers in the Crary Lab will be used for sample processing.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-197-O **NSF/OPP** 02-24957 (SGER)

Station: McMurdo Station

RPSC POC: Steve Alexander

Research Site(s): Cape Crozier

Effects of B15 on breeding success of the Cape Crozier emperor penguin colony

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Dr. Paul Ponganis
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Center for Marine Biotechnology and Biomedicine

Deploying Team Members: Gerald L Kooyman . Paul J Ponganis

Research Objectives: This project will investigate the effects of the iceberg, B15, on the emperor penguin (Aptenodytes fosteri) population at Cape Crozier. The population of this southernmost of the emperor penguin colonies, although sometimes fluctuating radically, had grown steadily in past years, with as many as 1,200 chicks counted. This probably represented an adult population of 2,400 to 3,000 birds. However, in 2001, after B15 ground into the Cape Crozier area during the winter breeding period, no live emperor chicks were found. The colony had disappeared.

The goal of this project is to determine whether the colony will re-establish itself at Cape Crozier or relocate to a different site nearby. If the colony re-establishes at Cape Crozier, project team members will estimate the previous year's loss with a census of the chicks present this year. The destruction of the colony site by the iceberg in 2001 represents a natural experiment to examine the resilience of breeding emperor penguins to short-term disasters. Broader impacts of this study are related to the historical importance and worldwide interest in this colony, since it was the first emperor penguin colony discovered and has probably the longest census record of any penguin colony.

Field Season Overview: The arrival of iceberg B15 at Cape Crozier caused much ice movement and habitat destruction at the emperor penguin breeding site. The result was total failure of breeding success at the colony. This year researchers hope to determine how many birds have returned to breed at the colony, how many chicks are likely to fledge, and sea ice conditions at the breeding site. These data will help to assess the possible longterm effects of B15.

Researchers will be flown by helicopter to the hut at Cape Crozier. During that flight they will do a brief aerial survey to determine the location of the birds, and to obtain aerial photographs of the area. While at the Crozier hut they will conduct ground counts and habitat surveys.

If no birds return to Cape Crozier, researchers will make an aerial survey of Price Bay to determine if they have relocated the colony at a new site. If sea ice permits, an aerial and possibly a ground survey of the Beaufort Island colony will be conducted.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-081-O

NSF/OPP 98-14921
01-16577 (MRI)

Station: McMurdo Station
RPSC POC: Mike McClanahan
Research Site(s): Mt. Erebus

Mount Erebus Volcano Observatory: Gas emissions and seismic studies
Development of integrated seismic, geodetic and volcanic gas surveillance instrumentation for volcanic research

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Dr. Richard Aster
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Deploying Team Members: Richard C Aster . Beth A Bartel . Nelia W Dunbar . Richard P Esser . Pierre J Gauthier . Richard W Karsten . Philip R Kyle . William C Mcintosh . Sylvain Pichat . Mario C Ruiz . Ken W Sims

Research Objectives: Magmatism is one of the most fundamental dynamic processes of planetary interiors, yet knowledge of the time-dependent parameters of basalt petrogenesis (solid mantle upwelling rate, melting rate, melt transport rate, magma storage time, and magma recharge rate) is quite limited. Magmatic processes such as melting, fractional crystallization, and magma chamber replenishment can fractionate parent/daughter ratios of U-decay series isotopes and thus create isotopic disequilibrium. Because the half-lives of U-series isotopes are comparable to the time scales of these processes, measurement of this isotopic disequilibrium in volcanic gases and mineral separates provides constraints on the duration and rates of magmatic processes.

Mount Erebus on Ross Island is Antarctica's most active volcano and also the only one with a persistent convecting lake of molten, alkali-rich phonolitic magma in its summit crater. This makes Mount Erebus one of the few volcanoes on Earth with nearly continuous, small explosive activity (two to six Strombolian eruptions daily) and continuous internal earthquake (seismic) activity. As such, it provides the ideal natural laboratory to study certain phenomena, specifically how gas is given off by magma and the seismic activity that results from a convecting magma conduit.

The small Strombolian eruptions eject volcanic bombs, thus providing samples of the magma with large, well-formed crystals. These bombs, plus older radiometrically dated lava flows around the summit of Mount Erebus, provide samples that constitute a unique opportunity to understand the timing of fundamental magmatic and volcanologic processes.

Researchers intend to combine seismic studies and gas emission rate measurements in order to elucidate the nature and dynamics of the magmatic plumbing system, as well as eruptions and degassing from the lava lake. (The eruptions will be captured on video.) The gas studies will provide some of the first data available on carbon dioxide degassing from a highly alkalic magma system. They should also help evaluate how much lead from Mount Erebus (relative to lead released by marine aerosols) gets into the snow on the East Antarctic Ice Sheet and thus shed light on hypotheses about the anthropogenic origins of lead. Further goals of the gas studies are to

• Examine the role of Mount Erebus as a source of gas and aerosols for the antarctic environment

• Understand the role of volcanism as a source of carbon dioxide emissions into the atmosphere, especially for highly alkalic magma

• Understand the evolution of the main volatile substances (water vapor, carbon dioxide, total sulfur, fluorine, and chlorine) in the Mount Erebus magmatic system, as well as their role in the eruptive behavior of the mountain

• Correlate the nature of the gas emissions with the observed seismic activity.

For the seismic studies, project team members will install five integrated scientific instrument packages, all slightly different, depending on their location. All will include a broadband seismometer and dual-frequency global positioning system (GPS) units with 900 mega-Hertz spread spectrum transceivers to telemeter the data to McMurdo Station. Other equipment will include tiltmeters, infrasonics sensors, meteorological instruments (wind speed and directions, pressure and temperature), infrared radiometers (thermometers), and gas sensors. The packages will be battery powered and have solar panels and wind generators. Researchers will also use GPS geodetic measurements for deformation studies to monitor the movement of magma inside the volcano.

Using U-series isotopes will allow researchers to examine the time scales of

• Magma genesis and melt transport from the mantle

• Magma evolution and crystallization processes during magma storage in the crust, and

• Magma degassing and recharge rates into the erupting magma chamber.

This is the first time U-series isotopes have been used in an integrated fashion to examine both gases and the associated magma. Researchers hope to achieve a better understanding of the whole magmatic system, from magma formation by partial melting in the mantle through its evolution and finally to its degassing and open-system behavior in the lava lake.

The resulting data should enhance the collection of earthquakes that researchers are using in a computer model of the interior of the volcano, as well as provide a tool that scientists can use for conducting volcano surveillance, monitoring eruptions, and detecting subtle changes in the internal behavior of volcanoes. The broadband data will support a detailed study of the explosion mechanism, especially the very-long-period signals that are emitted. It should also help reveal temporal and spatial variability in earthquake mechanisms, which in turn might provide more insights into how variations in gas emissions could be implicated.

Field Season Overview: This event is a collaboration of two separately funded projects acting as an integrated team. Project team members will work closely with Ken Sims (GO-085-O) to maximize logistical resources. Researchers will focus on:

1. The gas emissions and seismic activity of Mt. Erebus.

2. The development of integrated seismic, geodetic and volcanic gas surveillance instrumentation.

Project team members will establish a camp at the Lower Erebus Hut and will use it as a base of operations for work on and around Mt. Erebus. With helicopter support they will install five integrated surveillance systems and inspect, repair and maintain the existing array of permanent seismic and GPS stations around the flank and summit of Mt. Erebus. Team members will measure carbon dioxide emission rates, profiling the gas plume by helicopter and using an on-board analyzer. Researchers will require daily helicopter support and snowmobiles for travel in the summit area.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-128-O

NSF/OPP 00-90545

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): Cusp Lab

A versatile electromagnetic waveform receiver for South Pole Station

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Dr. Allan Weatherwax
Siena College Physics

Deploying Team Members: James W Labelle . Shengyi Ye

Research Objectives: The Earth's aurora naturally emits a rich variety of radio waves at low, medium, and high frequencies (LM/MF/HF) which are signatures of the interaction between the auroral electron beam and the ionospheric plasma. Yet some of the mechanisms that generate plasma waves are not well understood. This project focuses on several types of signals detectable at ground level, including auroral hiss, which occurs primarily at very low frequencies but often extends into the LF/MF range, and auroral roar, a relatively narrow band emission generated near or at the second and third harmonics of the electron cyclotron frequency.

This group uses a versatile electromagnetic waveform receiver deployed at South Pole Station. Only recently has it been possible to conceive of an inexpensive, versatile receiver of this type for the South Pole. An antarctic location is essential for ground-based observations of LF auroral hiss because the broadcast bands usually found in the northern hemisphere are typically absent in Antarctica. Further, the absence of broadcast bands improves the effectiveness of automatic wave-detection algorithms.

Researchers can use the receiver to address many issues. For example, it has recently been discovered that auroral roar is sometimes modulated at frequencies between 7 and 11 Hertz, a phenomenon called flickering auroral roar. This receiver will enable researchers to discover how common flickering auroral roar is, the conditions under which it occurs, what the frequencies are, and how the amplitude and frequency vary over time.

Between 15 percent and 30 percent of auroral hiss events are not observable at very low frequencies. The receiver will determine whether LF auroral hiss consists exclusively of relatively unstructured broadband impulses or whether it sometimes displays a fine structure similar to that of auroral kilometric radiation and whistler mode waves in the same frequency range detected in the lower ionosphere. Project team members will also define and test auroral roar and auroral hiss mechanisms. Despite its extensive application for communications, the LF/MF/HF band has been relatively little investigated as a source of natural radio emissions detectable at ground level.

A complete knowledge of our geophysical environment requires understanding the physics of these emissions. Further, electron beam–plasma interactions analogous to the terrestrial aurora occur in many space physics and astrophysics applications. Often, the electromagnetic radiation emitted by these systems is our only source of knowledge about them. The local auroral plasma provides an opportunity to view some plasma radiation processes at close range.

Field Season Overview: A complete system upgrade is scheduled for the 2002-2003 austral summer. This includes a new electromagnetic waveform receiver and computer in the Cusp Lab at South Pole Station. Station science technicians will operate and maintain the equipment throughout the 2003 austral-winter.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-183-O

NSF/OPP 00-88136

Station: McMurdo Station

RPSC POC: Kirk Salveson

Research Site(s): Vida Lake

Aeolian processes in the McMurdo Dry Valleys, Antarctica

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Desert Research Institute
Earth & Ecosystem Sciences
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Deploying Team Members: Kurt C Cupp . John A Gillies . Nicholas Lancaster . William G Nickling

Research Objectives: This is an ongoing project. The group plans to continue measurements of shear stress partitioning on rocky surfaces, with emphasis on relations between rock cover and sand transport. They will deploy instruments to several sites in the eastern part of the Victoria Valley to measure wind profiles, drag on rocks, surface shear stress, and sand transport. They will also acquire low level digital aerial photographs of 2001-2002 study site and 2002-2003 sites for determination of roughness element distribution and geometry.

Field Season Overview: Project team members will travel by helicopter to Lake Fryxell in Taylor Valley where they will occupy the Lake Fryxell field camp. From the camp they will travel by helicopter to a series of study sites in the Taylor, Wright, and Victoria Valleys. At each site, they will establish temporary satellite camps, set up instruments, and take measurements. At the end of the field season, the project team members will return by helicopter to McMurdo Station with all their equipment.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-101-M/S

Station: McMurdo and South Pole Stations

RPSC POC: Jesse Alcorta

Research Site(s): McMurdo, South Pole

A continuation of magnetometer data acquisition at McMurdo and South Pole Stations

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Lucent Technologies
Bell Laboratories
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Dr. Carol Maclennan
Lucent Technologies

Deploying Team Members: No Deployment

Research Objectives: Magnetometers installed at selected sites in polar regions continue to provide measurements of the magnitude and direction of variations in the Earth's magnetic field in the frequency range from 0 to about 0.1 Hertz.

This project focuses on measurements of these variations using magnetometers installed at conjugate sites in the northern and southern hemispheres in Canada and Antarctica. The system collects data on the coupling of energy from the interplanetary medium into the dayside magnetosphere, including the magnetospheric cusp region, as well as on the causes and propagation of low-frequency hydromagnetic waves in the magnetosphere. Because of unique climatic conditions at the South Pole, optical measurements can be correlated with particle precipitation measurements and with hydromagnetic-wave phenomena recorded by the magnetometer.

Field Season Overview: The support contractor's science technicians will work year-round in support of this project's magnetometer data-collection systems installed at McMurdo's Arrival Heights Facility and at South Pole Station's the Cusp Lab. The science technicians will perform daily checks of the equipment operation, maintain a log of panel meter readings, and monitor the magnetometers to ensure continuous operation. The University of Maryland's data recording systems acquire data at both locations.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-136-O **NSF/OPP** 01-32576

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

Measurement and analysis of extremely low frequency (ELF) waves at South Pole Station

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Deploying Team Members: No Deployment

Research Objectives: This project aims to detect and record magnetic field fluctuations in the extremely-low-frequency (ELF) range at South Pole Station, specifically auroral ion cyclotron waves, which have been well correlated with flickering aurora. Theory predicts that these waves modulate precipitating electron fluxes, thereby causing the flickering in luminosity emissions. Substantial evidence now supports this theory, although the excitation mechanism responsible for the ion cyclotron waves is somewhat uncertain. Perhaps the most well-developed theory suggests that the waves result from an electron-beam instability. In any case, the frequency of the flickering or, equivalently, the frequency of the ground-based observations of ion cyclotron waves can be used to infer the altitude of the excitation mechanism, since the wave frequency depends on the strength of the background magnetic field, which is a known quantity. As such, the information that will be acquired can be used to test models of auroral acceleration mechanisms, as well as study dispersive ELF waves, a type of wave that has been reported in the literature only a few times, but one that may provide important information on substorm onset or, perhaps, the boundaries of open and closed magnetic fields.

A first step is to identify the wave mode and to determine the location and geomagnetic conditions under which these waves can be observed. The equipment used to make these observations consists of an induction coil magnetometer and data acquisition system. The induction coil is a commercially available device, one that was originally designed for geophysical exploration. Data will be returned to Dartmouth College for analysis.

Field Season Overview: No project team members will deploy this field season. They will design and build the required instrumentation and deploy it to the South Pole in the 2003-2004 austral summer.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-152-O

NSF/OPP 00-88143

Station: RV/IB Nathaniel B Palmer
RPSC POC: Jim Holik
Research Site(s): RV/IB NBP

Antarctic cretaceous-cenozoic climate, glaciation, and tectonics: Site surveys for drilling from the edge of the Ross Ice Shelf

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Dr. Doug Wilson
University of California, Santa Barbara

Deploying Team Members:

Louis R Bartek . Tom M Carpenter . Emily W Crawford . Robert C Decesari . John Diebold . Bruce P Luyendyk . Jared P Marske . Zenon R Mateo . Robin S Matoza . Heather N Ramsey . Joan Rosenburg . Christopher C Sorlien . Kathryn D Sowder . Michelle E Thibault . Karen N Vasko . Jeffrey D Warren . Brandon J Wood

Research Objectives: Many of the outstanding problems concerning the evolution of the East and West Antarctic Ice Sheets, antarctic climate, global sea level, and the tectonic history of the West Antarctic Rift System will be solved by drilling into the seafloor of the Ross Sea.

Climate data for Cretaceous and Early Cenozoic time are lacking for this sector of Antarctica. Climate questions include, Was there any ice in Late Cretaceous time? What was the antarctic climate during the Paleocene-Eocene global warming? When was the Cenozoic onset of antarctic glaciation? When did glaciers reach the coast and when did they advance out onto the margin? Was the Ross Sea shelf non-marine in Late Cretaceous time? When did it become marine?

Tectonic questions include, What was the timing of the Cretaceous extension in the Ross Sea rift? Where was it located? What is the basement composition and structure? Where are the time and space limits of the effects of Adare Trough spreading?

This group will conduct sites surveys for drilling from the Ross Ice Shelf into the seafloor beneath it. Another drilling objective is to sample and date the sedimentary section bounding the mapped RSU6 unconformity in the Eastern Basin and Central Trough to resolve questions about its age and regional extent. Deep Sea Drilling Project Leg 28 completed sampling at four drill sites in the early 1970's but had low recovery and did not sample the Early Cenozoic. Other drilling has been restricted to the McMurdo Sound area of the western Ross Sea and results can be correlated into the Victoria Land Basin but not eastward across basement highs. Further, Early Cenozoic and Cretaceous rocks have not been sampled.

Field Season Overview: The researchers will collect swath bathymetry, gravity, magnetic, sub-bottom profile, high-resolution and deep-penetration seismic profiling data. Sediment cores will be collected to obtain samples for geotechnical properties, to study sub-ice shelf modern sedimentary processes, and to study locations where deeper strata is exposed.

The survey will include long profiles and detailed grids over potential Ocean Drilling Project (ODP) drill sites. Survey lines will be tied to existing geophysical profiles and deep sea drilling project's (DSDP) 270 sites.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-L **NSF/OPP** 98-10219

Station: McMurdo Station

Research Site(s): Wright Valley, Lake Hoare, Taylor Valley, CSEC

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.

Dr. W. Berry Lyons
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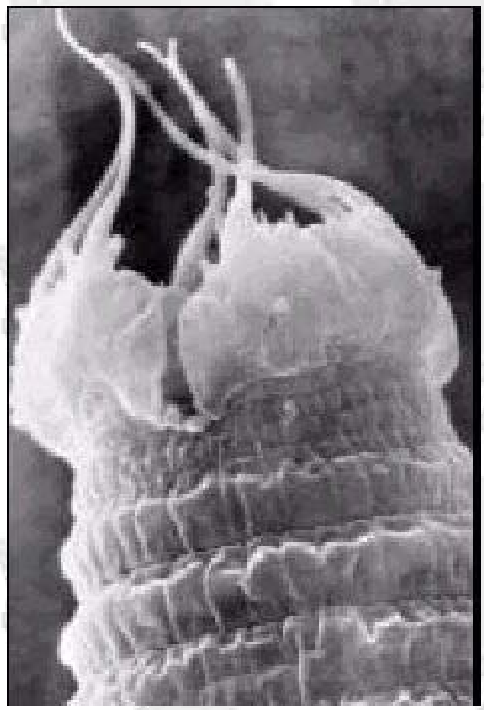

Deploying Team Members: Timothy O Fitzgibbon . Jill Gudding . William B Lyons . Daryl L Moorhead . Kathleen A Welch

Research Objectives: Chemistry of streams, lakes, and glaciers component of McMurdo LTER. The group is responsible for monitoring the inorganic geochemistry of waters collected from glaciers, streams and lakes of the dry valleys. This year the group will address questions about the concentrations and fluxes of phosphorus in various components of the ecosystem. They will coordinate with another project of the principal investigator (GO-074-O) to examine the nature of chemical weathering in the Dry Valleys.

Field Season Overview: This field season, researchers plan to monitor the inorganic chemistry of water collected from glaciers, streams, and lakes of the Dry Valleys, in collaboration with other LTER groups involved in lake and stream sampling. This group will specifically address questions about the concentrations and fluxes of phosphorus in various components of the ecosystem.

Team members will travel by helicopter and on foot to sites in the Dry Valleys to collect water, rock, sediment, snow and ice samples. The chemical analysis of lake, stream and glacier samples will be done at Crary Lab.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-074-O

NSF/OPP 00-87915

Station: McMurdo Station
RPSC POC: Ken Doggett
Research Site(s): Taylor Valley

Chemical weathering in Taylor Valley streams: Sources, mechanisms and global implications

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Deploying Team Members: Peter Cable . Carolyn B Dowling

Research Objectives: Geochemists study the process of "chemical weathering" whereby rocks and minerals are transformed into new, fairly stable chemical combinations, primarily by such chemical reactions as oxidation, hydrolysis, ion exchange and solution. Silicate hydrolysis is another such process, which may have an impact on the global climate by consuming carbon dioxide (CO2), an important greenhouse gas. Generally scientists have concentrated on more temperate climates to examine chemical weathering, because two of its most significant drivers are warmth and humidity.

However, recent data suggests that chemical weathering can and does occur in polar desert streams. At around 78°S, a number of ephemeral streams in the Taylor Valley that are associated with dry-based glaciers flow for four to ten weeks each year. Solutes produced from chemical weathering such as major cations, minor elements (for example, rubidium, cesium, lithium, strontium, and barium), bicarbonate, and dissolved reactive silica, as well as isotopes (87Sr/86Sr) have been found here. Although the mechanism/process of weathering is unknown, this project's researchers hypothesize that the high chemical weathering rates that have been computed derive either from the high coincidence of freezing/thawing cycles and/or the unusual hydrologic behavior of the hyporheic zone in these streams.

Building on the initial work of the McMurdo Dry Valleys Long Term Ecological Research team and others, researchers hope to better establish weathering rates and weathering mechanisms by examining the cryogenic processes whereby physical weathering may influence chemical weathering. To establish what materials are being weathered, project team members will analyze the suspended matter (in streams from the Lake Bonney basin in Taylor Valley and the Onyx Valley in Wright Valley) for their bulk chemistry and then compare these data to rock types in the valleys. To better ascertain solute sources, they will focus on uranium series geochemistry. Using major rock types from the Taylor and Wright valleys, they will also conduct laboratory experiments to establish how microfracturing from freeze-thaw cycles may affect chemical weathering. All of the data will be used to draw analogies to historic weathering regimes on Earth during colder, drier, climatic eras.

Field Season Overview: Project team members will be based at the Lake Bonney field camp. They will travel by helicopter to outlying sampling areas where they will collect water, sediment, suspended load samples and rocks. Water samples will be processed in laboratories at Lake Hoare and Lake Bonney as well as at Crary Lab. Specimens will be transported back to the U.S. for further study.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-006-O **NSF/OPP** 01-30398

Station: McMurdo Station
RPSC POC: Rob Robbins
Research Site(s): Cinder Cones, Cape Evans, Cape Armitage, New Harbor, Crary Lab

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Energetics of protein metabolism during development of Antarctic echinoderms

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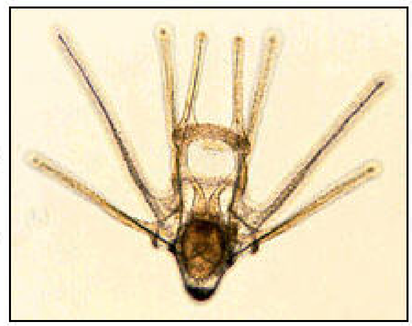
In its early developmental stage, an echinoderm larva is the model of biological efficiency. This stage of growth is exhibited by the type of Antarctic sea urchin discussed here. Photo by Michael Berger.



Deploying Team Members: David W Ginsburg . Allison J Green . Amanda L Haag . Donal T Manahan . Robert E Maxson . Douglas A Pace . Matt Winkler

Research Objectives: Larval forms are dominant in the life history strategies of invertebrates in marine environments. In Antarctica, energy budget calculations have shown that larval stages of echinoderms have the capacity to survive for years without food. This has led to the speculation that mechanisms of energy metabolism are more efficient in these larval forms and that this enhanced efficiency might be unique to life in extreme cold.

Embryos and larvae of an antarctic sea urchin have high rates of protein synthesis while maintaining low rates of metabolism. The cost of protein synthesis in this antarctic sea urchin is 1/25th that reported for other animals. This is the lowest cost (highest efficiency) for protein synthesis ever reported and has important implications for the physiology of animal growth and development in cold environments. This project will investigate this unique biochemical efficiency in detail.

This experimental plan has three major objectives:

• Test the generality of the low cost of protein synthesis in antarctic sea urchin larvae by measuring metabolism and protein synthesis during development of other antarctic echinoderm species

• Directly test the hypothesis that a high rate of protein synthesis with low metabolic cost means that growth efficiencies will be high in such organisms,

• Explain in specific molecular terms the unique high efficiency of protein synthesis in antarctic sea urchin embryos by studying each of the component processes of protein synthesis.

These measurements will be supplemented with measurements based on selected individual proteins. At the subcellular level, rates of ATP consumption during protein synthesis will be measured in cell-free translation systems of sea urchin embryos. The combination of these quantitative analyses will enable researchers to pinpoint those aspects of protein metabolism that result in such extremely high-energy efficiencies.

Understanding metabolic efficiency in polar organisms will help resolve questions about temperature compensation and adaptations to food limitation in polar regions. This approach emphasizes the cellular and subcellular levels of biological analysis in order to understand the relationship between development, growth, metabolic rate, and rates and costs of protein synthesis in these organisms. This project will test the hypothesis that there is a “new” biochemistry for protein synthesis in these organisms.

Field Season Overview: Project team members will dive to perform experiments and collect benthic samples. Support contractor personnel will drill holes and transport huts to dive locations. Researchers will travel by tracked vehicle to diving locations at Cinder Cones, Cape Evans, and Cape Armitage, and by helicopter to sites around New Harbor. The aquarium, darkroom and freezers in the Crary Lab will be used for sample processing.

2002-2003 Science Planning Summary

Geology & Geophysics	Dr. Scott Borg Program Manager

GO-054-A
NSF/OPP 98-11877
Station: McMurdo Station
RPSC POC: Karla College
Research Site(s): Dry Valleys

Response of the East Antarctic Ice Sheet to middle miocene global change

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Dr. Huiming Bao
Louisiana State University, Baton Rouge

Deploying Team Members: Huiming Bao . Sarah E Burns . James W Head . Emily L Klingler . Adam R Lewis . David R Marchant . Helen Margerison . Greg Michalski . Stephanie G Thomas

Research Objectives: Marine oxygen-isotope records, which register changes in ocean-water temperatures and global ice budget, show a major and permanent shift about 14 million years ago. Previously, this shift was thought to be linked to three geologic events, (1) the build-up of glacier ice in East Antarctica, (2) the development of a polar-style ice sheet in Antarctica, or (3) the initiation of the modern mode of ocean circulation off Antarctica (dominated by high-latitude deep water sources and strong meridian thermal gradients).

This project is designed to determine Antarctica 's role in this fundamental global climate shift. The group addresses the question of climate change and ice-sheet dynamics by examining Miocene-aged till sheets, lacustrine deposits, and moraines in the Dry Valleys region of southern

Victoria Land. The mapped distribution of these deposits provides information on the areal extent of east antarctic ice. The textural characteristics of these deposits sheds light on climate conditions that prevailed during and after sediment deposition. Argon 40/39 analyses of ashfall deposits interbedded with these sediments, along with cosmogenic He-3, Be-10, and Al-26 analyses of surface boulders on moraines, will provide chronologic control.

Field Season Overview: Nine team members will participate in two collaborative projects with combined logistical support:

- Dr. David Marchant (GO-054-A)

- Dr. Huiming Bao (GO-051-O)

Project team members will erect camps in the Olympus and Asgard Ranges. With helicopter support, researchers will map moraines and collect soil samples. Soil excavations will be filled in and the desert pavement replaced, a technique that allows for rapid surface recovery. Researchers will also collect volcanic ash in the McKelvey Valley region and measure ancient sub-glacial meltwater channels at the head of Wright Valley.

Supported by the University NAVSTAR Consortium (UNAVCO) and support contractor personnel, two team members will acquire high-precision elevation data for up to 50 sites within the western Dry Valleys region. The data will be used to produce high-resolution, one-meter contour maps of selected study areas and to provide control for analyses of cosmogenic data. Rock and soil samples will be returned to the investigators’ home institutions for analyses.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-056-O
NSF/OPP 98-14332

Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Dry Valleys

The ferrar magmatic mush column system, Dry Valleys, Antarctica

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Morton K. Blaustein Department of Earth and Planetary Sciences
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Deploying Team Members: Amanda D Charrier . Sarah J Fowler . Taber G Hersum . Bruce D Marsh . Michael Weiss . Karina Zavala

Research Objectives: Over billions of years the Earth's geologic processes have produced a wide diversity of rock types that have given rise to the fundamental surface features: Continents and ocean basins. The details of these physical and chemical processes remain largely undiscovered. Although present day volcanism exemplifies the general process of differentiation through the variety of lava expelled, it is not clear how volcanic eruptions relate to the prolonged, detailed magmatic processes that are responsible for the final result. Solidified bodies of magma (called plutons), once deeply buried and now exposed through erosion, furnish some evidence, but often the spatial context of these plutons within the magmatic-volcanic system is not clear. By studying a group of magmatic rocks displaying these processes, researchers hope to help solve this fundamental question. These rocks, which expose the fundamental relationship of plutonism to volcanism, may be an important key to understanding planetary magmatism in the most general terms.

The Ferrar magmatic system in the McMurdo Dry Valleys (Ferrar-DV) exemplifies the emerging global paradigm of a stack of magmatic sheets or sills connected below to a deep-seated magmatic source and above to a volcanic center. The world's major magmatic systems tend to exhibit this same style, but only the Ferrar-DV clearly reveals the critical physical and chemical connections between the deep, mush-dominated system and near-surface, pre-eruptive sill system.

The objective of this project is to ascertain the full physical and chemical nature of the Ferrar-DV magmatic system. The major goals are:

-To delineate its vertical and horizontal extent

-To understand the dynamics of its establishment

-To understand the mechanics of formation of the Dais layered intrusion

-To produce a map of Ferrar rocks throughout the Dry Valleys

-To produce a 3-D model of the orthopyroxene tongue and feeder system. Researchers will also attempt to elucidate a rarely seen transition between plutonic and volcanic systems, which may have implications fundamental to planetary magmatism.

Field Season Overview: Team members will travel by helicopter from McMurdo Station to Bull Pass and establish a base camp from which the fieldwork will be staged. Researchers will then travel by helicopter to scout suitable locations for groundwork and take aerial photographs. From the selected locations, they will travel on foot, mapping locations of rocks and collecting samples throughout the magmatic bodies with the goal of fully characterizing them in terms of chemical properties and crystal content.

The researchers will return to McMurdo Station by where they will prepare the rock samples for return to the home institution.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BP-021-L
NSF/OPP 02-17282

Station: RV Laurence M Gould
RPSC POC: Karl Newyear
Research Site(s): Anvers Island vicinity

Long Term Environmental Research (LTER): Climate migration, ecological response and teleconnections in an ice-dominated environment

Dr. Douglas G. Martinson

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Research Objectives: The modeling component of the Long Term Ecological Research (LTER) project focuses on temperature and salinity profiles of the water column at each standard station in the study areas. The models will also include weather and navigational data such as wind speed and direction, air temperature and humidity at east station site, as well as latitude and longitude data. Data from shipboard ADCP is also used for interpretation and checking of geostrophic calculations.

Field Season Overview: Fieldwork for this LTER component occurs aboard the RV Laurence M. Gould. With assistance from shipboard technicians, project team members will deploy SBE 911+ dual-sensor equipped CTD (conductivity, temperature, depth probe) XBTs (expendable bathythermographs). They will use the onboard Autosal and Portasal to determine salinity of water samples. The vessel's continuously-operating data acquisition system will capture meteorological and navigational data.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-153-A **NSF/OPP** 97-25057
Station: McMurdo Station
Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: Science management for the United States component of the International Trans Antarctic Expedition

Dr. Paul A. Mayewski

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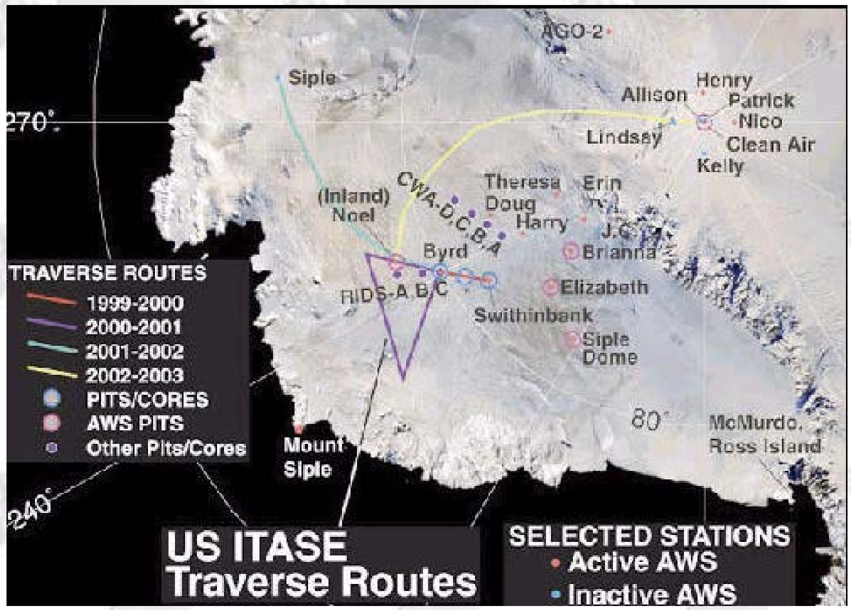

Deploying Team Members: Steven A Arcone . Daniel Dixon . Markus M Frey . Gordon S Hamilton . Susan D Kaspari . James G Laatsch . Paul A Mayewski . David Schneider . Vandy B Spikes . Leigh A Stearns . Eric Stieg . Brian Welch . Mark A Wumkes . Elizabeth F Youngman . Joseph R McConnell

Research Objectives: Formulated in 1990, the International Trans Antarctic Scientific Expedition (ITASE) aims to describe and understand environmental change in Antarctica over the last 200 years. ITASE objectives have been adopted as a key science initiative by the International Geosphere-Biosphere Program (IGBP) and the Scientific Committee on Antarctic Research (SCAR). The 200-year period was chosen because it covers the onset of major anthropogenic involvement in the atmosphere and the end of the Little Ice Age.

U.S. involvement in ITASE is consistent with the objectives established in NSF's Supplemental Environmental Impact Statement for the United States Antarctic Program (SEIPS, 1990), ITASE will provide an environmental framework from which to assess change. Further, the aims of ITASE closely parallel the objectives of NSF's Global Change Research Program, which emphasizes the need for the collection of paleoclimate records, understanding ocean-atmosphere-land-ice interactions, and scaling of dynamic behavior and biogeochemical cycling.

Spanning field seasons from 1997 to 2007, US ITASE focuses on West Antarctica -- a site of major US glaciological activity for more than a decade. As a component of WAIS (West Antarctic Ice Sheet Initiative), the US ITASE effort entails a four-phase approach:

1. Meteorological modeling and remote sensing will be used to plan sampling strategies conducive to the major objectives of US ITASE,

2. Ground-based sampling (ice cores, radar and surface sampling),

3. Continued monitoring at key sites (meteorology and ice dynamics), and

4. Interpretation and modeling.

In each of four research corridors, ground-based sampling techniques are used to collect 200-year-long ice cores at 100 kilometer intervals. Complementary studies in meteorology, remote sensing, and surface geophysics are integrated with the coring program. These multi- disciplinary studies are taking over several years and provide another level of coordination and collaboration among disparate projects that are already planned or underway in West Antarctica. US ITASE is intended to act as a scientific glue for these projects.

U.S. ITASE provides an important spatial perspective for the shared research goals of a variety of research programs funded by the NSF, NASA and NOAA. By the integration of US ITASE with the ITASE activities of other countries, major contributions will be made to our understanding of Antarctica's role in global change.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-153-B **NSF/OPP** 98-11857

Station: McMurdo Station

Research Site(s): Traverse from Byrd Surface Camp to South Pole

U.S. ITASE: Glaciochemistry

Dr. Paul A. Mayewski
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Institute for Quaternary and Climate Studies
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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: Among the research targets for scientists in the U.S. ITASE is the impact of anthropogenic activities on the climate and atmospheric chemistry of West Antarctica and the variations in biogeochemical cycling of sulfur and nitrogen compounds over the last 200 years.

Begun during the 1999-2000 austral summer, this five-year project focuses on glaciochemical analyses of the major anions and cations to be found in shallow and intermediate depth ice cores collected on the U.S. ITASE traverses. The ionic composition of polar ice cores provides one of the basic stratigraphic tools for relative dating. These data can also be used to document changes in chemical-species source emissions, which in turn facilitate mapping and characterization of the major atmospheric circulation systems affecting the West Antarctic Ice Sheet.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by

Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-323-O **NSF/OPP** 00-87776
Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Traverse from Byrd Surface Camp to South Pole

U.S. ITASE: Deposition of the HFC degradation product trifluoroacetate in antarctic snow and ice

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: Pursuant to the 1987 Montreal Protocol and the 1995 Clean Air Act in the United States, the threat to global ozone posed by migration into the atmosphere of chlorofluorocarbons (CFC) has led to the release into the biosphere of some worrisome substitutes. One of these, trifluoroacetate (TFA), is a highly persistent, atmospheric degradation product of the halogenated ethane derivatives (HCFC, HFC).

As this class of chemicals is now in widespread industrial use, there is growing concern that TFA will accumulate in aquatic ecosystems. Extant data on the pre-industrial (background, or baseline) concentration of TFA in meteoric and surface waters, including antarctic ice, are ambiguous. Thus the impact of anthropogenic TFA on these background concentrations is hard to specify. Ice core records, however, can provide a useful proxy for background and thus enable models to be developed for anthropogenic TFA deposition.

Our primary objective is to use ice cores and snow pits at South Pole to develop a record of TFA deposition for the last millennium, focused especially on the past 20 years. This pre-industrial to present record of TFA in near-surface snow and ice at South Pole and in West Antarctica will be unique. It should elucidate the origin, transport, and fate of this contaminant over Antarctica and - possibly - the globe. More generally, it enhances the context for assessing potential impacts on antarctic ecosystems from the natural and anthropogenic sources, by providing vital data on the regional and long-range movement, and the eventual fate, of contaminants.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-M **NSF/OPP** 98-10219

Station: McMurdo Station

Research Site(s): Taylor Valley, Lake Miers, Wright Valley

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.

Dr. Diane M. McKnight
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Deploying Team Members: Jenny Baeseman . Karen Cozzetto . Louise T Huffman . Diane Mcknight . Peter A Spatz . Paul L Turner . Erin C Van Matre

Research Objectives: Flow, sediment transport, and productivity of streams component of McMurdo LTER. The researchers plan to monitor the flow, sediment transport, and productivity of glacial melt streams in the McMurdo Dry Valleys.

Field Season Overview: Team members will maintain the current network of 19 stream gauges. High flows from the previous season damaged some of the gauge structures, and early season efforts will ensure the continued viability of these structures. Previously established stream algal transects throughout Taylor Valley will be sampled and surveyed this season. Sediment size distribution analysis will be carried out in response to last seasons high flows.

The group will also collect water quality samples, make hydrologic measurements, and install telemetry equipment at some of the stream gauges.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-185-O **NSF/OPP** 99-80434

Station: McMurdo Station

RPSC POC: Kirk Salveson

Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: The physical properties of the U.S. ITASE ice cores

Dr. Debra Meese
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Deploying Team Members: No Deployment

Research Objectives: The objective of this project is to examine the visual stratigraphy, physical, and structural properties of the U.S. ITASE ice cores. First, the group will examine visual stratigraphy to delineate the annual layer structure for dating purposes and to determine to as great a depth as possible, accumulation variability over the full length of a stratigraphically dated core. Wind crusts and melt layers will also be identified in each core.

Second, researchers will measure and analyze depth-density profiles. The rate of snow and firn densification depends on the rate at which the snow is deposited and the in-situ snow temperature. These data will be used to derive average snow accumulation rates for the sites where annual layer structure is difficult to decipher or where stratigraphic analysis fails altogether.

Third, they will measure the mean crystal size over the full length of a core. Since crystal growth is strongly temperature-dependent, measurements of ITASE cores will help bridge a significant data gap that exists in the mean annual temperature range, -31 to –50 degrees Centigrade. Crystal size data can also be used in conjunction with ice loads based on density profile measurements to extract mean accumulation rates for these sites where stratigraphic dating of cores proves difficult or impossible. This is likely to occur at the lowest accumulation/lowest temperature sites along the ITASE traverse routes.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-104-O **NSF/OPP** 98-18086
Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): Aurora Lab in Skylab Building

Antarctic Auroral Imaging

Dr. Steven Mende
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Deploying Team Members: No Deployment

Research Objectives: Auroras occur when particles from the magnetosphere -- the magnetic field surrounding the earth -- precipitate into the atmosphere. Amundsen-Scott South Pole Station is uniquely situated to observe aurora using optical methods because the darkness of polar winter permits continuous monitoring. By observing the dynamics and the morphology of the aurora, scientists get a reliable glimpse into the dynamics of the magnetosphere.

This project will deploy an intensified optical, all-sky imager (operating in two parallel wavelength channels, 4,278 and 6,300 Angstroms) to record digital and video images of auroras. These wavelength bands enable discrimination between more- and less-energetic electron auroras and other precipitation. The South Pole Station observations of the polar cap and cleft regions entail measuring auroral-precipitation patterns and then interpreting the results in terms of the coordinated observations of magnetic radio-wave absorption images as well as high-frequency coherent-scatter radar measurements.

Researchers expect this work to provide insight into the sources and energization mechanisms of auroral particles in the magnetosphere, as well as other forms of energy inputs into the high-latitude atmosphere.

Field Season Overview: No project team members will deploy to Antarctica this season. The support contractor's science technicians will maintain and operate the equipment.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AA-130-O
NSF/OPP 99-80474
Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

AMANDA 2000 (Antarctic Muon And Neutrino Detector Array)

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Dr. Albrecht Karle

University of Wisconsin, Madison
Department of Physics

Deploying Team Members:

Steven W Barwick . Heinz Becker-Karl . Elisa Bernardini . David Besson . Thomas T Burgess . Jodi A Cooley . Douglas Cowen . Anna K Davour . Carlos P De Los Heros . Paolo Desiati . Jessica M Drees . Thomas H Feser . Olav N Franzen . Raghunath Ganugapati . Tonio Hauschildt . Philippe Herquet . Gary C Hill . Brennan J Hughey . Per Olof Hulth . Klas G Hultqvist . Stephan Hundertmark . Ilya V Kravchenko . Kyler W Kuehn . Holger Leich . James M Madsen . Jackie Meyer . Joshua E Meyers . Yulia Minaeva . Robert M Morse . Eric

Muhs . Rolf Nahnhauer . Jiwoo Nam . Peter Niessen . Mathieu A Ribordy . Steffen Richter . Darryn A Schneider . Robert K Schwarz . Andrea Silvestri . Michael Solarz . Christian Spiering . Peter Steffen . Karl H Sulanke . Jennifer A Thomas . Wolfgang Wagner . Christin Wiedemann . Henrike Wissing . Kurt W Woschnagg

Research Objectives: Neutrinos are elementary particles, with no electrical charge, and very little mass. They are very penetrating, interacting rarely with other particles. Low energy neutrinos have been detected from the sun and from Supernova 1987a in the Large Magellanic Cloud -- to date the only sources of extra-terrestrial neutrinos. The primary goal of the AMANDA experiment is to detect the expected sources of high energy neutrinos from cosmic objects such as active galaxies, pulsars, neutron stars, blazars, and gamma-ray bursts. If the present understanding of the acceleration mechanisms in these objects are correct, gamma-ray bursts should be copious emitters of neutrinos.

AMANDA is the largest detector of neutrinos in the world. Over the last five seasons, the project has drilled an array of holes in the ice 1 to 2 kilometers deep and installed over 600 photomultiplier tubes with "strings" of instrument suspended inside. The ice at South Pole is so clear that the tubes can detect Cherenkov radiation from several hundred meters away. Cherenkov radiation, visible as a blue glow, is emitted by collisions of high-energy neutrinos with ice or rock.

There are currently 26 strings in the ice, each hard-wired to computers in the Martin A. Pomerantz Observatory (MAPO) facility. The computers analyze the gigabytes of collected data to determine true neutrino events.

Only in recent years has it become technically possible to build such large neutrino detectors. As one of the first of this new generation, AMANDA promises to make seminal contributions to the new field of high energy neutrino astronomy.

Field Season Overview: No drilling will take place this season. The project team will perform routine maintenance and calibration on the existing instrument strings. Each string is hard-wired to computers in the Martin A. Pomerantz Observatory (MAPO) for data collection and analysis to identify true neutrino events.

Two members of the research team will remain at South Pole Station during the 2003 austral winter to ensure smooth detector operation and data transmission to the participating institutions.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-052-M **NSF/OPP** 02-33246

Station: McMurdo and Palmer Stations

RPSC POC: Kelly Brunt

Research Site(s): Arrival Heights, Beacon Valley, TAMDEF GPS ARGO stations

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Antarctic mapping, geodesy, geospatial data, satellite image mapping and Antarctic Resource Center management

Mr. Jerry L. Mullins
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Geographic Sciences
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Dr. Larry Hothem
United States Geological Survey

Dr. Cheryl Hallam
United States Geological Survey

Deploying Team Members: Cheryl A Hallam . Larry D Hothem . Jerry L Mullins . Richard Sanchez . Herbert M Thompson

Research Objectives: Geodetic surveying, aerial photography, remote sensing (principally using several varieties of satellite imagery), and mapping are all activities necessary for the successful operation of a multifaceted scientific and exploration effort in Antarctica. The U.S. Geological Survey provides these support activities to the U.S. Antarctic Research Program.

Year-round data acquisition, cataloging, and data dissemination activities will continue in the U.S. Antarctic Resource Center for geospatial information. Field surveys will be conducted in support of specific research projects, and as part of a continuing program to collect the ground-control data necessary to transform existing geodetic data to an earth-centered system suitable for future satellite mapping programs.

LandSat data will be collected as part of satellite image mapping activities. This will permit continued publication of additional 1:50,000 scale topographic maps in the McMurdo Dry Valleys region. Such topographic studies provide a uniform base map on which to ensure that scientific information (from geology, glaciology, biology and other areas) is spatially accurate. These, as well as the satellite image maps, are used by scientists to plan and execute future research work. Spatially-referenced, digital cartographic data will be produced in tandem with the published maps.

In the austral summer of 2001-2002, this group will collaborate with NASA's Airborne Topographic Mapper Program to collect very high-resolution elevation data in portions of the McMurdo Dry Valleys and vicinity. The detailed land surface characterizations will be tested for feature recognition in the Beacon Valley, glacier studies in the Taylor Valley, and geologic applications in the Mt. Discovery area. The data will be tested for positional accuracy and resampled to provide regularly spaced observations for use in models and science. The USGS team will work with selected scientists to develop elevation data at resolutions that best serve their research needs. The data will then be used to develop elevation models at a variety of resolutions.

Very high-resolution data also will be collected for use by the ICESat (Ice, Cloud, and Land Elevation Satellite) research community to calibrate their 70-meter elevation data in Antarctica. The McMurdo Dry Valleys comprise a primary site for calibration and validation of NASA's ICESat satellite, scheduled for launch in December 2001. The primary sensor on ICESat is a laser altimeter, designed to measure the surface elevation very precisely, within the 70-meter footprint of the laser. Because the altimeter will be operated with off-nadir pointing, it is equally important to calibrate for mounting angle as well as for range. A calibration site for such a sensor requires precise knowledge of local topography, which must be a stable, snow-free surface region with minimal vegetation. Angle calibration is also enhanced if you have variable surface slopes of moderately large amplitude (10-20 degrees). With accurately measured surface elevations, the Dry Valleys provide a nearly ideal calibration site for ICESat. Furthermore, the Dry Valleys are in the region of the maximum altitude for the orbit of ICESat, allowing measurement errors to be detected through comparisons with measurements from other parts of the world. No other site in the world can provide this unique combination of features.

Field Season Overview: Each year the geographic south pole survey marker moves with the glacier it is embedded in and a new marker is designed and fabricated by station personnel. Thus each field season, the USGS project team members determine and mark the geographic south pole.

USGS team members also provide on-site support for the continuous operation of the GPS geodetic observatory in the CosRay Lab in the Skylab Building. They will perform upgrades and maintenance on the system with the assistance of the station science technician. The team members will train the winter-over science technician to operate the system.

As part of the Trans-Antarctic Mountain Deformation (TAMDEF) program, project team members will travel by helicopter to sites in the Transantarctic Mountains and South Victoria Land near McMurdo Station. They will take simultaneous measurements with deployed GPS receivers and other instruments

Team members will coordinate USGS fieldwork with the GPS measurements of the Italian Geodetic Team at Terra Nova Bay. USGS will also coordinate a continuous operating GPS/GLONASS (GLObal NAvigation Satellite System) observatory system and tide gage calibration activities at Cape Roberts with Land Information New Zealand. The researchers will continue their operation of the GPS/GLONASS receiver and antenna system at the Crary Lab. The station science technician will monitor the system during the austral winter.

No project team members will deploy to Palmer Station. The science technician will maintain the continuously operating GPS reference station at Palmer Station. The technician will assist other groups with establishing GPS coordinates for study sites in the local area as needed throughout the season.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-179-O

NSF/OPP 00-85435

Station: Palmer Station

RPSC POC: Rob Edwards

Research Site(s): Arthur Harbor, Bismark Strait

Gene expression in extreme environments: Extending microarray technology to understand life at its limits

Dr. Alison E. Murray

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Deploying Team Members: Joe Grzymski . Alison E Kelley . Alison E Murray

Research Objectives: One of the most difficult challenges facing scientists who study life in extreme environments is observing the organisms in situ, and then extrapolating those observations into descriptions that capture both the unique aspects of life and the adaptations required for survival. The antarctic marine psychrophiles (cold-loving organisms) provide an excellent model group of extreme microorganisms to study. Very little is known about their biological and functional diversity or about the metabolic adaptations they have developed to live at -1.8ºC.

Such work may well have fairly direct practical benefits. DNA microarray technology can be applied to studies of life in extreme environments and may identify new genes for use in biotechnology. You begin by identifying specific adaptations to extreme environments and then try to detect genes that are uniquely expressed to subserve them. By discovering these genes in natural (though extreme) environments, scientists not only learn about their functions, but might obviate the need for having to cultivate them.

The details of this work entail:

• Sequencing six large bacterial genomic DNA fragments isolated directly from antarctic marine psychrophiles,

• Constructing two different types of DNA microarrays designed to identify genes being actively expressed in uncultivated microorganisms living in the sub-zero marine waters of the Antarctic,

• Optimizing specific aspects of microarray technology for use with environmental samples, and

• Developing a transferable methodology that will be useful for other researchers in accessing gene expression information directly from the natural environment.

Field Season Overview: The researchers plan to investigate gene expression in the marine bacterioplankton near Palmer Station. Project team members will travel to Palmer Station on board the R/V Laurence M. Gould. From there, depending on conditions, they will travel over the sea ice or in Zodiac inflatable boat to sample seawater in Arthur Harbor and other local sites. They will also sample seawater from the Palmer pump house, collect ice cores, brash ice, and marine sediment. Samples will be returned to the Palmer Station laboratory for experiments and analysis.

2002-2003 Science Planning Summary

Artists & Writers

Mr. Guy Guthridge
Program Manager

WO-219-O

NSF/OPP (none)

Station: McMurdo Station

RPSC POC: Elaine Hood

Research Site(s): Cape Adare, Dry Valleys, Cape Hallet, Cape Evans, Cape Royds, Terra Nova Bay, Cape Crozier

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A photographic overview of the ongoing human exploration and occupation of Antarctica, the most hostile continent on our planet

Ms. Joan Myers
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http://www.joanmyers.com

Deploying Team Members: Joan Myers

Research Objectives: Why does Antarctica matter? Why go there? Why have men and women risked life and limb in such a hostile environment? Why do we still spend money for research there? This photographic project, with its resulting exhibitions and book, will suggest answers to these questions by linking the past years of exploration visible in the historic huts with the ongoing research at McMurdo, field stations, and the South Pole, as seen in the structures that cling to the antarctic ice and in the faces and stances of those who work there.

A fine-art photographer, Ms. Myers will produce photographs that will appear in exhibit and book form. The works will complement works from her earlier trips to South Georgia, the South

Orkneys, and the Antarctic Peninsula to illustrate remnants of the past, research stations of the present, and construction for the future—that is, how we as a species have visited, explored, studied, and lived in Antarctica. Her book, "Salt Dreams: Land and Water in Low-Down California" (1999, University of New Mexico Press), won the Western States Award for nonfiction.

Field Season Overview: Ms. Myers will work out of McMurdo for about 4 months. She plans to photograph field sites in the polar landscape as well as details of structures, research equipment, and individuals working at the sites. Her photos will include panoramas, site documentation, portraits, and aerials.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-376-O

NSF/OPP 01-30389

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): MAPO Building

Mapping galactic magnetic fields with SPARO (Submillimeter Polarimeter for Antarctic Remote Observations)

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Deploying Team Members: Bai Li-Hua . Giles A Novak

Research Objectives: The submillimeter polarimeter for antarctic observations (SPARO) maps interstellar magnetic fields by measuring the linear polarization of submillimeter thermal emission from magnetically aligned interstellar dust grains. Interstellar magnetic fields are generally difficult to observe, especially in the dense regions to which SPARO is most sensitive. It is important to study these fields because their energy density is comparable to that of the other physical ingredients that are found in interstellar regions, so they can play important roles in the physical processes that occur there. This program is designed to contribute to our understanding of two general problems in which interstellar gas (and thus probably also magnetic fields) plays important roles: The study of the Galactic Center region and star formation.

The study of the super-massive black holes that are found at the centers of many galaxies is motivated in part by the desire to understand the behavior of nature in such extreme environments and in part by the likely influence of these active galactic nuclei on the evolution of galaxies and perhaps of the Universe. Magnetic fields in star-forming regions may also help support star-forming clouds against gravity, or they may help clouds collapse via angular momentum transfer.

The SPARO instrument is operated on the Viper 2-meter telescope at the South Pole. Observations are carried out by personnel who remain there for the 8-month winter when South Pole Station is inaccessible. These observations are complementary to submillimeter polarimetry that is being carried out by larger telescopes at Mauna Kea, but SPARO is much more sensitive to submillimeter emissions because of the exceptionally good atmosphere transmission and the stability of the winter skies over the Antarctic Plateau.

Therefore, these observations are specifically aimed at (a) confirming SPARO’s recent discovery of a large-scale toroidal magnetic field at the Galactic Center, (b) testing a magnetic outflow model for the Galactic Center Lobe, a radio structure possibly tracing gas that has been ejected from the galactic nucleus, and (c) mapping large-scale magnetic fields in a sample of star-forming clouds to study the relationship between the elongated shapes of these clouds and their magnetic fields.

Field Season Overview: Project team members will re-install the SPARO instrument on the Viper telescope, located on a tower adjacent to the Martin A. Pomerantz Observatory (MAPO building). During summer months, the group will gather data and calibrate the instrument. Most of the data is collected during the austral winter.

This instrument and William Holzapfel's Arcminute Cosmology Bolometer Array (ACBAR, AO-378-O) share the Viper telescope. Thus, the SPARO instrument will be installed and removed twice during the austral summer.

During the austral winter, the station science technician monitors the equipment and performs routine maintenance.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-321-M/S

NSF/OPP 00-90343

Station: McMurdo and South Pole Stations

RPSC POC: Steve Alexander

Research Site(s): McMurdo, South Pole

Prevention of environment-induced decrements in mood and cognitive performance

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Deploying Team Members: Kathleen Reedy . Mark J Smith

Research Objectives: Cognitive performance degrades with residence in Antarctica, and mood alteration fits a seasonal pattern during extended residence. Although these changes suggest psychological responses to physiological adaptations to cold and dim light, the exact mechanisms are poorly understood.

The first objective is to determine whether long-term exposure to cold temperatures and/or to dim light is associated with significant changes in cognitive performance and emotional well-being:

• Is physiological adaptation to cold and/or adaptation to dim light independently or synergistically associated with decrements in cognitive performance and emotional well-being?

• Do personnel at South Pole Station experience greater physiological adaptation and decrements than personnel at McMurdo Station?

This group will also determine whether these decrements can be prevented or minimized by pharmacologic interventions and/or phototherapy:

• What are the effects of combining liothyronine sodium with levothyroxine sodium versus supplementation with tyrosine (a precursor to both thyroid hormone and catecholamines) and daily phototherapy?

• Is phototherapy used in combination with a pharmacologic agent more effective than either intervention used alone.

In phase I, project team members will establish computer-testing protocols, develop an effective placebo capsule, package the necessary drugs, and test the validity and reliability of computer-administered cognition and mood protocols with 30 hypothyroid outpatients on constant thyroid hormone replacement and 30 age- and sex-matched healthy controls in New Zealand.

In phase II, 50 members of the 2002 winter (v) crews, 35 at McMurdo Station and 15 at South Pole Station, will be randomized in a double-blind crossover design into 1 of 2 treatment groups (20 subjects in each group) and 1 control group (10 subjects). Baseline measurements will be conducted, and treatment groups will be switched after a 1-month washout period. Mood and memory testing will comprise 5 assessments over 12 months. Treatments consist of 50 micrograms (mcg) of levothyroxine sodium plus 12.5 mcg of liothyronine per day, 150 milligrams per kilogram of tyrosine per day, and a placebo.

In phase III, a similar design will be used to evaluate the effectiveness of phototherapy, alone and in combination with the more effective of the two pharmacologic interventions.

This research will lead to an improved understanding of the specific environmental conditions and physiological mechanisms that affect behavior and performance in the Antarctic, help develop countermeasures for circannual oscillations of mood and cognitive performance, and contribute to a reduction in accidental injuries at high latitudes.

Field Season Overview: During the austral summer, researchers will measure participants' height, weight, blood pressure, heart rate and 24-hour records of core and skin temperature. Volunteers will be asked to provide blood samples for analysis of thyroid hormones, catecholamines, cortisol melatonin, and plasma lipids. The winter-over physicians at McMurdo and South Pole Stations will conduct similar assessments. At each assessment, study participants will also perform self-administered computerized psychological tests that assess mood and cognitive performance.

2002-2003 Science Planning Summary

Artists & Writers

Mr. Guy Guthridge
Program Manager

WO-218-O

NSF/OPP (none)

Station: McMurdo Station

RPSC POC: Elaine Hood

Research Site(s): Big Razorback, Dry Valleys, McMurdo Sound

A nonfiction, illustrated children's book about the Weddell seal

Mr. Laurence Pringle
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Mr. Robert Marstall
n/a
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http://www.marstallstudio.com

Deploying Team Members: Robert T Marstall . Laurence Pringle

Research Objectives: This group's primary goal is to produce an illustrated nonfiction children's book about Weddell seals and seal research. They intend to describe the animals' life history by focusing on one hypothetical individual. During deployment, they will report on their progress to elementary school classrooms via the internet. Their contact with other researchers will probably lead to additional children's nonfiction books.

Mr. Pringle is a writer and Mr. Marstall is an illustrator. They have collaborated on numerous books including "An Extraordinary Life: The Story of a Monarch Butterfly" (Orchard, 1997) which was judged the best children's nonfiction book published in 1997 and won the Orbis Pictus Award for Outstanding Nonfiction for Children in 1998.

Field Season Overview: The team will work with NSF-funded investigators studying the

Weddell seal in McMurdo Sound. They will also visit the McMurdo Dry Valleys to look for mummified seal remains.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-P

NSF/OPP 98-10219

Station: McMurdo Station

Research Site(s): Dry Valleys

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.

Dr. John C. Priscu

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http://huey.colorado.edu/LTER

Deploying Team Members: Brent C Christner . Christine M Foreman . Jill Mikucki . Nicholas Stevens

Research Objectives: Lake pelagic and benthic productivity and microbial food webs component of McMurdo LTER. The group will continue measurements of biological, chemical, and physical limnological properties of Dry Valley lakes, with special emphasis on LTER core research areas. They will also measure other parameters relevant to modeling the Taylor Valley Lake Ecosystems.

Field Season Overview: The researchers plan to measure the biological, chemical, and physical properties of Dry Valley lakes, including parameters relevant to modeling the Taylor Valley Lake ecosystems. Team members will use ice augers and other coring devices to penetrate lake ice caps for collecting water samples and retrieving and deploying sediment traps and quantum sensors.

Support contractor personnel will provide helicopter support between McMurdo and the Dry Valleys. They will also facilitate camp put-ins, moves, close out, and transportation of scientific samples back to McMurdo.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-001-O

NSF/OPP 00-88000

Station: McMurdo Station

RPSC POC: Steve Alexander

Research Site(s): Wohlschlag Bay, Granite Harbor

Function and chemical nature of ice-active substances associated with sea ice diatoms

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Department of Biological Science 4004
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Deploying Team Members: Michael G Janech . Michael Kuiper . James A Raymond

Research Objectives: Sea ice diatoms -- a class of algae -- are plentiful in McMurdo Sound in the ice platelet layer and congelation ice. Previous work suggests these particular diatoms produce certain extracellular ice-active substances (IASs) -- molecules with large molecular weights that appear to be glycoproteins. They are widely distributed in the Southern Ocean, occur in both summer and winter sea ice, are associated with many, if not all, of the diatoms found in sea ice, and are apparent as darkly stained areas in the sea ice. Because similar molecules have not been found in temperate water diatoms, they apparently have a function related to cold or icy environments.

The IASs represent a novel type of ice-binding molecule that is distinct from the antifreeze proteins and glycoproteins found in some fish species. Since they are ubiquitous in antarctic sea-ice communities but absent in warmer regions, they would appear to have an important role in polar communities.

Although different in structure, the IASs do share some properties with fish antifreezes, and so understanding their ice-binding properties and chemical structure will make it possible to better understand how this family of molecules interacts with ice. Finally, unlike the fish antifreezes, the IASs are produced in large quantities in nature. Perhaps they could be used in other applications.

The objective of this project is to characterize the chemical nature and function of the ice-active substances produced by sea ice diatoms. During the 2002-2003 season they will travel to locations in McMurdo Sound to collect darkly-stained sea ice. In the lab at they will (1) purify the IASs (reducing large quantities of ice to small volumes), (2) test the ability of the IASs to protect sea ice diatoms from cell damage during the freeze-thaw process, (3) experiment with a new technique for purification, and (4) examine the effect of the IAS on brine pocket formation in sea ice.

Field Season Overview: Team members will take ice samples between Hut Point and Inaccessible Island. They will collect brown ice from Botany Bay and from the UCSG icegreaker near the ice edge and in the channel.

In Crary Laboratory researchers will purify and analyze ice active substances to test their ability to protect sea ice diatoms from cell damage during the freeze-thaw process. They will also examine the effect of the ice active substances on brine pocket formation in sea ice. Some ice and diatom samples will be returned to their home institution for further analyses.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-064-O **NSF/OPP** 01-25194

Station: McMurdo Station
RPSC POC: Karla College
Research Site(s): Taylor Valley, Bull Pass, Beacon Valley

Calibration of cosmogenic argon production rates in Antarctica

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Deploying Team Members: Kimberly B Knight . Paul R Renne

Research Objectives: Researchers intend to establish the systematics of cosmogenic argon production required to establish its measurement as a routine surface exposure dating tool analogous to existing methods based on helium-3, beryllium-10, carbon-14, neon-21, and aluminum-26. Cosmogenic argon offers advantages over existing cosmogenic chronometers in that it is stable (hence applicable to long-term or ancient exposure dating) and less prone to diffusive loss than helium or neon.

Argon-38 is produced principally by spallation of calcium and (probably) potassium, and it is most easily measured using neutron-irradiated samples, as has been done routinely on extraterrestrial samples for decades. Initial measurements on antarctic samples demonstrate the viability of this method for terrestrial samples and suggest an average production rate of greater than 100 atoms/gram-calcium/year. Existing data suggest that argon-38/calcium exposure ages younger than 105 years can be accurately determined by this method.

Further work on calcic minerals (apatite, sphene, clinopyroxene, plagioclase, calcite) whose exposure histories are constrained by helium-3 and neon-21 concentration data will be used to determine the calcium-derived production rate. Analogous work on potassium-rich minerals (potassium-feldspars, micas) will be used to constrain the production of argon-38 from potassium, which should theoretically be comparable to that from calcium when the same neutron-activation method is used.

Analytical work will use existing samples plus new samples to be collected from the dry valleys of Antarctica to maximize cosmic radiation dosage for purposes of calibration. Laboratory studies of the retentivity of argon-38 in appropriate minerals will be used to help evaluate results and guide future applications.

Field Season Overview: Project team members will collect rock samples from stable geomorphic surfaces for separation of minerals to be analyzed for isotopic composition of helium, neon and argon. Helicopter support will be provided for day trips from McMurdo to Hess Mesa, Mount Feather, Kukri Hills, Table Mountain, and Schist Peak.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-111-M/S **NSF/OPP** 00-03881

Station: McMurdo and South Pole Stations

RPSC POC: Jesse Alcorta

Research Site(s): McMurdo, South Pole

Riometry in Antarctica and conjugate region

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Dr. Allan Weatherwax
Siena College Physics

Deploying Team Members: No Deployment

Research Objectives: The University of Maryland will continue studies of the polar ionosphere and magnetosphere from Antarctica and nominally conjugate regions in the Arctic. High frequency (HF) cosmic noise absorption measurements (riometry) and auroral luminosity measurements (photometry) form the basis of these investigations. However, research efforts also involve extensive collaboration with other investigators using complementary data sets.

Riometers measure the relative opacity of the ionosphere. Working at both McMurdo and South Pole, this group maintains and uses an imaging riometer system called IRIS (imaging riometer for ionospheric studies), broad-beam riometers, an auroral photometers. This group has helped to extend antarctic coverage by providing imaging riometers for the British Halley Bay and the Australian Davis stations. The instruments work synergistically with a number of other instruments that are operated at all of these sites by other investigators. They also provide the data acquisition systems at South Pole and McMurdo for the common recording of other geophysical data and the provision of these data to collaborating investigators. To enhance the usefulness and timeliness of these data to the general scientific community, the data is made available in near real time on the Internet. Imaging riometer measurements will also be continued at Iqaluit, NWT, Canada, the nominal magnetic conjugate point of South Pole station.

Continuation of these activities will enable this group to participate in, and contribute to, several major science initiatives, including the GEM, CEDAR, ISTP/GGS, and National Space Weather programs. A primary focus of the analysis activities over the next year will include coordinated ground- and satellite-based studies of Sun-Earth connection events.

These disparate activities have the common goal of enhancing understanding of the relevant physical processes and forces that drive the observed phenomena, both internal (e.g. magnetospheric/ionospheric instabilities) and external (e.g. solar wind/IMF variations). From such knowledge may emerge an enhanced forecasting capability. Many atmospheric events can have negative technological or societal impact, and accurate forecasting could ameliorate these impacts

Field Season Overview: No team members will deploy to Antarctica this season. Science technicians at McMurdo and South Pole stations will perform year-round maintenance, collect data, and send it to the principal investigators.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-112-O

NSF/OPP 98-18176

Station: McMurdo Station

RPSC POC: Doug Miller

Research Site(s): Deep field AGO sites 1, 2, and 5

Polar Experiment Network for Geophysical Upper-Atmospheric Investigations

Dr. Theodore Rosenberg

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http://www.polar.umd.edu/ago.html

Deploying Team Members: Rick Sterling

Research Objectives: PENGUIn (polar experimental network for geophysical upper-atmospheric investigations) is a consortium of U.S. and Japanese scientists working with a network of automatic geophysical observatories (AGOs). Six AGOs have been established at remote sites on the east antarctic polar plateau. Each observatory is equipped with a suite of instruments to measure magnetic, auroral, and radio wave phenomena. Designed to operate year-round and without human intervention, the AGOs only require annual service visits during the austral summer.

Data obtained from the AGOs help researchers understand the sun's influence on the structure and dynamics of the earth's upper atmosphere and how the solar wind couples with the earth's magnetosphere, ionosphere, and thermosphere. The ultimate objective of this research is to be able to predict solar/terrestrial interactions that can interfere with long distance phone lines, power grids, and satellite communications.

When combined with measurements made at other non-autonomous stations, the AGO arrays facilitate studies on the energetics and dynamics of the high-latitude magnetosphere, on both large and small scales. The research will be carried out with in situ observations of the geospace environment by spacecraft in close cooperation with other nations working in Antarctica and in conjunction with conjugate studies at northern hemisphere sites. PENGUIn AGO data is sent to Augsburg College in Minnesota where it is processed and distributed to PENGUIn investigators.

Field Season Overview: This project will continue the acquisition of upper atmospheric physics data from the instruments deployed at three of the Automated Geophysical Obervatory sites (AGO 1, 2, and 5). A team chosen by the PI will service each of the AGOs this season. The season's primary objectives are to convert these three AGOs to solar power only, and to convert the data processing system from a hard disk storage device to an Iridium data link device. This conversion will allow the capture of real-time data from the AGO's while also improving the power system performance. AGO's 3, 4, and 6 will not be serviced this season while plans are made to remove those stations from the field.

Transportation to and from the AGO sites will be via fixed-wing aircraft.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AB-148-O
NSF/OPP 99-80654
Station: McMurdo Station
RPSC POC: Ron Nugent
Research Site(s): Williams Field

BOOMERanG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics): A balloon-borne measurement of polarization in the cosmic microwave background

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Dr. Adrian T. Lee
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Dr. Phil Mauskopf
Cardiff University

Dr. Silvia Masi
Universita'degli Studi di Roma "La Sapienza"

Deploying Team Members: Paolo D Bernardis . Andrea Boscaleri . Brendan P Crill . Eric Francois A Hivon . Armando Iacoangelli . Bill Jones . Theodore S Kisner . Andrew Lange . Carolyn Mactavish . Silvia Masi . Phil Mauskopf . Thomas E Montroy . Barth Netterfield . Enzo Pascale . Francesco Piacentini . John E Ruhl . Giuseppe D Stefano . James Watt

Research Objectives: Cosmic microwave background (CMB) provides a view of the early universe. It shows astronomical objects as they were in the past because of the time it takes light to travel across space. For example, an observer on Earth sees the sun as it was eight minutes ago because it takes light eight minutes to travel the distance. From Earth, the nearest star appears as it was four years ago and the appearance of the Andromeda galaxy is 2 million years behind "real" time. Looking far away in distance then, is equivalent to looking far back in time. Since the CMB is part of the electromagnetic spectrum, in a similar way it offers a glimpse into the universe billions of years ago, to a time before the first stars and galaxies were formed, when the universe was only a few hundred thousand years old.

BOOMERanG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics) is a millimeter-wave sensitive telescope designed to image CMB radiation. It is carried aloft by a balloon that will be launched from the Williams Field Balloon Integration Facility and flown around Antarctica under a long duration stratospheric balloon. During this flight, researchers will also attempt to measure the polarization of the CMB.

Field Season Overview: Of the approximately 20 BOOMERanG team members, 14 are on site at any one time. Seven participants are sponsored by the Italian Antarctic Program.

NASA's National Scientific Balloon Facility (NSBF) will assist project team members in launching, tracking, and recovering the balloon-borne BOOMERanG instrumentation. The long-duration, stratospheric helium balloon is launched from Williams Field and will circumnavigate the continent. NSBF personnel monitor the balloon's flight from helicopter, Twin Otter or LC-130 aircraft. When the balloon returns to the McMurdo area, NSBF staff will terminate the flight by radio commands sent to the gondola. They will recover the instrument, data, and, if possible, the gondola.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-275-O
Station: Palmer Station
RPSC POC: Rob Edwards
Research Site(s): Palmer Station, T-5 building

University of Miami/Dept of Energy-Environmental Measurements Lab, Remote Atmospheric Measurements Program (RAMP)

Dr. Colin G. Sanderson
United States Department of Energy
Environmental Measurements Lab
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Deploying Team Members: No Deployment

Research Objectives: Radionuclides are atoms that emit radioactive energy, some of which occur naturally in the surface air. The Environmental Measurements Laboratory's (EML) Remote Atmospheric Measurements Program (RAMP) is designed to detect and monitor these as well as nuclear fallout and any accidental releases of radioactivity. Since 1963 EML, as part of the U.S. Department of Energy, has run the Global Sampling Network to monitor surface air. The RAMP system provides on-site analysis in thirteen different locations around the world, including Palmer Station. Using a high-volume aerosol sampler, a gamma-ray spectrometer, and a link to the National Oceanic and Atmospheric Administration's ARGOS satellite system, researchers will continue sampling air at Palmer Station for anthropogenic radionuclides.

Field Season Overview: No project team members will deploy to Antarctica this field season. Throughout the year, the science technician monitors and operates the project's high-volume aerosol sampler, gamma-ray spectrometer, and satellite data transmission system. Data and samples are sent to the Environmental Measurements Laboratory for analysis and archiving.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IO-186-O

NSF/OPP 01-25570

Station: McMurdo Station

RPSC POC: Joni English

Research Site(s): TAMSEIS Camp

Characteristics of snow megadunes and their potential effects on ice core interpretation

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Dr. Mark Fahnestock
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Deploying Team Members: Mary R Albert . Robert J Bauer . Mark A Fahnestock . Theodore A Scambos . Christopher A Shuman

Research Objectives: The extensive snow 'megadune' areas of the East Antarctic Plateau appear to be the result of intense snow-atmosphere interaction, caused by katabatic wind flow (at about 20 knots for 11 months of the year) and ablation/vapor redeposition of firn. The features are extremely subtle, 2 to 4 meters in amplitude over a 2 to 4 kilometer wavelength. January and December provides good conditions for this work, including temperatures of -25 to -30 Centigrade and lighter winds than other times of the year. Earlier field reports indicate that the surface of the leeward faces of the dunes is very smooth.

This group plans to conduct ground penetrating radar surveys, global positioning surveys, firn cores, pit sampling, AWS (automatic weather station) installation, and snow permeability experiments. The overall objective is to determine the physical and chemical characteristics of the dunes, and investigate whether dunes may have an effect on the interpretation of climate in deep ice cores.

Field Season Overview: Project team members will travel by Twin Otter to TAMSEIS Camp (Trans-Antarctic Mountains Seismic Camp) where they will acclimate before flying to their work location at the megadune study site. Researchers will conduct ground-penetrating radar surveys, GPS surveys, 15-20 meter firn cores, snow-pit sampling, and snow permeability experiments. They will also install an automated weather station (AWS).

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-036-L/P

NSF/OPP 01-25890

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Rob Edwards

Research Site(s): Dallman Bay, Arthur Harbor, Anvers Island

Cold body temperature as an evolutionary shaping force in the physiology of antarctic fishes

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Deploying Team Members: Jamie Hendrickson . Timothy S Moerland . Bruce D Sidell

Research Objectives: Notothenioid fishes have been evolving for 10 to 14 million years at a nearly constant body temperature of ~0ºC. Many unusual characteristics of these fishes are adaptations to life at cold body temperatures or physiological or biochemical features permitted by life at cold body temperatures but otherwise deleterious. This project's three major objectives will entail a combination of shipboard collection of fishes and experimentation at Palmer Station, with more extensive and sophisticated laboratory analyses on samples in the United States.

Researchers will identify the amino acid substitutions in the fatty acid-binding pocket of fatty acyl coenzyme A synthetase (FACS) from antarctic fishes. Fatty acids are a major source of energy in these fishes, and FACS is essential to their metabolism. Site-directed mutagenesis will be used to produce modified antarctic fish FACS in which specific amino acids have been mutated to those of consensus sequences from warmer-bodied vertebrate animals. These experiments may permit the researchers to determine the specific substitutions that explain both substrate specificity and preservation of catalytic rate of notothenioid FACS at cold temperatures.

The group will also produce a rigorous biochemical and biophysical characterization of an intracellular binding protein, parvalbumin, from antarctic fishes. Parvalbumin plays a pivotal role in facilitating the relaxation of fast-contracting muscles and is a likely site of strong selective pressure. Preliminary data strongly indicate that in antarctic fishes, the protein has been modified to function at cold temperatures. Full-length clones for antarctic fish parvalbumin(s) will be obtained. In combination with already available information, these data will yield insight into their functioning at very cold body temperatures.

Finally, the group will conduct a broad survey of the pattern of cardiac myoglobin (Mb) expression in the Notothenioidei. Previous work has indicated a variable pattern of presence or absence of Mb in the hearts of icefishes, probably due to the unusually low niche competition in the Southern Ocean. It is likely that similar loss of cardiac Mb will be observed in other notothenioid taxa. Project team members will survey as many notothenioid species as possible and will use molecular biological techniques to determine the mechanism(s) responsible for loss of Mb expression.

Field Season Overview: Aboard the R/V Laurence M. Gould in the Antarctic Peninsula, researchers will collect fish using mobile trawls, buoyed and anchored fish pots and longlines. The primary collecting areas include Dallmann Bay, the south shore of Low Island and the southeast shore of Livingston Island. The aquarium room on board the vessel will maintain live specimens during transport to Palmer Station for subsequent experiments. Fish will also be collected in the local Palmer area using hook-and-line and fish traps from Zodiac inflatable boats. At Palmer Station, experiments will be performed using both live fish and prepared tissues. Tissue samples will also be returned to the home institution for further analysis.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-085-O **NSF/OPP** 01-26269

Station: McMurdo Station
RPSC POC: Mike McClanahan
Research Site(s): Mt. Erebus

U-Series (uranium-series) isotopic constraints on the rates of magma genesis evolution and degassing at Mt. Erebus, Antarctica

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Deploying Team Members: See Phil Kyle (GO-081-)

Research Objectives: Mount Erebus, Ross Island is the most active volcano in Antarctica. It is unique in containing a persistent convecting lava lake of anorthoclase phonolite magma. Degassing of the lake and underlying magmatic system emits volcanic gases into the pristine Antarctic atmosphere. Because of the good access and the nature of the small strombolian eruptions, Erebus has become a model volcano for volcanological studies. In the 2002-2003 field season, three separate funded projects will be undertaken at Mt. Erebus. All three projects will work as an integrated team. Some of the objectives of the three projects are:

-To collect volcanic rocks samples and gases and measure U-decay series isotopes in them to assemble a geochemical-isotopic-petrologic data set to evaluate the rate dependent parameters of magma genesis, evolution and degassing

-To deploy five integrated surveillance instrumentation (ISI) systems containing a broadband seismometer, dual frequency GPS receiver, tiltmeter, a variety of environmental sensors and associated power systems (batteries, solar panels and wind generators)

-To continue the annual surveillance of the volcanic activity as part of the Mt. Erebus Volcano Observatory studies.

The existing short period and new broadband seismic network will allow an understanding of the eruptive behavior and dynamics of Mt. Erebus. Inversion of the seismic data will allow topographic imaging of the magma chamber and plumbing inside the volcano. Collected data will be used to evaluate the potential impact of gas emission from Erebus on the snow chemistry on the East Antarctic Ice Sheet. Researchers will also examine short-term variations in the emission rates of F, Cl, SO2 and metals to examine volatile zoning in the magma chamber supplying the lava lake. A GPS network on the flanks and summit of the volcano will be re-occupied to examine any deformation that may have occurred. (NSF Award # 01–26269)

Field Season Overview: Project team members will work closely with Phil Kyle (GO-081-O) to maximize logistical resources. Project team members will establish a camp at the Lower Erebus Hut and will use it as a base of operations for work on and around Mt. Erebus. With helicopter and snowmobile support they will collect gas and lava samples to study uranium series isotopes.

Once a week, samples will be sent by helicopter to McMurdo Station. From there they will be forwarded to a laboratory in France for further analysis.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-129-O

NSF/OPP 99-09339

Station: South Pole Station

RPSC POC: Paul Sullivan

Research Site(s): Aurora Lab in the Skylab Building, ARO

Effects of enhanced solar disturbances during the 2000-2002 solar-max period on the Antarctic mesosphere-lower-thermosphere (MLT) and F regions composition, thermodynamics and dynamics

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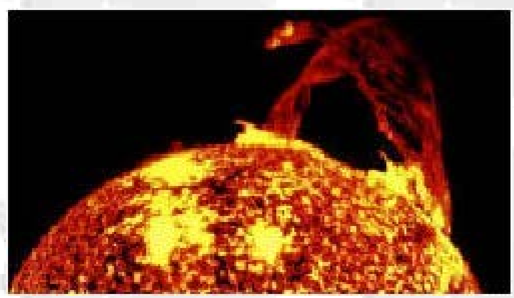

Deploying Team Members: Justin A Bartee . Richard D Browning . Lisandro M Martinez . Charles K Mutiso . Johnathan J Pesce . Steven N Sedlack . Gulamabas G Sivjee

Research Objectives: Variations in the sun's energy affect people in obvious ways, for example, driving the weather and the seasons. However, there are many cycles and variations on scales from seconds to centuries to eons that are of deeper interest to science. One of the most basic is the 11-year cycle when the sun's magnetic poles reverse direction. The 23rd cycle since reliable observations began has just recently peaked. Coincident with this cycle, sunspots and other solar activity are waxing to peak levels.

NASA is using this opportunity to conduct its TIMED (Thermosphere-Ionosphere-Mesosphere-Energetics and Dynamics) satellite study, focusing on the region between 60 and 180 kilometers above the earth's surface.

This project takes advantage of the timing of both of these events, using observations in the visible and near-infrared ranges of upper-atmospheric emissions above South Pole Station to study the heating effects of auroral electrical currents in the ionosphere, as well as planetary waves and atmospheric tides.

TIMED will provide data on the temperature, winds, and tides of earth's upper atmosphere, especially above the poles as it passes overhead. But tracking satellites often have difficulty differentiating between variations in location or time. The South Pole ground-based observations conducted by this group will be valuable in sorting out the time-location question.

Field Season Overview: Project team members will maintain and service the Michelson Interferometer, the spectrometer, the photometer, and the data-acquisition system in Aurora Lab in the Skylab Building. Construction personnel will build a new dome on the roof of the Atmospheric Research Observatory (ARO) and install a new charge-coupled device (CCD) spectrograph . This project receives year-round science technician support for maintenance, data collection, backups, and transmission to principal investigators.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-047-O

NSF/OPP 00-87401

Station: McMurdo Station

RPSC POC: Don Michaelson

Research Site(s): USCG icebreaker, Southern Ross Sea, McMurdo Sound, CSEC

Interannual Variability in the Antarctic Ross Sea (IVARS): Nutrient fields and seasonal productivity II

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Research Objectives: During the last few decades, oceanographers and other scientists have found significant variations in Southern Ocean biogeochemical processes from year to year. Some of the more significant of these inter-annual variations are ice extent and concentration, the composition of herbivore communities, and the distributions and reproductive success of bird and marine mammals.

Surprisingly, because it is so central to the food web, little is known about how phytoplankton production varies from year to year or what role these variations may play. The production system in the Ross Sea consists predominantly of two major functional groups - diatoms and Phaeocystis Antarctica, a colonial haptophyte. Project team members will collect time-series data and assess the inter-annual variations of the production of phytoplankton in the southern Ross Sea, Antarctica.

The Ross Sea provides a unique setting for such an investigation, for a number of reasons. Researchers can build upon a de facto time-series already ongoing in the Ross Sea because so many studies have been conducted there in the last decade. It is established that there are fewer species there (relative to some other sites) and that seasonal production is as great as anywhere in the Antarctic. Most importantly, seasonal production of both the total phytoplankton community (as well as its two functional groups) can be estimated from late summer nutrient profiles.

Inter-annual variations in seasonal production (and of the two major taxa of producers) may be an important factor in the growth and survival of higher trophic levels within the Ross Sea food web. They also shed light on the natural variability of the suite of biogeochemical processes in the region. Having a scientific handle on that baseline of change is important, because of the scientific efforts to model how climate may change in the future. As climate changes, so too will biology be profoundly affected. Accurately modelling and evaluatihng such change means placing it in the context of "natural" inter-annual variability.

Field Season Overview: The researchers plan to study the interannual variablility of phytoplankton production in the southern Ross Sea. The research team will travel on the USCG icebreaker Polar Star from Hobart, Tasmania to two locations in the southern Ross Sea to deploy instrument moorings that collect high resolution time series samples. During the transit from Hobart and in between mooring sites, they will conduct CTD casts (conductivity, temperature, depth) for water column samples. Phytoplankton samples will be isolated and incubated on the vessel.

Later in the field season, the research team will redeploy to McMurdo Station to recover the moorings During the recovery phase, additional CTD casts will be made at the mooring stations and at stations between the moorings. Some water and sediment samples will be returned to the home institution for analysis.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-260-O
NSF/OPP 00-03618

Station: RV Laurence M Gould
RPSC POC: Paul Olsgaard
Research Site(s): Science of opportunity on cruises

Drake Passage XBT Program

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Deploying Team Members: Justine Afghan . Glenn S Pezzoli

Research Objectives: The Antarctic Circumpolar Current (ACC) is a powerful force that drives waters in the Southern Ocean - four times as fast as the Gulf Stream, for example. The current is even stronger wherever the distance between Antarctica and neighboring land is narrowed. These are the so-called chokepoints, such as The Drake Passage off the tip of South America and the sea regions between Antarctica and both the Cape of Good Hope and Tasmania. To determine the fluctuations in the transport of the ACC, scientists deploy bottom pressure gauges and similar instruments. This data can then be ranged against currents in the subtropical and subpolar gyres, and viewed in the context of the wind field over the southern oceans. Since 1996, scientists in this research project have been collecting data to characterize the water mass variability in the Drake Passage, to describe temperature and circulation variability in the Southern Ocean, and to define the role of the Southern Ocean in the global climate system.

Using high-density expendable bathythermographs (XBT) launched from the R/V Laurence M.

Gould, researchers measure current, temperature, and depth for seasonal and year-to-year temperature fluctuations in the upper ocean within the Drake Passage. Since the water changes more rapidly there, they will conduct frequent casts across the Subantarctic, Polar, and ACC fronts.

Field Season Overview: This "science of opportunity" takes advantage of the numerous Drake Passage crossings of the R/V Laurence M. Gould during logistics cruises to Palmer Station and science cruises to the Antarctic Peninsula. Using an autolauncher mounted on the stern, shipboard technicians deploy XBTs (expendable bathythermographs) and XCTDs (expendable conductivity-temperature-depth probes) on select crossings as weather conditions allow. The Sippican MK-12 and MK-21 Oceanographic Data Acquisition system records the data, which is sent by FTP over the internet to the principal investigator for analysis and processing.

About 60 casts per crossing are made from the 200-meter bathymetric contour off Isla de la Estados (in Argentine territorial waters) to the 200-meter contour off Antarctica.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-377-O

NSF/OPP 00-94605

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

Wide-field imaging spectroscopy in the submillimeter: Deploying SPIFI on AST/RO

Dr. Gordon Stacey

Research Objectives: SPIFI (the South Pole imaging Fabry-Perot interferometer) is the first direct detection imaging spectrometer for use in the submillimeter band and was designed for use on the 1.7-meter Antarctic Submillimeter Telescope and Remote Observatory (AST/RO) at the South Pole in the far-infrared and submillimeter windows. After having developed and extensively field-tested SPIFI, the primary scientific goals of this project are to:

• Image the inner regions of the galaxy, in particular submillimeter lines that characterize excitation conditions in the Central Molecular Zone (CMZ), and trace the dynamics of the gas. Questions to be answered are, among others, Can neutral gas flowing through the CMZ be traced? Are there shocks from cloud-cloud collisions in this flow? What is the connection between the CMZ molecular clouds and the circumnuclear ring?

• Map the Large Magellanic Cloud and Small Magellanic Cloud in these lines. The low metalicity environment in these dwarf galaxies may mimic that of protogalaxies, so that investigating the interaction between star formation and the interstellar matter in these galaxies is key to understanding the star formation process in the early Universe.

• Characterize and map the physical conditions of the interstellar matter in nearby galaxies. These data are unique and will be key to understanding the relationships between density waves, bar potentials, and galaxy-wide star formation.

These projects can be undertaken only with the high sensitivity and mapping capabilities of the SPIFI AST/RO combination. SPIFI is much more sensitive than the best heterodyne receivers, which do not have the sensitivity, or (often) the bandwidth, to detect the broad, weak lines from galaxies, or the spatial multiplexing capability necessary for wide-field mapping projects.

This group plans plan to gradually upgrade SPIFI by a factor of 10. They will also make modest optical and cryogenic modifications to SPIFI to improve it in ways important to successful polar operations. The result will be better spatial resolution, with a wider field of view, and a large improvement in system sensitivity. Moreover, the new cryogenic system will require servicing every five days rather than the current 40 hours. This is helpful for outdoor polar operations. This new system also reduces helium consumption (by a factor of 2) and therefore reduces cost

Field Season Overview: This instrument uses the Antarctic Submillimeter Telescope and Remote Observatory (AST/RO) at South Pole Station. This field season, one team member will travel with Tony Stark's AST/RO group (AO-371-O) to plan for next season's installation and operation. The project's instruments will be installed in the 2003-2004 field season.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AO-371-O

NSF/OPP 01-26090

Station: South Pole Station

RPSC POC: Paul Sullivan

Research Site(s): South Pole Station

AST/RO (Antarctic Submillimeter Telescope and Remote Observatory)

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Deploying Team Members:

Richard A Chamberlin, Jr. . Jason C Dickinson . Eyal Gerecht . Dathon Golish . Jacob W Kooi . Craig Kulesa . Christopher L Martin . Thomas Nikola . Fernando Rodriguez-Morales . Rudolph Schieder . Antony A Stark . Robert J Stupak Jr . Nicholas Tothill . Christopher K Walker . Gregory A Wright . Sigfrid Yngvesson . Ric Zannoni

Research Objectives: Astronomy is undergoing a revolutionary transformation, where for the first time researchers can observe the full range of electromagnetic radiation emitted by astronomical sources. One of the newly developed and least explored bands is the submillimeter, at frequencies from about 300 giga-Hertz up into the tera-Hertz range. Submillimeter-wave radiation is emitted by dense gas and dust between the stars, and submillimeter-wave observations allow scientists to study in unprecedented detail the galactic forces acting on that gas and the star formation processes within it.

The Antarctic Submillimeter Telescope and Remote Observatory (AST/RO) is a 1.7-meter, single-dish instrument that has been operating for six years in several submillimeter bands. It has made position-position-velocity maps of submillimeter-wave spectral lines with arcminute resolution over regions of sky that are several square degrees in size. AST/RO is a valuable complement to the planned arrays, which are inefficient when observing large areas because of their small field of view. AST/RO can observe molecular clouds throughout the fourth quadrant of the Milky Way and the Magellanic Clouds to locate star-forming cores and study in detail the dynamics of dense gas in our own galaxy. AST/RO studies are showing how molecular clouds are structured, how the newly formed stars react back on the cloud, and how galactic forces affect cloud structure. They have also shown that the structure of molecular clouds is affected by their heavy element content and by their proximity to spiral arms, have studied the gradient of heavy elements in the galaxy, and have recently observed deuterated water to better understand the chemistry of water in dense clouds.

Essential to AST/RO's capabilities is its location at Amundsen–Scott South Pole Station. Most submillimeter radiation is absorbed by irregular concentrations of atmospheric water vapor before it reaches the Earth's surface. The dry air over South Pole Station allows an accurate intercomparison of submillimeter-wave power levels from locations on the sky separated by several degrees. This is essential to the study of submillimeter-wave radiation on the scale of the Milky Way and its companion galaxies.

Project researchers will devote equal effort to three initiatives: Making large-scale maps of emissions in the Galactic Center and the Magellanic Clouds (these will be made freely available), supporting proposals from the scientific community, and installing and using the detector systems currently under development.

Field Season Overview: Project team members will service the receivers, refrigerators, and coldheads on the AST/RO instrument. In addition to operations, and site testing conducted by the project team, the support contractor will begin preparations to install a new 1.4-THz hot-electron bolometer detector system (the TREND project).

This project will continue to operate throughout the 2002 austral-winter. The support contractor's science technician will monitor the equipment and perform routine maintenance.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-202-O

NSF/OPP 01-26262

Station: McMurdo Station

RPSC POC: Andy Archer

Research Site(s): Byrd Surface Camp, USCG icebreaker, other AWS locations, CSEC, Siple Dome Camp

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Antarctic Meteorological Research Center (AMRC)

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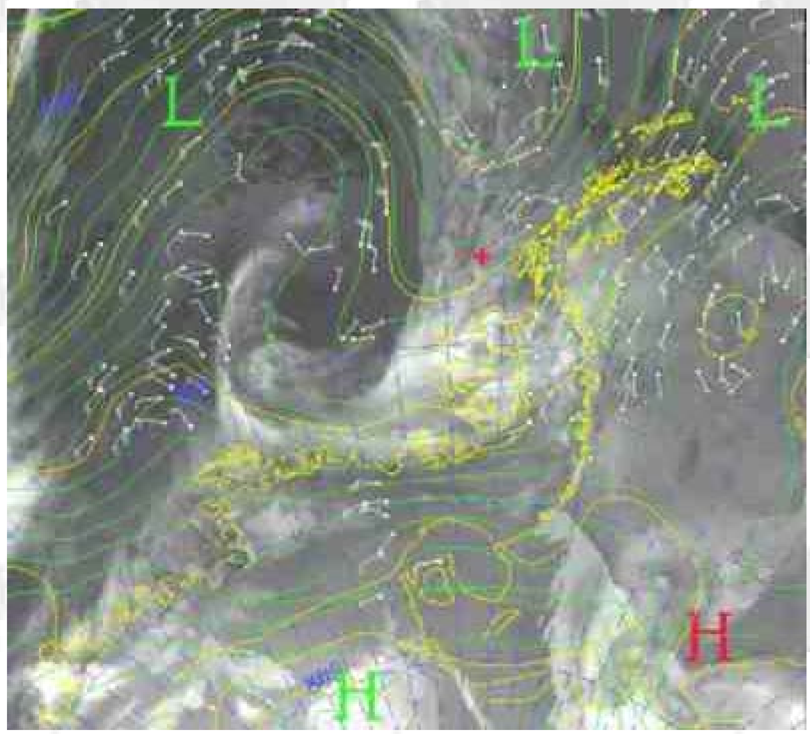

Research Objectives: The Antarctic Meteorological Research Center (AMRC) was created in 1992 to improve access to meteorological data from the Antarctic. The AMRC's mission is to conduct research in observational meteorology and the stewardship of meteorological data, along with providing data and expert assistance to the antarctic community to support research and operations. The AMRC continues to fulfill its mission this season by:

- Maintain and expanding the long-term record of all meteorological data on Antarctica and the Southern Ocean, and make these data available to the scientific community for multidisciplinary use. Special attention is given to obtaining data not normally or readily available by other means.

- Generating satellite products, including but not limited to antarctic composite imagery, and expand and improve on them as much as possible

- Conducting research in observational meteorology especially with regard to climatological analyses and case studies

Conducting and expanding educational and public outreach activities associated with antarctic meteorology and related fields.

Using available meteorological interactive processing software and other standard computing tools, the research team will collect data from all available sources for processing, archiving, and distribution.

The mission of the AMRC not only includes the opportunity to advance the knowledge of antarctic meteorology, but with the free availability of its data holdings, the AMRC gives others the opportunity to advance the frontiers of all antarctic science. Continuing educational outreach activities on meteorology and the Antarctic, an important component of this work, have the potential to raise the science literacy of the general public, as well as the level of K-12 science education.

Field Season Overview: The project team member plans to work in McMurdo Station's Crary Science and Engineering Center (Crary Lab) and at McMurdo Weather Operations (Mac Weather) to upgrade the data reception and processing capabilities of the Antarctic Meteorological Research Center (AMRC). He will also work with support contractor personnel to upgrade the AMRC tape-archiving system. The support contractor will provide assistance in collecting, viewing, measuring and photographing fog droplets in support of AMRC's effort to detect fog using satellite-mounted instruments.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-283-M **NSF/OPP** 00-88058

Station: McMurdo Station
RPSC POC: Howie Tobin
Research Site(s): Numerous Automatic Weather Station sites

Antarctic automatic weather station program: 2001-2004

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Deploying Team Members: Matthew A Lazzara . George A Weidner

Research Objectives: A network of nearly 50 automatic weather stations (AWS) has been established on the antarctic continent and several surrounding islands. These facilities were built to measure surface wind, pressure, temperature, and humidity. Some of them also track other atmospheric variables, such as snow accumulation and incident solar radiation.

Their data are transmitted via satellite to a number of ground stations and put to several uses, including operational weather forecasting, accumulation of climatological records, general research purposes, and specific support of the U.S. Antarctic Program - especially the LTER program at McMurdo and Palmer Stations. The AWS network has grown from a small-scale program in 1980 into a significant data retrieval system that is now extremely reliable, and has proven indispensable for both forecasting and research purposes. This project maintains and augments the AWS, as necessary.

Field Season Overview: The McMurdo Station team will travel by Twin Otter aircraft to service AWS sites on the Ross Ice Shelf and by helicopter and snowmobile to service sites in the Ross Island region. The team members will travel by LC-130 aircraft to Byrd Surface Camp or Siple Dome Camp, and by Twin Otter aircraft from these camps to service AWS stations near those locations. Project team members will also service an AWS placed on iceberg B-15A for Douglas MacAyeal's project (IO-190-O).

The South Pole Station team will travel by Twin Otter aircraft to service two AWS sites about 100 kilometers away. AWS service in these remote locations includes raising the sensors because of snow accumulation. The Clean Air AWS at South Pole Station will also be serviced.

The Palmer Station science technician monitors data sent out from the AWSs and will work with the support contractor's marine science personnel to service the stations if conditions allow. Currently two stations need servicing and visits are scheduled for cruise LMG 02-08. Landings will be made by small boats if weather and sea-state conditions permit. No project team members will deploy to Palmer Station.

Other AWS locations around the continent will be serviced by members of the British Antarctic Survey team and the Japanese Antarctic Program. Tentative field work is also planned for AWSs supported by the French Institute for Polar Research and Technology (IFRTP) at the French Dumont D'Urville Station.

Weather and sea-state conditions permitting, crew members of the U.S. Coast Guard icebreaker Polar Sea will set up and install a new AWS "dog house" on Young Island in the Balleny Islands during its southbound transit. A second AWS will be installed at Scott Island on the northbound transit.

AWS units are also scheduled for installation in West Antarctica by members of the U.S. ITASE traverse team at sites to be determined.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IU-193-O **NSF/OPP** 99-04947

Station: McMurdo Station

RPSC POC: Kirk Salveson

Research Site(s): Traverse from Byrd Surface Camp to South Pole

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U.S. ITASE: Stable isotope studies at West Antarctic ITASE sites

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Deploying Team Members: See U.S. ITASE Management (IU-153-A)

Research Objectives: This group will perform stable isotope analyses of samples collected during the traverses in West Antarctica. Using instrument and remote-sensing temperature histories, they will focus on the spatial and temporal distribution of oxygen-18 and deuterium in West Antarctica (where data are particularly sparse) and the calibration of the isotope/climate relationship on a site-by-site basis. This projects objectives are to:

- Obtain detailed oxygen-18, deuterium, deuterium-excess, and stratigraphic histories in snow pits at most or all of the U.S. ITASE coring sites,

- Provide direct calibration of the isotope/climate relationship at each site through a combination of direct (automatic weather stations) and indirect (passive microwave satellite) temperature measurements.

- Obtain isotope profiles covering the last 200 years, and

- Use the results to provide climate histories at high temporal and broad spatial resolution across West Antarctica for the past two centuries.

These climate histories will provide the context to test relationships that have been proposed among isotopes, moisture source conditions, synoptic scale climatology, and site-specific meteorological parameters. They will also enhance scientists' ability to interpret isotope records from older and deeper antarctic ice cores.

Field Season Overview: The ITASE project team and support contractor staff traverse West Antarctica from Byrd Surface Camp (BSC) to South Pole Station. Two trains pulled by Challenger 55 Caterpillar tractors will transport personnel, instruments, and field camp equipment. Along the way, team members will collect ice cores and surface snow and ice samples, take meteorological readings, and collect radar profiles of the ice sheet. Periodically, Twin Otter aircraft will resupply the traverse team and transport samples back to Byrd Surface Camp. At the end of the traverse, the group will return to McMurdo Station where they will begin to analyze some of their samples. Other samples will be returned to their home institutions.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AB-145-O **NSF/OPP** NASA

Station: McMurdo Station
RPSC POC: Ron Nugent
Research Site(s): Williams Field

Long duration balloon program (LDB)

Mr. William Stepp
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Deploying Team Members: Frank A Candelaria . Victor Davison . Andrew Denny . Derek P Dolbey . Gerald S Gregg . Scott C Hadley . Otto J Masters . Bobby Meazell . Mark A Metzger . Robert E Redinger . Donald Roberts . Glenn C Rosenberger . Robert G Salter . William Stepp . David W Sullivan . Thomas W Thomas, Ii . Robin P Whiteside

Research Objectives: Free-flying balloons offer many advantages over satellites as a means of high-altitude exploration: They remain at a specific location much longer and cost a fraction to launch. NASA's National Scientific Balloon Faciltity (NSBF), based in Palestine Texas, operates the Long Duration Balloon (LDB) program near Williams Field at McMurdo Station. NSBF staff work with researchers, launching, tracking, and recovering high-altitude balloons carrying scientific payloads into the stratosphere.

The NSBF will launch two stratospheric balloons, each with a volume of 28.42 million cubic feet and capable of ascending at a rate of approximately 900 feet per minute to a float altitude of 125,000 feet.

Both launches will take place at the LDB site near Williams Field, reach float altitude, circumnavigate the continent between 77 degrees south latitude and 80 degrees south longitude. They will be terminated and recovered on the Ross Ice Shelf or on the Polar Plateau. The launch window is mid-December to mid-January.

To terminate the flight an aircraft flies within line-of-sight of the balloon and sends a command to the payload from an onboard communication system. At the point of release, the payload will descend with a parachute to a predicted impact zone. Recovery operations then follow.

Field Season Overview: This season NASA's NSBF team will launch, track and recover balloon-borne instruments for John Ruhl's BOOMERanG project (AB-149-O) and John Wefel's ATIC (Advanced Thin Ionization Calorimeter) project (AB-143-O).

Team members conduct a pre-launch data retrieval test flight with an LC-130 aircraft, in case such a retrieval becomes necessary. Up to five small balloons with payloads are sent up to determine stratospheric conditions before launching the science payloads. Balloons with science payloads circumnavigate the continent and NSBF personnel use remote telemetry from aircraft to monitor their progress.

When the balloons return to the McMurdo area, NSBF staff terminate the flights by sending radio commands to the gondola. Depending on the locations of the payloads, team members will travel by helicopter, Twin Otter, or LC-130 aircraft to recover the instruments and data. Team members will break down the gondolas at the landing site, remove data disks and instrumentation, and return the components to McMurdo Station. If possible, the gondolas themselves will also be recovered.

2002-2003 Science Planning Summary

Artists & Writers

Mr. Guy Guthridge
Program Manager

WO-220-O

NSF/OPP (none)

Station: McMurdo Station
RPSC POC: Elaine Hood
Research Site(s): McMurdo Station

Frigid Beauty: Weather in Antarctica

Mr. Thomas E. Svarney
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http://www.sff.net/people/p.barnes-svarney

Ms. Patricia Barnes-Svarney
n/a

Deploying Team Members: Patricia L Barnes-Svarney . Thomas E Svarney

Research Objectives: Once thought to be a cold, windswept land of desolation, harboring nothing but penguins and seals, the realities of Antarctica are far more interesting: The continent is a dynamic, vibrant landmass not only known for its harsh weather, but also its connection to the global climate. Although the rocks and ice hold secrets to the continent's past climate, the wide horizons grant a view of contemporary weather unsurpassed anywhere on Earth. This group's goal is not only to experience some of the weather in order to understand the continent, but to interview (and possibly watch in action) atmospheric scientists, meteorologists, and climatologists conducting weather/climate research. They will use the data to write a book, "Frigid Beauty: Weather in Antarctica," which will present the uniqueness of antarctic weather, highlight optical phenomena, discuss the latest research in climate and weather at both stations, examine Antarctica's influence on the global climate, and detail some space weather studies being conducted at the Pole.

The authors are science writers with backgrounds as professional scientists. Simon & Schuster in 1999 published their "Skies of Fury: Weather Weirdness Around the World."

Field Season Overview: The team will be in the Antarctic for about 3 weeks, visiting weather researchers and forecasters at McMurdo and South Pole.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-214-O
NSF/OPP 00-03609

Station: RV Laurence M Gould
RPSC POC: Bob Kluckhohn
Research Site(s): Science of opportunity on cruises

Mesoscale, seasonal, and inter-annual variability of surface water carbon dioxide in the Drake Passage

Dr. Taro Takahashi
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Deploying Team Members: Colm Sweeney

Research Objectives: The Southern Ocean provides an important component of the global carbon budget. Cold surface temperatures with consequent low vertical stability, ice formation, and high winds produce a very active environment where the atmospheric and oceanic reservoirs readily exchange gaseous carbon. The Drake Passage is the narrowest point through which the Antarctic Circumpolar Current and its associated fronts must pass. This so-called chokepoint is an efficient site for measuring the latitudinal gradients of gas exchange.

Working from the R/V Laurence M. Gould, project team members will use equipment designed to measure both dissolved carbon dioxide (pCO2) and occasional total carbon dioxide in the surface waters during transects of the Drake Passage. This work extends similar measurements made aboard R/V Nathaniel B. Palmer, and complements other data collected on surface temperatures and currents. These several data sets, supplemented by satellite imagery, will enable scientists to make estimates of the net production and carbon export by the biological community, as well as the basic targets -- a quantitative description of the sources of pCO2 variability and a calculation of CO2 fluxes between the ocean and the atmosphere.

Field Season Overview: One project team member will deploy to perform routine maintenance on the system. Contractor support staff on the USAP research vessels maintain and operate the pCO2 system and send data to the principal investigators each week. The data from this equipment compliments the data from other underway systems on the vessels (acoustic Doppler current profiler (ADCP), expendable bathythermograph (XBT), thermosalinograph (TSG), and weather systems) to give a more complete picture of environmental conditions across the Drake Passage.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-080-L **NSF/OPP** 01-26472

Station: Not based at a station

RPSC POC: John Evans

Research Site(s): South Shetland Islands, Antarctic Peninsula, Spring Point, O'Higgins Base (Chile), Pratt Base-Greenwich Is, Juan Carlos Is, Livingston Is., Low Is., King George Is., Elephant Is.

The Scotia Arc GPS Project: Focus on the Antarctic Peninsula and South Shetland Islands

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Deploying Team Members: Clifford A Frohlich . Krishnavikas Gudipati . Frederick W Taylor

Research Objectives: The principal aim of the original Scotia Arc GPS (global positioning system) Project (SCARP) was to determine motions of the Scotia Plate relative to adjacent plates and to measure crustal deformation along its margins with special attention to the South Sandwich microplate and Bransfield Strait extension. Current research is confined to the part of the SCARP project that includes researcher's GPS sites at Elephant Island, the South Shetland Islands, and the Antarctic Peninsula. The British Antarctic Survey provides data from two sites on the Scotia Arc for this project.

Researchers plan to complete the measurements required to quantify crustal deformation related to the opening of the Bransfield Strait and the South Shetland microplate, and to identify any other independent tectonic blocks that the GPS data may reveal. These measurements will be done using ship support during the 2002–2003 season. Five years have passed since researchers did their first measurements, so it should be possible for them to determine quite precise horizontal velocities.

The British Antarctic Survey and the Alfred Wegener Institute have also recognized the importance of the Scotia plate and the Bransfield system. They, too, have used GPS to measure crustal motions in this region and duplicate a number of sites. Researchers on this project expect to publish a joint paper with the British, as well as one with their own interpretations and data.

There are several advantages that justify collecting and analyzing another set of data.

1. Researchers on this project have already established and measured GPS sites on Smith, Low, and Livingston Islands, where other groups have not. These sites significantly extend the dimensions of the South Shetland microplate so that they can determine a more precise pole and recognize any sub-blocks within the South Shetland arc. Smith and Low Islands are near the end of the Bransfield Basin, where relative motion between the South Shetland microplate must somehow terminate, perhaps by faulting along an extension of the Hero fracture zone.

2. Another advantage is that researchers conducted their measurements using fixed-height masts that eliminate all but a fraction of a millimeter of vertical error. Vertical motion associated with post-glacial rebound should be on the order of several millimeters per year, which will eventually be measurable. The fact that mid-Holocene shorelines emerged to more than 20 meters on some South Shetland arc islands suggests that vertical motion is significant. (NSF Award # 01–26472)

Field Season Overview: GPS fixed survey points for this project were established in the Bransfield Strait/Elephant Island area during the 1997-1998 field season. Each researchers re-measure their positions. Zodiac inflatable boats will transport researchers and equipment between ship and shore. Two 24-hour data collection periods are planned for each site to ensure the minimum 0000 to 2400 GMT day that is necessary to obtain the precision required. The field team may set up a temporary tent camp. They will have sufficient GPS equipment to allow for simultaneous data collection at up to three locations.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-040-O **NSF/OPP** 99-80641

Station: Not based at a station

RPSC POC: John Evans

Research Site(s): Copacabana field camp on King George Island

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Foraging behavior and demography of pygoscelis penguins

Dr. Wayne Z. Trivelpiece
Montana State University Bozeman
Department of Ecology
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Deploying Team Members: Stacey Buckelew . Laura Morse . Ladislav Rektoris . Iris Saxer . Susan G Trivelpiece . Wayne Z Trivelpiece

Research Objectives: How well organisms thrive in their environment is often revealed by basic ecological relationships. For two decades at Admiralty Bay on King George Island in the Antarctic Peninsula region, data have been collected on several species of penguins, including the Adélie, gentoo and chinstrap. Looking at some of the basic aspects of the lives of these predators - such as survival and recruitment, population size and breeding success, and diets and foraging ecology - scientists have been able to develop and test key hypotheses about variability in the antarctic marine ecosystem.

This project focuses on one of these relationships. As the extent of sea-ice cover changes with the season and year-by-year, krill (a key food web species in the Southern Ocean that accounts for nearly 100 percent of the prey eaten by dominant predators such as baleen whales, seals, and penguins) are more or less abundant, which directly affects the population biology of the penguins. Years with heavy winter and extensive sea ice paradoxically favor krill recruitment, because larval krill find refuge and food in the sea-ice habitat. The long-term seabird research indicates that in those same, heavy sea-ice years, Adélie but not chinstrap penguins are also favored.

To explore these relationships, project team members will capture adult and juvenile penguins periodically to band, measure, and weigh them, and to collect blood and diet samples for genetic and physiologic studies. During the breeding season, the penguins and the sea ice will be observed by satellite. Another aspect of the population biology of penguins relates to the possible impact of commercial fishing, so this study will provide useful information to the Convention for the Conservation of Antarctic Marine Living Resources, which is the part of the Antarctic Treaty System that focuses on fisheries management.

Field Season Overview: This project is a continuing, long-term study of the breeding biology and demography of Adelie, chinstrap, and gentoo penguins on King George Island in the South Shetland group. Research is conducted annually from October through March at the Copacabana Field Station (Copa) on the west side of Admiralty Bay.

A 1998 Memorandum of Agreement defines the shared logistical support to be provided by NSF's Office of Polar Programs (OPP) and NOAA's Antarctic Marine Living Resources (AMLR). OPP supports the annual opening of the field camp and AMLR is responsible for its closing.

This season's opening is scheduled for mid-October when the R/V Laurence M. Gould (LMG) will transport four researchers and their supplies to the field station. Support contractor personnel will assist with the researchers in opening the facility, starting heat, power, and communications, and off-loading fuel, food, supplies and equipment. Zodiac inflatable boats operated by the RV LMG's marine technicians will transport personnel and cargo from ship to shore.

2002-2003 Science Planning Summary

Artists & Writers

Mr. Guy Guthridge
Program Manager

WO-217-O

NSF/OPP (none)

Station: McMurdo Station

RPSC POC: Elaine Hood

Research Site(s): Mt. Hope, Beardmore Glacier, Gateway

The Lost Men: A book linking modern science and Shackleton's Ross Sea Party

Ms. Kelly B. Tyler
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Deploying Team Members: Kelly Tyler

Research Objectives: Ms. Tyler's book is a nonfiction account of the Ross Sea Party of Sir Ernest Shackleton's British Imperial Trans-Antarctic Expedition (1914-1917). She will observe sites related to the basic operations and sledging journeys of that expedition and interview scientists engaged in field research relevant to the topic. As a science journalist, Ms. Tyler's goal is to build a deeper context for understanding the historical events detailed in the primary source narratives of the expedition, and seek explanations for phenomena and events not fully understood by the Ross Sea Party in current NSF research.

Field Season Overview: The author will visit research locations and interview investigators to intertwine modern science with the historical account, providing a deeper context for the expedition. The book is slated for publication in the US by Viking/Penguin, in the UK, Australia, and New Zealand by Bloomsbury Press, and as an audiobook by Simon & Schuster. Ms. Tyler, a science journalist and historian, produced, wrote, and directed the 2-hour television documentary Shackleton for Nova and was coordinating producer of the IMAX film Shackleton's Antarctic Adventure.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-V

NSF/OPP 98-10219

Station: McMurdo Station

Research Site(s): Dry Valleys

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert

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Deploying Team Members: John E Barrett . Jennifer Mercer . Ross A Virginia

Research Objectives: Soil productivity component of McMurdo LTER. This season the group will focus on:

- The influence of climate and edaphic factors on carbon and nitrogen cycling in terrestrial ecosystems of the Antarctic Dry Valleys.

- The influence of climate and soil chemistry on the distribution and abundance of soil biodiversity in the Antarctic Dry Valleys.

- Understanding the linkages between soil biological communities and underlying ecosystem functioning.

- Evaluating the influence of changes in climate on terrestrial ecosystems and invertebrate communities.

Field Season Overview: The researchers plan to study the influence of environmental conditions on carbon and nitrogen cycling and on the abundance and distribution of biota in Dry Valley soils. As in past years Diana Wall (BM-042-W) and Ross Virginia (BM-042-V) will work closely together, sharing office space, lab space and helicopter hours.

Based in McMurdo, the project team members will make day trips by helicopter to sites in the Dry Valleys. They will collect soil samples and measure in situ soil carbon dioxide flux. They will incubate soils from the Lake Fryxell area in intact soil chambers located in Beacon Valley, and Beacon Valley soils in the Lake Fryxell area. They will install additional sensors at the meteorological station in Beacon Valley and at the long term experiments (BEE plots) in the Fryxell and Bonney basins.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-213-M
Station: Not based at a station
Research Site(s): Dome C with the Italian/French Program

Work at Dome C through NASA and the Italian/French program

Dr. Von Walden
University of Idaho
Department of Geography

Dr. Robert Stone
National Oceanic and Atmospheric Administration

Deploying Team Members: Bradley C Halter . Robert Stone . Von P Walden

Research Objectives: The Antarctic Plateau is an ideal ground site for calibrating and validating infrared satellite instruments. In terms of surface temperature and emissivity, the large continental ice sheet is one of the most homogeneous land surfaces on Earth. Ground-based measurements of upwelling infrared radiation between 8 and 12 micrometers are very nearly equal to those measured by satellites because of the minimal atmospheric emission and absorption found on the antarctic plateau. Therefore, accurate measurements of spectral infrared radiance made at the surface there can provide data to validate the National Aeronautics and Space Administration's Atmospheric Infrared Sounder (AIRS).

Field Season Overview: Research operations for this group will occurr primarily on the continental ice sheet, which is one of the most homogeneous land surfaces on earth in terms of surface temperature and emissivity. These characteristics make the Antarctic Plateau an ideal ground site for calibration and validation of infrared satellite instruments.

Researchers will conduct a field program at Dome Concordia (Dome C) that will measure upwelling (from the surface) and downwelling (from the atmosphere) spectral infrared radiances using the Polar Atmospheric Emitted Radiance Interferometer (PAERI).

The research team will use a high-precision GPS and a theodolite. The theodolite will be used to flag various horizontal angles around the research tower for orientation of the PAERI. Project team members will be working at the same remote sensing site near Dome C as Dr. Steve Warren's group (OO-201-O) and are coordinating research activities with that group.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-W **NSF/OPP** 98-10219

Station: McMurdo Station

Research Site(s): Dry Valleys, Lake Hoare, Lake Bonney, Lake Fryxell, Beacon Valley

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McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert

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Deploying Team Members: Gina Adams . Steve W Blecker . Andrew N Parsons . Dorota L Porazinska . Diana H Wall

Research Objectives: Soil productivity component of McMurdo LTER. The group will continue to maintain (through application of water and nutrients), monitor (soil moisture and temperature) and sample (soils) in our various long-term experimental plots near Lakes Fryxell, Hoare and Bonney. The overall goal is to determine the impacts of natural factors and those associated with potential climate change on the abundance, distribution, and diversity of soil biota.

Field Season Overview: Based in McMurdo, the team will make day trips by helicopter to study sites in the Dry Valleys, where they will conduct experiments and collect samples. They will sometimes stay for 2-3 days at established Dry Valley camps to conduct microscopy and other studies. The researchers plan to use sediment traps and other instruments to collect samples.

Tasks include:

- Sampling new eolian sediment traps set up last field season.

- Follow up last year's extremely wet season by re-sampling areas identified as sites where moisture seeped to the surface for the first time for years.

- Gather data regarding the sources and cycling of carbon through carbon dioxide respiration work in the field (Taylor Valley) and radioisotope work in the Crary Lab.

2002-2003 Science Planning Summary

Oceans & Climate

Dr. Bernhard Lettau
Program Manager

OO-201-O

NSF/OPP 00-03826

Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Dome C

Solar radiation on the East Antarctic Plateau

Dr. Stephen G. Warren
University of Washington
Atmospheric Sciences Dept.
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Dr. Thomas Grenfell
University of Washington

Deploying Team Members: Richard E Brandt . Delphine M Six . Stephen G Warren

Research Objectives: This project is an experimental study of solar radiation processes near the surface at Dome C, the French-Italian station in East Antarctica. It will be carried out in cooperation with the Laboratoire de Glaciologie et Geophysique de l'Environment in Grenoble, France. The emphasis is on the reflection of sunlight by snow and the transmission of sunlight through clouds. The observations researchers gather will be relevant to climate, remote sensing, and the physics of ice and snow.

The research team will measure transmissions of solar radiation through clouds, and these measurements will be used to obtain effective cloud optical depths to estimate cloud radiative forcing, with applications in climate models. They will develop a method to obtain this information from pyranometers alone so that the historical record of solar radiation observations in the antarctic interior can be analyzed for climatological information on clouds.

Observations of the angular pattern of solar radiation reflected from the snow surface will allow the researchers to validate information derived from satellite-derived atmospheric profiles. Using radiative transfer modeling through the atmosphere, the project's research team will reconcile measured surface reflection functions with the empirical functions obtained from advanced Vidicon high-resolution radiometers on the polar orbiting satellites of the National Oceanic and Atmospheric Administration.

Finally, the spectral peak of snow albedo will be accurately located in order to resolve a discrepancy over the spectral absorption of pure ice in the visible to near-ultraviolet range.

Field Season Overview: Project team members will travel by fixed-wing aricraft to Dome Concordia (Dome C) and use a portable spectrophotometer and sun photometer to measure the spectral and angular dependence of sunlight reflection by snow, and the spectral transmission of sunlight through clouds on the East Antarctic Plateau at Dome C. The measurements collected may show that the Dome-C region is the optimum antarctic surface for calibrating Earth-observing satellites.

This project is a collaboration with Dr. Michel Fily of the French Polar Research Institute, who will have one participant travelling with this project team. The researchers will be working at the same remote sensing site near Dome C as Dr. Von Walden's group (OO-213-M) and are coordinating research activities with that group.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AB-143-O **NSF/OPP** ATIC

Station: McMurdo Station
RPSC POC: Ron Nugent
Research Site(s): Williams Field

ATIC Long Duration Balloon Flight (Advanced Thin Ionization Calorimeter)

Dr. John P. Wefel
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Physics and Astronomy
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Deploying Team Members:

James H Adams . Mark J Christl . Mark D Cox . Cynthia K Ferguson . Opher Ganel . Randy E Gould . Clifford Granger . Douglas J Granger . T. G Guzik . Leonard Howell ,Jr. . Joachim B Isbert . Evgueni Kuznetsov . Alexandre Malinine . Douglas R Smith . Michael Stewart . John P Wefel

Research Objectives: The advance thin ionization calorimeter (ATIC) balloon experiment uses NASA's Long-Duration Balloon (LDB) program for a series of antarctic balloon flights (each 10 to 14 days long). The goal is to investigate the composition and energy spectra of galactic cosmic rays (GCR) at the highest energies accessible from balloon platforms, the region up to ~1014 electronvolt (eV). If supernova remnants are, as widely believed, the cosmic accelerators for the GCR, it is in this high-energy region that researchers anticipate observing effects of the acceleration process.

The ATIC experiment, weighing 1,360 kg and consuming 400 watts of power, consists of three major detector systems: (a) a detector to measure the particle charge, (b) a three-layer, crossed scintillator strip hodoscope, interspersed within a carbon target, to measure the trajectory of the particle, and (c) a fully active bismuth germanate scintillation calorimeter to measure the energy of the hadronic cascade initiated by particle interactions in the carbon target. The individual detectors are read out with application-specific integrated circuit devices.

Previous pioneering experiments have indicated differences in the spectra of hydrogen, helium, and the heavier nuclei, leading to an energy-dependent composition. In addition, the “all-particle” GCR spectrum and composition, as measured by ground-based air shower arrays, show indications of changes in the energy regime approaching the well-known spectral “knee” at 1015-1016 eV. The researchers’ goal is to apply new experimental techniques to the study of these very–high-energy particles to verify previous reports and to search for the behavior expected from the supernova remnant acceleration process.

Field Season Overview: The research team will be transported daily between McMurdo and Williams Field to support shift work and round-the-clock payload monitoring during assembly, testing and flight operations. A crane will be used for final assembly and transfer of the 1,360 kilogram payload to the launch vehicle. During the flight, the research team will control the balloon from an office at McMurdo Station using a TCP/IP (internet protocol) connection. Successful flights are determined by the following criteria:

- At least eight days duration, 14-30 days is preferable

- At least 110,000 feet altitude, over 124,000 feet is preferable

- Minimum requirements for communication with the payload is the transmission of commands and receipt of instrument status information. Ideally, the group will also receive event samples.

- Recovery of the on-board recorders

Recovery of the payload data recorders is essential since only a small fraction of the data collected can be transmitted. With this in mind, the payload has been designed for partial recovery of critical components if the full payload cannot be recovered.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-089-M
NSF/OPP 99-09603

Station: McMurdo Station
RPSC POC: Joni English
Research Site(s): TAMCAMP, deep field

A broadband seismic experiment to investigate deep continental structure across the East-West Antarctic boundary

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http://epsc.wustl.edu/seismology/Tamseis

Dr. Andy Nyblade
Pennsylvania State University

Deploying Team Members: Noel Barstow . Bruce C Beaudoin . Margaret H Benoit . Jesse L Fisher . Alexander Gerst . Audrey Huerta . Andy Nyblade . Sara Pozgay . Patrick J Shore . Timothy Watson

Research Objectives: Antarctica's outline shape looks generally like Australia, though half again as large. However beneath its enormous ice sheet lies evidence of its origin. East Antarctica has a bedrock continent-like foundation, while the ice sheet over West Antarctica -- a third the area -- in fact covers a series of "islands." West Antarctica shares a geologic history with the South American Andes Mountains, the result of plates colliding and subducting. East Antarctica is more like a large coherent chunk that broke free of the supercontinent, Gondwanaland, and drifted to a new position at the bottom of the world. The boundary between these two regions (with their disparate geologic pedigrees) is called the east-west antarctic boundary. The crust and upper mantle here reveals many important and interesting distinctions which tells the basic story of the tectonic development of Antarctica.

In November 2000 this group began making seismic measurements using three arrays and a total of 44 seismic stations, all geared to evaluating geodynamic models of the evolution of Antarctica that rely on data about the crust and upper mantle. To analyze the data, researchers use a variety of proven modeling techniques, including body- and surface-wave tomography, receiver function inversion, and shear-wave splitting analysis.

One basic question is, "How were the Transantarctic Mountains formed?" Though widely considered a classic example of rift-flank uplift, there is little consensus about the uplift mechanism. Many theories have been proposed ranging from delayed phase changes to transform-flank uplift. All make various assumptions about upper mantle structure beneath and adjacent to the rift-side of the mountain front.

Another focus will be the structure of the east antarctic craton, the highest ice block in the world. Was this anomalous elevation a prime driver in the onset of glaciation there? More to the point, how did it arise? Proposed models include isostatic uplift from thickened crust, anomalously depleted upper mantle, and thermally modified upper mantle, as well as dynamic uplift. How far the old continental lithosphere extends is also uncertain. In particular, it is unknown whether the old lithosphere extends to the western edge of East Antarctica beneath the crustal rocks deformed during the Ross Orogeny (formation).

When completed and analyzed, this comprehensive set of data and theory testing will enable new maps of the variation in crustal thickness, upper mantle structure, anisotropy, and mantle discontinuity topography across the boundary of East and West Antarctica, providing a much enhanced foundation for understanding the geodynamics of the antarctic.

Field Season Overview: Project team members will travel by helicopter and Twin Otter aircraft to install new broadband seismic stations and upgrade existing stations at several locations near McMurdo Station. Some team members will remain in McMurdo while others travel by LC-130 aircraft to the TAMSEIS (Trans-Antarctic Mountain Seismic) field camp and from there by Twin Otter to the seismic stations.

Later in the field, project team members will return to Antarctica to revisit and service the seismic stations. These team members will also provide training to the winter-over science technician. During the austral-winter season, the science technician will download data and make repairs as necessary to the seismic station installed at McMurdo.

2002-2003 Science Planning Summary

Biology & Medicine | Dr. Polly Penhale
Program Manager

BO-229-E **NSF/OPP** 02-28895

Station: Not based at a station

RPSC POC: John Evans

Research Site(s): Marine locations on RV Tangoroa

Viral dynamics and the Southern Ocean iron cycle

Dr. Steven W. Wilhelm
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Microbiology
wilhelm@utk.edu

Deploying Team Members: Sara M Handy . Steven W Wilhelm

Research Objectives: The bioavailability of iron has been shown to regulate primary production in high-nutrient low-chlorophyll (HNLC) marine environments such as are found in Antarctica. More than 99 percent of dissolved iron in HNLC systems is organically complexed, and these iron-ligand complexes represent (at least indirectly) the pool of iron that is available to marine plankton. However, the character and source of the iron-binding ligands in sea water are unknown.

Recent research has suggested that the activity of naturally occurring viral populations provides enough organically complexed iron to regenerate the concentrations of dissolved iron measured in an HNLC coastal upwelling system in a time frame consistent with the growth of the phytoplankton community. This project’s goal is to participate in the upcoming FeCycle analysis and, in collaboration with scientists from the University of Otago (New Zealand) and the University of Delaware, to determine the rate at which viruses recycle iron back to the marine microbial community.

A 12-day experiment in the vicinity of 46º 30’ S, 178º 30’ E will build on 4 years of research in this region. The overall objective of the project is to collect information that will allow researchers to develop a preliminary model for the cycling of iron in this system in the absence of iron fertilization.

Field Season Overview: Researchers will sail on the New Zealand research vessel Tangaroa departing from Christchurch, New Zealand.

2002-2003 Science Planning Summary

Artists & Writers

Mr. Guy Guthridge
Program Manager

WO-223-O

NSF/OPP (none)

Station: Palmer Station

Research Site(s): Palmer Station vicinity

To Paint in Antarctica

Mr. James D. Woodside

Walnut Hill School

jwoodside@attbi.com

Deploying Team Members: James D Woodside

Research Objectives: Mr. Woodside will paint and draw landscapes, seascapes, and wildlife from direct observation as much as possible. He will work with oil on canvas, or colored pencil and ink on paper, depending on conditions.

Mr. Woodside is chair of the art department of the Walnut Hill School, one of only three residential independent arts high schools in the country. He plans to exhibit the paintings at colleges, independent secondary schools, and public schools and will use them in teaching and lecturing.

Field Season Overview: Mr. Woodside will work at Palmer Station and vicinity, joining science teams at their field sites. He and the other artist on station, Scott Kelly, (WO-221-O), will travel to and work at field locations together, as practicable.

2002-2003 Science Planning Summary

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2002-2003 Science Planning Summary

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-058-O **NSF/OPP** 99-80452

Station: McMurdo Station

RPSC POC: Joni English

Research Site(s): Pecora Escarpment, Beardmore Glacier, Allan Hills, LaPaz Icefield

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The Antarctic search for meteorites (ANSMET)

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Research Objectives: Since 1976, ANSMET (the Antarctic Search for Meteorites program) has recovered more than 10,000 meteorite specimens from locations along the Transantarctic Mountains. Antarctica is the world's premier meteorite hunting ground for two reasons:

• First, although meteorites fall all over the globe at random, the likelihood of finding a meteorite is enhanced if the background material is plain and the accumulation rate of terrestrial sediment is low. This makes the East Antarctic Ice Sheet the perfect medium.

• Second, along the margins of the sheet, ice flow is sometimes blocked by mountains, nunataks, and other obstructions. This exposes slow-moving or stagnant ice to the fierce katabatic winds, which can deflate the ice surface and expose a lag deposit of meteorites (a representative portion of those that were sprinkled throughout the volume of ice lost to the wind). When such a process continues for millennia, a spectacular concentration of meteorites can be unveiled.

It is important to continue recovering antarctic meteorites because they are the only currently available source of new, non-microscopic extraterrestrial material. As such, they provide essential "ground truth" about the composition of asteroids, planets, and other bodies of our solar system. ANSMET recovers samples from the asteroids, the Moon and Mars for a tiny fraction of the cost of returning samples directly from these bodies.

Field Season Overview: During the 2001-2002 field season, ANSMET's main field party visited the Meteorite Hills region near the headwaters of the Darwin Glacier. Systematic searching at this site resulted in the collection of 740 meteorites. This season will extend systematic searches to regions visited only sporadically last year, including the nearby Finger Ridges, where three meteorites were recovered in 2000-2001.

From McMurdo Station, the systematic search party will travel by LC-130 aircraft to Beardmore South Camp. From there they will make at least three overland traverses to Goodwin Nunataks and MacAlpine Hills where they will conduct systematic searches for meteorites. Mid-season Twin Otter flights will re-supply the team, remove trash, empty fuel drums, and transfer personnel. At the end of the season, researchers will make a day trip by helicopter to the Allan Hills region.

A second field party dedicated to high level reconnaissance will be ferried to and from South Pole Station by LC-130 flights. Twin Otter flights will support put-ins, re-supply, and camp moves of this team in the Pecora/La Paz region. Samples will be returned to the home institution for analysis.

2002-2003 Science Planning Summary

Glaciology

Dr. Julie Palais
Program Manager

IO-196-M **NSF/OPP** 01-24014

Station: McMurdo Station
RPSC POC: John Evans
Research Site(s): Lakes Vanda, Joyce, Bonney, Fryxell

Millennial-scale fluctuations of Dry Valleys lakes: A test of regional climate variability and the interhemispheric (a)synchrony of climate change.

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Dr. Glenn Berger
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Deploying Team Members: Sean Birkel . Mary A De Mello . Amber Hawkins . Aaron Schlosser . Thomas Whittaker

Research Objectives: A key unresolved question in antarctic glaciology concerns the stability of the West Antarctic Ice Sheet (WAIS). The WAIS is marine-based, meaning that its substratum is a series of archipelagoes in the northwestern Ross Sea Embayment off the northern Scott Coast. At its relatively fixed position, the WAIS is grounded on the continental shelf with plate boundaries nearby. In contrast, the East Antarctic Ice Sheet sits on a stable lithospheric plate.

As deglaciation began after the last glacial maximum (LGM), the WAIS became unmoored. Scientists believe this was likely the first area of the shelf to become free of grounded ice. Learning how and when and in what sequence this occurred is a critical step towards isolating the mechanisms (sea level, climate, ocean temperature, and internal dynamics) that control

WAIS dynamics.

The northern Scott Coast is of particular interest to researchers looking for mechanisms that may have triggered the key stages of deglaciation. An important first step is to better constrain the age of structures where the inquiry is focused. The Barbados coral record suggests the initial retreat from the Ross Sea Embayment may have begun as early as 17,000 years ago. In contrast, recent glacial geologic mapping and relative sea-level suggests that deglaciation on the southern Scott Coast occurred more recently. Using carbon-14 dating (14C), it appears that deglaciation occurred there during the Holocene (the last 11,000 years) with southward grounding-line migration past Ross Island shortly before 6,500 years ago. This chronology suggests that rising sea level could not have driven grounding-line retreat to the Siple Coast, because deglacial sea-level rise essentially would already have occurred by mid-Holocene.

To begin to resolve this conflict, one deficiency in the data from the southern Scott Coast might be corrected. Those data cannot differentiate among the possible triggering mechanisms because they come from 450 kilometers south of the LGM grounding-line position. The goal of this project is to try to overcome this by constructing relative sea-level curves on a transect along the northern Scott Coast. Researchers hope to get the ages for this work from accelerator mass spectrometer 14C dates of seal skins and shells within raised beaches. These curves should reveal when the grounded ice from the northwestern Ross Sea Embayment cut loose.

Field Season Overview: Project team members will travel by helicopter to the Dry Valleys where they will establish a field camp and conduct sediment coring operations in the bottoms of Lakes Fryxell, Bonney, Joyce and Vanda. At Lake Joyce, glacial geology work will be conducted. This group collaborates closely with a New Zealand research team led by Dr. Chris Hendy.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BO-022-L/P

NSF/OPP 01-25181

Station: RV Laurence M. Gould and Palmer Station

RPSC POC: Rob Edwards

Research Site(s): RV LMG, Palmer Station

The chemical ecology of shallow-water marine macroalgae and invertebrates on the Antarctic peninsula

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Dr. Bill Baker
University of South Florida

Dr. James McClintock
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Deploying Team Members: Margaret O Amsler . Charles D Amsler, Jr. . Billy J Baker . V. Anne Fairhead . Lynn Hollyfield-Jerri . Yusheng Huang . Kevin J Peters . Stephanie T Weiss

Research Objectives: Many organisms are not mobile and so cannot escape from predators. One way they can keep from being eaten is to make themselves unappetizing by producing defensive chemicals known as secondary metabolites. However, the energy and other resources that go into making these compounds could instead have gone into growth or reproduction. This group studies the evolution of these tradeoffs in an effort to understand ways that organisms maximize the usefulness of their investments in defensive chemistry.

For marine plants, the environment of Antarctica is very different from most other places in the world's oceans because nutrients are plentiful but light is often limited. So the "currency" that "pays" for defense, growth, and reproduction is different than for plants in most other marine communities. This allows researchers to test theories about the costs and benefits of defense in ways not possible elsewhere in the world.

For marine animals, Antarctica is unique in that predation by sea stars is much more important than in other marine communities. Sea stars feed by extending their stomachs and digesting prey outside their bodies. These researchers predict that this should lead to a much higher investment in defensive metabolites in the outer layers of the prey. One of the main goals for the 2002–2003 season will be to test the hypothesis that sponges (a very important component of these communities) will maximize their investment in chemical defense by having the highest levels of defensive secondary metabolites in their outermost layers.

This research should also advance our general understanding of the evolution of chemical defenses. This group hopes to elucidate the nature and role of bioactive agents in the ecology of the antarctic marine benthos (that is, organisms living at the bottom of marine environments).

Field Season Overview: Project team members will travel to Palmer Station on board the R/V Laurence M. Gould. Divers and their tenders will travel in Zodiac inflatable boats to local sites, collecting marine invertebrates and macroalgae. The samples will be taken to the Palmer Station laboratory for analysis and bioassays will be conducted in the aquarium. Some samples will be returned to the home institutions for further analysis.

2002-2003 Science Planning Summary

Biology & Medicine

Dr. Polly Penhale
Program Manager

BM-042-M

NSF/OPP 98-10219

Station: McMurdo Station

Research Site(s): Taylor Valley, Lake Miers, Wright Valley

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert.

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Deploying Team Members: Jenny Baeseman . Karen Cozzetto . Louise T Huffman . Diane Mcknight . Peter A Spatz . Paul L Turner . Erin C Van Matre

Research Objectives: Flow, sediment transport, and productivity of streams component of McMurdo LTER. The researchers plan to monitor the flow, sediment transport, and productivity of glacial melt streams in the McMurdo Dry Valleys.

Field Season Overview: Team members will maintain the current network of 19 stream gauges. High flows from the previous season damaged some of the gauge structures, and early season efforts will ensure the continued viability of these structures. Previously established stream algal transects throughout Taylor Valley will be sampled and surveyed this season. Sediment size distribution analysis will be carried out in response to last seasons high flows.

The group will also collect water quality samples, make hydrologic measurements, and install telemetry equipment at some of the stream gauges.

2002-2003 Science Planning Summary

Aeronomy & Astrophysics

Dr. Vladimir Papitashvili
Program Manager

AA-130-O

NSF/OPP 99-80474

Station: South Pole Station
RPSC POC: Paul Sullivan
Research Site(s): South Pole Station

AMANDA 2000 (Antarctic Muon And Neutrino Detector Array)

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Muhs . Rolf Nahnhauer . Jiwoo Nam . Peter Niessen . Mathieu A Ribordy . Steffen Richter . Darryn A Schneider . Robert K Schwarz . Andrea Silvestri . Michael Solarz . Christian Spiering . Peter Steffen . Karl H Sulanke . Jennifer A Thomas . Wolfgang Wagner . Christin Wiedemann . Henrike Wissing . Kurt W Woschnagg

Research Objectives: Neutrinos are elementary particles, with no electrical charge, and very little mass. They are very penetrating, interacting rarely with other particles. Low energy neutrinos have been detected from the sun and from Supernova 1987a in the Large Magellanic Cloud -- to date the only sources of extra-terrestrial neutrinos. The primary goal of the AMANDA experiment is to detect the expected sources of high energy neutrinos from cosmic objects such as active galaxies, pulsars, neutron stars, blazars, and gamma-ray bursts. If the present understanding of the acceleration mechanisms in these objects are correct, gamma-ray bursts should be copious emitters of neutrinos.

AMANDA is the largest detector of neutrinos in the world. Over the last five seasons, the project has drilled an array of holes in the ice 1 to 2 kilometers deep and installed over 600 photomultiplier tubes with "strings" of instrument suspended inside. The ice at South Pole is so clear that the tubes can detect Cherenkov radiation from several hundred meters away. Cherenkov radiation, visible as a blue glow, is emitted by collisions of high-energy neutrinos with ice or rock.

There are currently 26 strings in the ice, each hard-wired to computers in the Martin A. Pomerantz Observatory (MAPO) facility. The computers analyze the gigabytes of collected data to determine true neutrino events.

Only in recent years has it become technically possible to build such large neutrino detectors. As one of the first of this new generation, AMANDA promises to make seminal contributions to the new field of high energy neutrino astronomy.

Field Season Overview: No drilling will take place this season. The project team will perform routine maintenance and calibration on the existing instrument strings. Each string is hard-wired to computers in the Martin A. Pomerantz Observatory (MAPO) for data collection and analysis to identify true neutrino events.

Two members of the research team will remain at South Pole Station during the 2003 austral winter to ensure smooth detector operation and data transmission to the participating institutions.

2002-2003 Science Planning Summary

Geology & Geophysics

Dr. Scott Borg
Program Manager

GO-056-O **NSF/OPP** 98-14332

Station: McMurdo Station
RPSC POC: Kirk Salveson
Research Site(s): Dry Valleys

The ferrar magmatic mush column system, Dry Valleys, Antarctica

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Deploying Team Members: Amanda D Charrier . Sarah J Fowler . Taber G Hersum . Bruce D Marsh . Michael Weiss . Karina Zavala

Research Objectives: Over billions of years the Earth's geologic processes have produced a wide diversity of rock types that have given rise to the fundamental surface features: Continents and ocean basins. The details of these physical and chemical processes remain largely undiscovered. Although present day volcanism exemplifies the general process of differentiation through the variety of lava expelled, it is not clear how volcanic eruptions relate to the prolonged, detailed magmatic processes that are responsible for the final result. Solidified bodies of magma (called plutons), once deeply buried and now exposed through erosion, furnish some evidence, but often the spatial context of these plutons within the magmatic-volcanic system is not clear. By studying a group of magmatic rocks displaying these processes, researchers hope to help solve this fundamental question. These rocks, which expose the fundamental relationship of plutonism to volcanism, may be an important key to understanding planetary magmatism in the most general terms.

The Ferrar magmatic system in the McMurdo Dry Valleys (Ferrar-DV) exemplifies the emerging global paradigm of a stack of magmatic sheets or sills connected below to a deep-seated magmatic source and above to a volcanic center. The world's major magmatic systems tend to exhibit this same style, but only the Ferrar-DV clearly reveals the critical physical and chemical connections between the deep, mush-dominated system and near-surface, pre-eruptive sill system.

The objective of this project is to ascertain the full physical and chemical nature of the Ferrar-DV magmatic system. The major goals are:

-To delineate its vertical and horizontal extent

-To understand the dynamics of its establishment

-To understand the mechanics of formation of the Dais layered intrusion

-To produce a map of Ferrar rocks throughout the Dry Valleys

-To produce a 3-D model of the orthopyroxene tongue and feeder system. Researchers will also attempt to elucidate a rarely seen transition between plutonic and volcanic systems, which may have implications fundamental to planetary magmatism.

Field Season Overview: Team members will travel by helicopter from McMurdo Station to Bull Pass and establish a base camp from which the fieldwork will be staged. Researchers will then travel by helicopter to scout suitable locations for groundwork and take aerial photographs. From the selected locations, they will travel on foot, mapping locations of rocks and collecting samples throughout the magmatic bodies with the goal of fully characterizing them in terms of chemical properties and crystal content.

The researchers will return to McMurdo Station by where they will prepare the rock samples for return to the home institution.

2002-2003 Science Planning Summary

Palmer Station LTER: Climate migration, ecological response and teleconnections in an ice-dominated environment

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List of 2002-2003 Palmer Station LTER projects

The Palmer Long Term Ecological Research (LTER) project is focused on one major ecological issue: To what extent does the advance and retreat of sea ice each year physically determine spatial and temporal changes in the structure and function of the antarctic marine ecosystem?

Evidence shows this dynamic variability of sea ice to have an important (perhaps determinant) impact on all levels of the food web, from total annual primary production to breeding success in top predators. For example, variability in sea ice may affect prey and predators directly by controlling access to open water or preferred habitats. That variability may affect prey and predators indirectly as changes in the sea ice cover affect other species that serve as food. Four hypotheses drive current Palmer LTER research:

- The timing and magnitude of seasonal primary production,
- The dynamics of the microbial loop and particle sedimentation,
- Krill abundance, distribution and recruitment,
- Survivorship and reproductive success of top predator

These factors probably differ for key species since the magnitude and timing of sea ice changes can have specific local impacts. What remains unclear are the implications for the whole antarctic ecosystem. As one of the basic examples, greater sea ice areal coverage promotes more available krill which enhances the survivorship and reproductive success of Adelie penguins.

General objectives of the Palmer LTER project are:

- Document the interannual variability of annual sea ice and the corresponding physics, chemistry, optics, and primary production within the study area,
- Document the life history parameters of secondary producers and top predators,
- Quantify the processes that cause variation in physical forcing and the subsequent biological response among the representative trophic levels,
- Construct models that will link ecosystem processes to environmental variables and which will also simulate spatial/temporal ecosystem relationships,
- Employ those models to predict and validate ice/ecosystem dynamics.

A key challenge for the Palmer LTER project is to characterize and understand the many cross-linkages that have developed in the antarctic ecosystem. Environmental phenomena vary over time and across areas, having both physical and biological consequences. These changes in turn can develop other loops and linkages that influence each other.

Principal Investigator	Institution	Event Number	Component
Hugh Ducklow	College of William and Mary	BP-045-L/P	Project Manager
William R. Fraser	Polar Oceans Research Group	BP-013-L/P	Seabird
Douglas G. Martinson	Lamont-Doherty Earth Observatory	BP-021-L	Modeling
Robin Ross	University of California Santa Barbara	BP-028-L/P	Zooplankton
Raymond Smith	University of California Santa Barbara	BP-032-L/P	Bio-optical
Maria Vernet	Scripps Institution of Oceanography	BP-016-L/P	Phytoplankton ecology

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2002-2003 Science Planning Summary

McMurdo Dry Valleys LTER: The role of natural legacy on ecosystem structure and function in a polar desert

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Project Manager:

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List of 2002-2003 McMurdo LTER projects

The largest ice-free area in Antarctica can be found in the McMurdo Dry Valleys on the western shore of McMurdo Sound. Among the most extreme deserts in the world, the Dry Valleys are the coldest and driest of all LTER sites. Consequently, the biological systems are limited to microbial populations, microinvertebrates, mosses, and lichens. Yet complex trophic interactions and biogeochemical nutrient cycles develop in the lakes, streams, and soils of the Dry Valleys. In the austral summer, solar energy produces glacial melt water, providing vital water and nutrients that are a primary influence on the ecosystems. Such material transport and climatic influences shape all ecosystems, but nowhere is this more apparent than in the McMurdo Dry Valleys.

In 1993, this region was selected as a study site for the National Science Foundation's Long Term Ecological Research (LTER) program. During the first six years, investigators studied the perennially ice-covered lakes, ephemeral streams, and extensive areas of soils to assess the role of physical constraints on the structure and function of the ecosystem. Clearly, the production of liquid water in both terrestrial and aquatic portions or this environment is a primary driver in ecosystem dynamics. Thus, the role of present-day climate variation is extremely important. However, one of the most significant discoveries was that past climatic legacies strongly overprint the present ecological conditions in the McMurdo Dry Valleys.

The McMurdo LTER project focuses on the aquatic and terrestrial ecosystems in the Dry Valleys landscape as a context to study biological processes and to explore material transport and migration. During the second phase of this LTER project, the LTER researchers will continue to investigate the McMurdo Dry Valleys as an "end-member" system, hoping to better ascertain the role of the past climatic legacies on ecosystem structure and function. They will test a series of eight hypotheses in three major focus areas -- hydrology, biological activity/diversity and biogeochemical processes.

Understanding the structure and function of the McMurdo Dry Valleys ecosystem requires understanding hydrological response to climate -- both now and in the past. Current patterns of biological activity and diversity reflect both past and present distributions of water, nutrients, organic carbon, and biota. Biogeochemical processes responsible for the transport, immobilization, and mineralization of nutrients and other chemicals provide the linkages between the region's biota and the physical environment. The timing, duration, and location of biogeochemical processes in the past and present are controlled by water availability. The LTER researchers continue to focus on the integration of the biological processes within and among the lakes, streams, and terrestrial ecosystems that comprise the McMurdo Dry Valleys landscape. The interdisciplinary research team will continue to use modeling and other integrative studies to synthesize data and to examine the McMurdo Dry Valleys ecosystem.

Principal Investigator	Institution	Event Number	Component
Peter T. Doran	University of Illinois, Chicago	BM-042-D	Paleoclimatology, paleoecology, meteorology
Andrew G. Fountain	Portland State University	BM-042-F	Glacier mass balance, melt and energy balance
W. Berry Lyons	Ohio State University	BM-042-L	Chemistry of streams, lakes, and glaciers
Diane M. McKnight	University of Colorado Boulder	BM-042-M	Flow, sediment transport, and productivity of streams
John C. Priscu	Montana State University Bozeman	BM-042-P	Lake pelagic and benthic productivity and microbial food webs
Ross A. Virginia	Dartmouth College	BM-042-V	Soil productivity
Diana H. Wall	Colorado State University	BM-042-W	Soil productivity

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United States Component of the International Trans-Antarctic Scientific Expedition (ITASE)

Project Manager:

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List of 2002-2003 ITASE projects

Formulated in 1990, the International Trans Antarctic Scientific Expedition (ITASE) aims to describe and understand environmental change in Antarctica over the last 200 years. ITASE objectives have been adopted as a key science initiative by the International Geosphere-Biosphere Program (IGBP) and the Scientific Committee on Antarctic Research (SCAR). The 200-year period was chosen because it covers the onset of major anthropogenic involvement in the atmosphere and the end of the Little Ice Age.

US involvement in ITASE is consistent with the objectives established in NSF's Supplemental Environmental Impact Statement for the United States Antarctic Program (SEIPS, 1990), ITASE will provide an environmental framework from which to assess change. Further, the aims of ITASE closely parallel the objectives of NSF's Global Change Research Program, which emphasizes the need for the collection of paleoclimate records, understanding ocean-atmosphere-land-ice interactions, and scaling of dynamic behavior and biogeochemical cycling.

Spanning field seasons from 1997 to 2007, US ITASE focuses on West Antarctica -- a site of major US glaciological activity for more than a decade. As a component of WAIS

(West Antarctic Ice Sheet Initiative), the US ITASE effort entails a four-phase approach:

1. Meteorological modeling and remote sensing will be used to plan sampling strategies conducive to the major objectives of US ITASE.
2. Ground-based sampling (ice cores, radar and surface sampling),
3. Continued monitoring at key sites (meteorology and ice dynamics), and
4. Interpretation and modeling.

In each of four research corridors, ground-based sampling techniques are used to collect 200-year-long ice cores at 100 kilometer intervals. Complementary studies in meteorology, remote sensing, and surface geophysics are integrated with the coring program. These multi- disciplinary studies are taking over several years and provide another level of coordination and collaboration among disparate projects that are already planned or underway in West Antarctica. US ITASE is intended to act as a scientific glue for these projects.

US ITASE provides an important spatial perspective for the shared research goals of a variety of research programs funded by the NSF, NASA and NOAA. By the integration of US ITASE with the ITASE activities of other countries, major contributions will be made to our understanding of Antarctica's role in global change.

Principal Investigator	Institution	Event Number	Component
Paul A. Mayewski	University of Maine	IU-153-A	Project Manager
Joseph R. McConnell	Desert Research Institute	IU-323-O	Deposition of the HFC degradation product trifluoroacetate in Antarctic snow and ice
Robert Jacobel	St. Olaf College	IU-133-O	Radar studies of internal stratigraphy and bedrock topography along the U.S. ITASE traverse
Paul A. Mayewski	University of Maine	IU-153-B	ITASE Glaciochemistry
Mary Albert	Cold Regions Research & Engineering Lab	IU-155-O	Snow and firn microstructure and transport properties: U.S. ITASE
Roger Bales	University of Arizona	IU-158-O	Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica:

			Participation in West Antarctic Traverse
Gordon Hamilton	University of Maine	IU-178-O	Mass balance and accumulation rate along US ITASE Routes
Eric Steig	University of Washington	IU-193-O	Stable isotope studies at West Antarctic ITASE sites
Steven Arcone	Cold Regions Research and Engineering Laboratory	IU-311-O	High resolution radar profiling of the snow and ice stratigraphy beneath the ITASE traverses
Debra Meese	Cold Regions Research and Engineering Laboratory	IU-185-O	The physical properties of the U.S. ITASE ice cores

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