Cover

Palmer Station graces the cover of this year's *Science Planning Summary*. March 2018 marked the fiftieth anniversary of this USAP station located on Anvers Island in the Antarctic Peninsula region. Shaun O'Boyle, an Antarctic Artists and Writers participant to both McMurdo Station (2015-16) and Palmer Station (2017-18), took the photo in October 2017.

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2018 - 2019

Science Planning Summary

United States Antarctic Program

This Science Planning Summary is also available online via the USAP web site at www.usap.gov/sps or by scanning the QR code below with a smart phone or other mobile device.

Table of Contents

Planning and On-Ice Support Points of Contact

Each project has both a planner and implementer point of contact (POC). Some projects may also have a project manager. POCs are listed on the bottom right of project pages (see below).

Program Director	**ASC Points of Contact**
Dr. Program Director	Joe Planner / Jane Implementer / Jack Project Manager

The planner is the point of contact during the proposal and early planning phases of a project; six planners are based in Alexandria, Virginia and one in Centennial, Colorado. A project's implementer becomes the point of contact when the support information package (SIP) is submitted and detailed planning and resource allocation begins. The implementer develops and distributes the research support plan (RSP) and will deploy to Antarctica. Each planner and implementer is responsible for a portfolio of projects as well as other duties.

The first name will always be the planner; In some cases where projects are supported from more than one station, there may be two or more implementers. The order of the implementers' names will correspond with the order of the location designation included in the science event number. (For more information on the science event numbering system, please turn to page iii.)

Finally, a project manager is assigned when the scope of the science proposal is unusually complex and/or requires greater oversight and budgetary responsibilities. The project manager may be assigned either during the proposal review or planning phase, depending on the project's needs and complexity.

Science Event Numbering System

Every funded science project is assigned a unique science event number, e.g., A-000-S.

The first letter, or prefix, indicates the USAP program funding the project.

Prefix	USAP Program
A	Astrophysics and Geospace Sciences
B	Organisms and Ecosystems
C	Integrated System Science
D	Instrumentation and Technology Development
G	Earth Sciences
I	Glaciology
O	Ocean and Atmospheric Sciences
T	Technical Events
W	Artists and Writers Events
X	Other Science Events
Y	Education and Outreach Events

The three digits in the middle are issued consecutively as needed.

The suffix represents the supporting station. If field work will occur at multiple locations, event numbers may have more than one suffix separated by a slash.

Suffix	Supporting Station
E	Special projects supported by the USAP, e.g., investigators working with other national programs
L	ARSV* *Laurence M. Gould*
M	McMurdo Station
N	RV/IB** *Nathaniel B. Palmer*
P	Palmer Station
S	South Pole Station
*ARSV: Antarctic Research and Supply Vessel **RV/IB: Research Vessel/Icebreaker	

Station and Vessel Schedules

Below are the 2018-19 USAP station and vessel schedules. Opening and closing dates are subject to change depending on weather, ice conditions, aircraft availability, and other factors.

Austral Summer Season Openings			**Austral Winter Season Opening**
Station	**Operational**	**Science**	
McMurdo (early season)	22 Aug 2018	23 Aug 2018	24 Feb 2019
McMurdo (Mainbody)	01 Oct 2018	14 Oct 2018	
South Pole	01 Nov 2018	06 Nov 2018	15 Feb 2019
Palmer	06 Oct 2018	06 Oct 2018	05 Apr 2019
Research Vessels	Year-round operations; Vessel schedules are available at www.usap.gov/vesselScienceAndOperations		

Estimated Population		
Location	**Summer**	**Winter**
McMurdo	850 (weekly average) 2,300 (total)	180 (winter total)
South Pole	150 (weekly average) 450 (total)	42 (winter total)
Palmer	36-44 (weekly average) 196 (total)	
RV/IB *Nathaniel B. Palmer*	39 science and staff/25 crew (per cruise)	
ARSV *Laurence M. Gould*	Capacity per cruise: 27 science and staff Capacity per transit to/from Palmer Station: 37 science and staff with two berthing vans	

Staffed Field Camps

In 2018-19, five field camps will have resident staff providing logistics and operations support to McMurdo-based researchers.

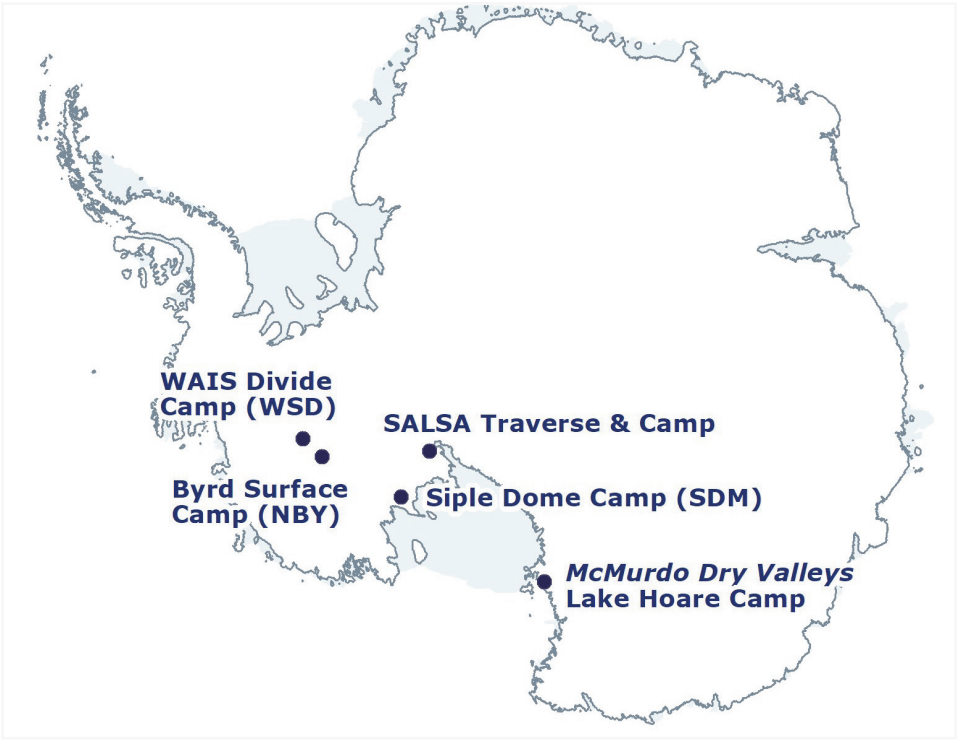


Figure 1. Map of 2018-19 USAP field-camp locations

Byrd Surface Camp (NBY), 80° 1.094' S, 119° 35.184' W
900 nautical miles from McMurdo Station
Byrd Surface Camp serves as a fueling point for aircraft operating between McMurdo Station and West Antarctica. A staff of three will provide daily weather observations, maintain the camp, and receive bulk fuel for out-year operations in support of the Thwaites Glacier campaign. Byrd camp will also have the ability to house and feed KBA Twin-Otter crews as needed.

Dry Valleys: Taylor Valley Camps, 77° 37.38' S, 162° 53.99' E (Lake Hoare Camp)
50 nautical miles from McMurdo Station
Each year, McMurdo Long-Term Ecological Research (LTER) grantees and other science teams conduct research in the Dry Valleys while based at the semi-permanent facilities in Taylor Valley. All the facilities are supported by helicopter operations based at McMurdo Station. This year, two resident staff based at Lake Hoare will oversee operations at Lake Hoare, Lake Fryxell, F6, and Lake Bonney

camps, as well as a small temporary camp at Lake Miers (located farther south in the Dry Valleys). The facility at New Harbor will not be open in 2018-19.

Science teams based out of Dry Valleys camps this season include B-320-M (Schmidt), B-235-M (Salvatore), and a component of C-516-M (Tulaczyk), along with the seven McMurdo LTER teams. T-295-M (Pettit-UNAVCO (University NAVSTAR Consortium)) will provide one to two participants to support McMurdo LTER. An Artists and Writers grantee, W-220-M (Waldman), will stay for a short period at Lake Hoare and possibly one other Taylor Valley camp. In addition, Antarctica New Zealand (ANZ) researchers K080 (Hawes) will join McMurdo LTER for a short period at Lake Bonney. Also, two other ANZ teams, K240 (Morton) and K042 (Stern) have requested stays at two Taylor Valley camps.

SALSA Traverse & Camp, 84° 38.415' S, 149° 30.193' W (Subglacial Lake Mercer)
535 nautical miles from McMurdo Station
The Subglacial Antarctic Lakes Scientific Access (SALSA) camp is a traverse-supported science-drilling site that will act as a field camp for the 2018-19 field season. The camp will support all SALSA science events including: C-533-M (Priscu), C-534-M (Priscu), I-353-M (Fricker) and T-524-M (McManis). The site will support both LC-130 and Twin Otter/Basler aviation operations. All materials on site will be relocated to McMurdo Station or staged at Camp 20 for out-year retrograde movement.

Siple Dome (SDM), 81° 39.840' S, 149° 1.050' W
507 nautical miles from McMurdo Station
This camp serves as a fueling point for aircraft operating between McMurdo Station and West Antarctica or South Pole. Two resident staff will provide daily weather observations and maintain the camp. Siple Dome will also house and feed Kenn Borek Air (KBA) Twin Otter crews as needed. This season, a McMurdo Station construction team will deploy to Siple Dome to relocate the Rac-Tent and freezer cave. While en route, an ANZ tractor traverse (K408-A) will briefly assist in the construction effort, supplying tractor support. Currently, there are no USAP science events scheduled to use Siple Dome.

WAIS Divide Field Camp (WSD), 79° 29.000' S, 112° 5.000' W
891 nautical miles from McMurdo Station
The West Antarctic Ice Sheet (WAIS) Divide field camp with ten resident staff will act as a regional aviation hub for West Antarctica. The camp will support five science projects: C-444-M, (Holland-MELT), C-446-M (Tulaczyk-TIME), G-065-M (Mitrovica) G-079-M (Wilson-POLENET), O-283-M (Lazarra-AWS) and their Twin-Otter missions from the site. Camp staff will also assist in retrograde movement of field gear to McMurdo Station that had been cached by T-150-M (IDPO).

Air Operations

McMurdo-based aircraft, including helicopters, fixed-wing aircraft, and unmanned aircraft systems (UAS) will continue to support USAP researchers and program logistical functions.

Helicopter Support

PHI, Inc. will provide helicopter support with four available aircraft (two AS-350-B2 "A-Stars" and two Bell 212s, plus a spare 212) based out of McMurdo Station. The helicopters will support research in and around McMurdo Sound, the McMurdo Dry Valleys, Royal Society Range, and Ross Island. In order to receive extensive maintenance during the off-season, both A-Stars and one 212 will sail north on the supply vessel in late January, and the two remaining 212s will fly north on a C-17 in late February.

In addition, Antarctica New Zealand (ANZ) will be providing a B3 A-Star (operated by **Southern Lakes Helicopters**) from about mid-October 2018 through mid-February 2019. ANZ and the USAP may collaborate on their helicopter tasking, if necessary and supportable.

~www.phihelico.com

~www.southernlakeshelicopters.co.nz

Fixed Wing Aircraft

The **New York Air National Guard (ANG) 109 AW** LC-130 Hercules will provide research and operational support to South Pole Station and deep-field locations including West Antarctic Ice Sheet (WAIS) Divide, Byrd Camp, Siple Dome, AGAP South, Camp 20, and Subglacial Lake Mercer.

~www.109aw.ang.af.mil

Kenn Borek Air will provide three DHC6 Twin Otter and one DC3 Basler aircraft to support a number of projects throughout the USAP area of operations. They will be based at South Pole and WAIS for much of the season.

In addition, ANZ will be operating a Twin Otter for a period of time during the 2017-18 season. The ANZ Twin Otter will support USAP missions for about one month.

~www.borekair.com

Unmanned Aircraft Systems

A number of USAP and ANZ projects will operate fixed-wing and rotary-wing unmanned aerial vehicles (UAV) in the Ross Island vicinity and deep-field locations.

Antarctic Astrophysics and Geospace Sciences

NSF/OPP Program Director: Dr. Vladimir Papitashvili

(Presented in order of science event number)

A-100-M/S	Chartier, Alex	A-147-M	Devlin, Mark
A-106-M/S	Clauer, C. Robert	A-149-S	Kovac, John
A-107-S	Karle, Albrecht	A-284-M	Palo, Scott
A-111-M/P/S	Gerrard, Andrew	A-333-S	Halzen, Francis
A-112-M/S	Gerrard, Andrew	A-340-S	Vieregg, Abigail
A-115-M	Krawczynski, Henric	A-343-M/S	Conde, Mark
A-118-S	Evenson, Paul	A-364-M/S	Kulesa, Craig
A-119-M/P/S	Taylor, Michael	A-368-S	Nayak, Michael
A-123-M	Chu, Xinzhao	A-369-M/S	Bristow, William
A-127-M/S	Barwick, Steven	A-373-P	Pazhukhov, Vadym
A-128-S	LaBelle, James	A-378-M	Meshik, Alexander
A-130-M	Chu, Xinzhao	A-379-S	Carlstrom, John
A-142-M	Binns, Walter	A-382-P	Fritts, David
A-145-M	Franco, Hugo	A-454-M	Smith, David

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Oblique sounding of ionized patches in the Antarctic ionosphere - instrument development and testing

A-100-M/S

NSF/OPP Award 1643773
Dr. Alex Chartier, Principal Investigator
Johns Hopkins University
Applied Physics Laboratory
Baltimore, Maryland

Phone: 240.228.3895
Email: alex.chartier@jhuapl.edu
Web: n/a

Research Locations
T-Site / Dark Sector

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
Ionospheric regions/structures associated with ionized patches are known to disrupt radio signals at high latitudes, which can impact search-and-rescue operations and other radio communications. Recent statistical studies showed a strong annual trend for ionized patches at about 300-km altitude, which appears to peak in the same months in the Arctic and Antarctic. This contrasts with established theories that predict seasonal trends, with patch occurrence peaks during each hemisphere's winter. Researchers on this project hope to confirm the Antarctic patch occurrence rates using independent sounding observations, along with observations of the ionospheric electric field behavior from existing ionospheric radars.

Field Overview
The ionosonde's transmitter will be installed on Observation Hill at McMurdo Station and will send radio pulses toward South Pole, where the receiver will collect data from this oblique sounding of ionized patches, following their formation, propagation, and dynamics. The 12-month-long period of testing this instrument in Antarctica will also allow scientists to collect enough experimental data to potentially deploy an array of transmitters at remote Antarctic locations, while the oblique sounding signals will be received and processed at the ionosonde's hub receiver at South Pole.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Elizabeth Kauffman / Timothy Ager / Neal Scheibe

Polar Experiment Network for Geospace Upper-atmosphere Investigation – PENGUIn: Interhemispheric investigations along the 40-degree magnetic meridian

A-106-M/S

Research Locations
East Antarctic Plateau
(PG4 site)

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Mid December to early January

NSF/OPP Award 1543364
Dr. C. Robert Clauer, Principal Investigator
Virginia Tech
Hampton, Virginia

Phone: 540.231.6646
Email: rclauer@vt.edu
Web: mist.nianet.org/

Project Description
The solar wind-magnetosphere-ionosphere coupling system is a complex and dynamic environment that affects critical infrastructure such as satellite communications and power grids, thus driving so-called space weather. To forecast, and thus adapt to, the effects of space weather events, researchers must develop accurate geomagnetic models of the Sun-Earth environment. The Northern Hemisphere is relatively well instrumented, but the Southern Hemisphere is not. This project established a chain of Autonomous Adaptive Low-Power Instrument Platforms (AAL-PIP) along the 40° magnetic meridian in Antarctica. The deployed chain of instruments will measure variations in the geomagnetic field that are conjugate to the west coast of Greenland (also equipped with magnetometers) for investigation of the interhemispheric electrodynamic coupling.

Field Overview
A two-person team will fly by LC-130 aircraft to South Pole Station and will then make a day trip by Twin Otter aircraft to the site of a malfunctioning PG4 station that was previously installed. While at the site, the team will swap the malfunctioning box with a tested replacement.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Jennifer Blum / Timothy Ager / Neal Scheibe

Development of the Askaryan Radio Array ultra-high energy neutrino detector at the South Pole

A-107-S

NSF/OPP Award 1404212
Dr. Albrecht Karle, Principal Investigator
University of Wisconsin Madison
Department of Physics
Madison, Wisconsin

Phone: 608.890.0542
Email: karle@icecube.wisc.edu
Web: ara.physics.wisc.edu

Research Locations
On station

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
The Askaryan Radio Array (ARA) testbed stations are aimed to detect high-energy neutrinos from space by observing radio pulses generated by neutrinos as they travel through and interact with ice. At these very high energies, neutrinos can be detected in dense, radio-frequency-transparent media, such as ice, by the Askaryan effect—an excess of negative charge that builds up when electrons are swept out along a neutrino shower front advancing relativistically through the ice. The ice's thickness (estimated to be almost two miles) and exceptional radio-frequency clarity make the southern polar ice cap an ideal place to study these ultra-high-energy neutrinos.

Field Overview
The on-ice activities of the ARA team this season will focus on improving the performance of the five previously deployed stations, doing some maintenance, surveying existing stations, and conducting calibration tasks. South Pole Ice Core (SPICECore) logging will provide additional radio sources for ARA calibration. The team will establish wireless communication between the ARA1 station and the Ice Core Lab to support test-mode operations. ARA personnel may also support some of the Antarctic Ross Ice-Shelf Antenna Neutrino Array (ARIANNA) activities at South Pole.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Paul Sullivan / Timothy Ager / Leah Street

The next generation of geospace research facilities at South Pole and McMurdo Stations

A-111-M/P/S

NSF/OPP Award 1643700
Dr. Andrew Gerrard, Principal Investigator
New Jersey Institute of Technology
Department of Physics
Newark, New Jersey

Phone: 732.357.5230
Email: gerrard@njit.edu
Web: n/a

Research Locations
Antenna Field / Arrival Heights / Terra Lab

Supporting Station/Vessel
McMurdo Station, Palmer Station, South Pole Station

Dates in Antarctica
October to mid January

Project Description
The geomagnetic field protects life on Earth from geomagnetic storms and coronal mass ejections that could affect satellites and disrupt communication with ground stations. The polar caps are specific areas around the geomagnetic poles where geomagnetic field lines are open and directly interact with the interplanetary magnetic field. There are many geospace-monitoring stations over the northern polar cap but far fewer on the southern polar cap. This project integrates clustered instrumentation at all three USAP stations to examine solar-wind interactions within the entire geospace system. Instruments include: ground-based fluxgate and search-coil magnetometers, extremely low frequency (ELF) and very low frequency (VLF) receivers, imaging and broadband riometers, sky-looking optical systems, and GPS scintillation-rated receivers.

Field Overview
A team of three will deploy to McMurdo Station in mid December. In late December, the team will deploy to South Pole for approximately two weeks. Tasking will include replacing the Bath University GPS computer, installing a proton magnetometer, inspecting the riometer antennas, and performing general data-acquisition system checks. They will also provide support and maintenance for instruments still in place at both McMurdo and South Pole from past project's (A-109-S (Moore) and A-102-S (Lessard)). Specifically, they will: evaluate the VLF antennas and determine if excess snow accumulation needs to be moved, inspect antennas and cable for damage, calibrate the VLF system, catalog and package data for shipment northbound, and prepare the system for winter operations. One participant will deploy via the ARSV *Laurence M. Gould* to Palmer Station to review and repair the VLF receiver installed there.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
J. Rand / E. Kauffman / J. Johnson / T. Ager / N. Scheibe

Scientific studies from a network of sustainable, robotic observatories across the Antarctic ice shelf: A new approach to polar research

A-112-M/S

NSF/OPP Award 1443507
Dr. Andrew Gerrard, Principal Investigator
New Jersey Institute of Technology
Department of Physics
Newark, New Jersey

Phone: 732.357.5230
Email: gerrard@njit.edu
Web: n/a

Research Locations
AGO sites / AGO5

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Early November to mid January

Project Description
The Automatic Geophysical Observatories (AGOs) are five unmanned stations deployed over the Antarctic Plateau that provide power and data transmission capabilities for various research instrumentation. Historically, the AGO program has collected magnetospheric data in the polar cap and auroral zone, with each AGO unit housing fluxgate and search-coil magnetometers, a riometer, a VHF antenna, and all-sky imagers. AGO platforms have attracted the attention of the broader scientific community, and now the AGO facilities also support seismometers, GPS receivers, and automatic weather stations.

Field Overview
Two teams, each accompanied by an ASC mountaineer, will visit AGO4 and AGO5 to make upgrades and repairs to equipment. The first mission will be to AGO4 in late December from South Pole. The second will be to AGO5 in mid January from McMurdo Station.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
S. Ouda / E. Kauffman / J. Blum / T. Ager / N. Scheibe

X-Calibur

A-115-M

NSF / NASA Agreement
Dr. Henric Krawczynski, Principal Investigator
Washington University
Physics
St. Louis, Missouri

Phone: 314.935.8553
Email: krawcz@wustl.edu
Web: sites.wustl.edu/xcalibur/

Research Locations
Williams Field (Long-Duration Balloon Facility)

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to mid February

Project Description
X-Calibur is a balloon-borne X-ray polarimetry mission that will observe mass-accreting black holes and neutron stars in the 25-60 kiloelectronVolts (keV) energy range. X-Calibur measures the linear polarization degree and angle – two new observables relating to the uniformity and orientation of the electric field carried by X-rays. This new capability of polarimetry allows X-Calibur to obtain geometrical information about objects that are too far away and too small to be imaged. The 2018-19 balloon flight will be used to observe four to 10 sources and to measure their energy-dependent hard X-ray polarization properties. The sources will include the accreting neutron star and X-ray pulsar Vela-X1, and the results will constrain the location and physical mechanisms that accelerate particles in Vela-X1.

Field Overview
The X-Calibur mission will launch on a high-altitude balloon flight from near Williams Field as part of the Columbia Scientific Balloon Facility (CSBF) Long-Duration Balloon (LDB) ballooning operations. The deployment and recovery teams will reside at McMurdo Station and make day trips to the launch site. The deployment team will remain in Antarctica until the payload is out of line-of-sight communications. The recovery team will, ideally, recover the instrument in the same season. If that is not possible, they will return the following season. The most crucial payload items will be recovered on an initial Twin Otter aircraft reconnaissance flight. The rest of the payload will be recovered on subsequent Twin Otter and Basler flights. If the payload terminates far from McMurdo Station, the team may reside in a field camp for up to two weeks to facilitate disassembly of the instrument.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Kaija Webster / Chad Naughton

Element composition of high-energy solar particles

A-118-S

NSF/OPP Award 1341562
Dr. Paul Evenson, Principal Investigator
University of Delaware
Physics and Astronomy
Newark, Delaware

Phone: 302.831.2988
Email: evenson@udel.edu
Web: neutronm.bartol.udel.edu/

Research Locations
B2 Science Building

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Late November to late January

Project Description
This project operates a neutron-monitor suite, which serves as the linchpin of the worldwide neutron monitor network at low energies. Opening the IceCube Neutrino Observatory has added a new dimension to this capability: the IceTop array of ice Cherenkov detectors. Central to the research is understanding the response of these detectors to the radiation environment of the South Pole, particularly to determine the cause of the peculiar secular decline in cosmic ray intensity at South Pole throughout the 50-year operating period of the neutron monitor. Understanding this decline is important because cosmic rays produce radionuclides like Beryllium-10 that become trapped in the ice and are used to determine ice-core ages and precipitation levels over Earth's polar regions. An understanding of the production rate is vital to interpreting these data.

Field Overview
This austral summer, a two-person science team will inspect the equipment and perform routine maintenance and upgrades. They will work in the B2 Science Building and on the outdoor remotes to mitigate the effects of static build up on windy days, which corrupts the data and requires equipment restarts. Up to two hours per week of research associate support will be provided throughout the year for routine monitoring and maintenance of equipment, if required.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe

Continental-scale studies of Mesospheric dynamics using the Antarctic Gravity Wave Instrument Network (ANGWIN)

A-119-M/P/S

NSF/OPP Award 1443730
Dr. Michael Taylor, Principal Investigator
Utah State University
Center for Atmospheric and Space Sciences
Logan, Utah

Phone: 435.797.3919
Email: mike.taylor@usu.edu
Web: ail.usu.edu/Data/Data.html

Research Locations
Arrival Heights / B2 Science Building / Terra Lab / Vernadsky Station

Supporting Station/Vessel
McMurdo Station, Palmer Station, South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
Gravity waves are key drivers of the general circulation and temperature distributions throughout the middle and upper atmosphere. The Antarctic Gravity Wave Imaging Network (ANGWIN) is a cooperative effort of six international Antarctic programs to collect continent-wide gravity wave measurements. This network capitalizes on existing optical and radar measurement capabilities at McMurdo, Palmer, South Pole, and six other research stations: Halley (UK), Syowa (Japan), Davis (Australia), Rothera (UK), and Ferraz (Brazil). The network quantifies the properties, variability, and momentum fluxes of short-period (less than one hour) mesospheric gravity waves and their dominant sources and effects over the Antarctic continent. An all-sky near-infrared (IR) imager is also installed at Palmer Station to augment the existing instrumentation and create a capability for studying gravity wave properties at each site.

Field Overview
A team of two will deploy to McMurdo Station to service the all-sky imager and the Advanced Mesospheric Temperature Mapper (AMTM) currently installed at Arrival Heights. They will then fly to the South Pole for about four days to check the large IR imaging system, clean the optics, and train the new support contractor research associate. No team members will deploy to Palmer Station this season. Image data obtained during the winter season at Palmer Station will be sent to the home institution for analysis.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe

Simultaneous Na Doppler and Fe Boltzmann LiDAR observations and modeling of the middle and upper atmosphere at McMurdo, Antarctica

A-123-M

NSF/OPP Award 1443726
Dr. Xinzhao Chu, Principal Investigator
University of Colorado Boulder
CIRES
Boulder, Colorado

Phone: 303.492.3280
Email: xinzhao.chu@colorado.edu
Web: cires1.colorado.edu/science/groups/chu/

Research Locations
Arrival Heights / ANZ Lab C

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to late September

Project Description
Researchers on this project will deploy a narrow-band, three-frequency Na (Sodium) Doppler LiDAR to McMurdo Station that is capable of measuring both winds and temperatures vertically. This LiDAR makes high-resolution simultaneous observations of the middle and upper atmosphere with the co-located Fe Boltzmann LiDAR. Both instruments are hosted by the Antarctica New Zealand (ANZ) program in their Arrival Heights building since late 2010. The Na Doppler observations provide critical data to address key science challenges associated with the space-atmosphere interaction region.

Field Overview
Observations with the STAR Na Doppler LiDAR started in January 2018 and continue through the entire year including over the austral winter. Researchers also continue simultaneous observations with the Fe LiDAR (A-130-M) at Arrival Heights while finishing optimization of the Na LiDAR, upgrading the Fe LiDAR, and training new winter and summer students. Students will conduct data analysis and progress toward the completion of their graduate degrees.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Richard Dean

Precision operation of Hexagonal Radio Array (HRA)

A-127-M/S

NSF/OPP Award 1607719
Dr. Steven Barwick, Principal Investigator
University of California Irvine
Department of Physics and Astronomy
Irvine, California

Phone: 949.824.2626
Email: sbarwick@uci.edu
Web: arianna.ps.uci.edu

Research Locations
ARIANNA site at Moore's Bay

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Late October to early January

Project Description
The pilot project for the Antarctic Ross Ice-Shelf Antenna Neutrino Array (ARIANNA) consists of seven autonomous stations, called the Hexagonal Radio Array (HRA). Located on the surface of the Ross Ice Shelf in Antarctica, the HRA is designed to detect short-duration radio pulses generated by neutrino interactions in the ice, which reflect from the ice-water surface at the bottom of the Ross Ice Shelf up to the stations on the surface. These measurements provide important insight on the locations of the most powerful particle accelerators in the universe, and allow physicists to probe for novel physics beyond the standard model used in the field.

Field Overview
Four team members will travel by helicopter to the ARIANNA camp site at Moore's Bay, south of McMurdo Station. They will receive support contractor assistance to put in a three-week tent camp. While there, they will collect data from all stations, elevate solar panels to minimize snow accumulation, and upgrade and test software. Upon returning to McMurdo Station, two participants will travel to South Pole Station. They will spend about 10 days moving the equipment installed last season to a new location near South Pole Station.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Jenny Cunningham / Jennifer Blum / Paul Sullivan

Earth's electromagnetic environment: Advancing recent discoveries in auroral plasma radio emission research

A-128-S

NSF/OPP Award 1443338
Dr. James LaBelle, Principal Investigator
Dartmouth College
Department of Physics & Astronomy
Hanover, New Hampshire

Phone: 603.646.2973
Email: jlabelle@aristotle.dartmouth.edu
Web: www.dartmouth.edu/~spacephy/

Research Locations
B2 Science Building / V8 Vault

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
This project uses existing instruments at South Pole Station to answer outstanding questions raised by the discovery of correlations between auroral kilometric radiation (AKR) observed 200,000 kilometers above Earth. The AKR-like signals were also observed simultaneously at South Pole Station. The higher electron cyclotron harmonic radiation is polarized, which suggests different and possibly nonlinear generation mechanisms. These phenomena are best observed, and in most cases can only be observed, from Antarctica, making the South Pole a perfect location for the experiment.

Field Overview
A support contractor research associate will help facilitate data transfers to the home institution and will perform routine maintenance and replace disks as necessary. Working remotely over the Internet, the researchers may change the modes of the receiver data collection to reflect different science objectives at different times of the year.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe

LiDAR investigation of middle and upper atmosphere temperature, composition, chemistry, and dynamics at McMurdo, Antarctica

A-130-M

NSF/OPP Award 1246405
Dr. Xinzhao Chu, Principal Investigator
University of Colorado Boulder
CIRES
Boulder, Colorado

Phone: 303.492.3280
Email: xinzhao.chu@colorado.edu
Web: cires1.colorado.edu/science/groups/chu/projects/mcmurdo.html

Research Locations
Arrival Heights / ANZ Lab C

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to late February

Project Description
This project continues the operation of the Fe Boltzmann LiDAR instrument installed in the Antarctica New Zealand (ANZ) lab at Arrival Heights. Primary research objectives are to acquire vertical profiles of atmospheric temperature (30–155 kilometers), Fe (iron) density (70–155 kilometers), and polar mesospheric cloud (PMC), to study the chemistry and dynamics of the polar atmosphere and to establish the baseline temperature, Fe, PMC, and gravity-wave climatologies.

Field Overview
Team members will deploy for both the A-130 and the A-123 projects and will work on both projects for simultaneous observations. They will upgrade instruments and perform routine maintenance and student trainings. They will also conduct data analysis on the ice, and students will progress toward the completion of their graduate degrees.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Richard Dean

Super Trans-Iron Galactic Element Recorder (SuperTIGER)

A-142-M

NSF / NASA Agreement
Dr. Walter Binns, Principal Investigator
Washington University
Physics Department
St. Louis, Missouri

Phone: 314.935.6247
Email: wrb@wuphys.wustl.edu
Web: supertiger.wustl.edu/

Research Locations
Williams Field

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to early February

Project Description
SuperTIGER builds on the heritage of the smaller Trans-Iron Galactic Element Recorder (TIGER) flown from Williams Field in 2001 and 2003. This next-generation version is a large-area instrument that measures the elemental abundances of cosmic rays from Zinc to Molybdenum. The instrument can detect an unprecedented combination of individual elements at an extraordinary resolution and statistical precision. The data collected will permit a sensitive test of the hypothesis that microquasars or other phenomena could superpose spectral features on the otherwise smooth energy spectra previously measured with less statistical accuracy.

Field Overview
Super TIGER-II will be launched on a high-altitude balloon from Williams Field as a part of the Columbia Scientific Balloon Facility (CSBF) Long-Duration Balloon (LDB) operations. The team will reside on station until the launch. Soon thereafter, some of the team will leave and some will stay at McMurdo Station to monitor data and participate in instrument recovery after the flight terminates. Those at McMurdo Station will be joined by one other team member in January. Instrument recovery will be supported by multiple flights of either a Twin Otter or Basler aircraft. Recovery will likely require that three members of the science team camp at the recovery site for about one week to disassemble the instrument and load it onto the recovery aircraft.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Chad Naughton / Scott Battaion

NASA Long Duration Balloon (LDB) support program

A-145-M

NSF / NASA Agreement
Mr. Hugo Franco, Principal Investigator
Columbia Scientific Balloon Facility
Palestine, Texas

Phone: 903.723.8002
Email: Hugo.Franco@nasa.gov
Web: www.csbf.nasa.gov

Research Locations
McMurdo Station / Long-Duration Balloon Facility

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to early February

Project Description
This austral summer the Columbia Scientific Balloon Facility (CSBF) will launch three stratospheric balloons as part of NASA's Long-Duration Balloon (LDB) program. The balloons measure 400 feet in diameter, expand to a volume of 40 million cubic feet, and ascend at a rate of about 900 feet per minute to a float altitude of 125,000 feet. Because of the Antarctic wind pattern that starts in early December, the balloons will circumnavigate Antarctica between 70° and 80° south latitude. Payloads are composed of scientific instruments, command and control systems, and solar- and/or battery-powered units. The bulk of the data collected is stored using onboard hard drives, with a small amount sent by radio telemetry to the United States.

Field Overview
Field team members will facilitate the preparation, launch, and recovery of NASA-sponsored high-altitude balloons and science payloads. The team will be housed at McMurdo Station and will commute daily to the LDB launch facility. Balloon and payload preparations are timed to coincide with favorable weather and wind patterns. Upon termination of the flights, recovery teams will use fixed-wing and/or helicopter support to retrieve the payloads.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Kaija Webster / Chad Naughton

Balloon-borne Large Aperture Sub-millimeter Telescope (BLAST-POL)

A-147-M

NASA / NSF Agreement
Dr. Mark Devlin, Principal Investigator
University of Pennsylvania
Department of Physics and Astronomy
Philadelphia, Pennsylvania

Phone: 215.573.7521
Email: devlin@physics.upenn.edu
Web: sites.northwestern.edu/blast/

Research Locations
McMurdo Station / Long-Duration Balloon Facility

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to late January

Project Description
The Balloon-born Large Aperture Submillimeter Telescope (BLAST) experiment measures polarized dust emission in our galaxy. The asymmetric dust grains are spun up by interacting with ultra-violet photons in star-forming regions. The dust grains can then align with the galactic magnetic field. Since they preferentially emit along their long axis, the dust polarization can be used to map the magnetic fields. Researchers on this project hope to understand the role magnetic fields play in star formation. In addition, they will work to better understand the polarized dust emission as a foreground for current and future cosmic microwave background experiments.

Field Overview
BLAST flies as a NASA high-altitude balloon payload. The team will reside at McMurdo Station and make day trips to the Long-Duration Balloon (LDB) launch facility. They require that cryogenic supplies (liquid helium and liquid nitrogen) be available when needed to allow them to get their instrument flight-ready on schedule. After the launch, the team will monitor and control the balloon payload around the clock from office space at McMurdo Station. At flight termination, the team will retrieve their payload to further analyze the acquired data.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Kaija Webster / Chad Naughton

Imaging the beginning of time from the South Pole: The next stage of the BICEP program

A-149-S

NSF/OPP Award 1638957
Dr. John Kovac, Principal Investigator
Harvard University
Cambridge, Massachusetts

Phone: 617.496.0611
Email: jmkovac@cfa.harvard.edu
Web: bicepkeck.org/

Research Locations
Dark Sector

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Early November to mid February; instruments operate year around.

Project Description
This project continues the Background Imaging of Cosmic Extragalactic Polarization (BICEP)/Keck/BICEP3 program of cosmic microwave background (CMB) polarization observations, while initiating the phased upgrade to the new BICEP Array. This upgrade follows the tradition of improving upon the previous generation's detectors housed in the mounts originally built for the Degree Angular Scale Interferometer (DASI), then subsequently used by the Small Polarimeter Upgrade for DASI (SPUD) and most recently the Keck Array.

Field Overview
At station opening, the team will use the Martin A. Pomerantz Observatory (MAPO) roof crane to take down one of the five Keck array receivers. It will be replaced with a 150 GHz receiver retrofitted with new ultra-high frequency (UHF) multiplexer readout hardware for focal-plane replacement. Once that is done, and the receivers are re-mounted, they will run test observations and perform any necessary calibrations. Support contractors will enlarge the opening in the ground shield and continue to work with the BICEP team to plan the installation of the BICEP array in 2019-20.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Paul Sullivan / Timothy Ager / Neal Scheibe / Leah Street

Lower thermospheric science using new meteor radars at McMurdo Station

A-284-M

NSF/OPP Award 1543446
Dr. Scott Palo, Principal Investigator
University of Colorado Boulder
Department of Aerospace Engineering Sciences
Boulder, Colorado

Phone: 303.492.4289
Email: scott.palo@colorado.edu
Web: ccar.colorado.edu/meteors/

Research Locations
On station

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Instruments operate year around.

Project Description
This project will observe the mesosphere and lower thermosphere (MLT) at an altitude between 80 and 120 km above the earth. This is a highly dynamic region that couples the lower terrestrial atmosphere with the upper atmosphere near-earth space environment. Of particular importance in this region are both the upward propagating thermally forced atmospheric tides, global-scale planetary waves, and small-scale gravity waves. All these phenomena transport heat and momentum from the lower atmosphere into the upper atmosphere. The primary goal of this research is to observe, quantify, model, and further understand the spatial-temporal structure and variability of the MLT circulation above Antarctica.

Field Overview
Three science team members will arrive on station early in the season and will stay for about two weeks. They will make upgrades to the existing system, including the installation of new receiver hardware and upgrading the transmit antenna system, increasing the transmitting power to 32 kW. The experiment runs year around. A support contractor research associate will provide weekly support throughout the year.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Elizabeth Kauffman

Management and operations of the IceCube Neutrino Observatory 2016-2021

A-333-S

NSF/OPP Award 1600823
Dr. Francis Halzen, Principal Investigator
University of Wisconsin Madison
Physics Department
Madison, Wisconsin

Phone: 608.262.2667
Email: halzen@icecube.wisc.edu
Web: icecube.wisc.edu

Research Locations
Dark Sector

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Early November to late January; instruments operate year around.

Project Description
The IceCube neutrino telescope transforms a cubic kilometer of ice into a Cherenkov detector. IceCube will open unexplored wavelength bands for astronomy using neutrinos as cosmic messengers. The project is an international collaboration, and the University of Wisconsin Madison serves as the host institution providing oversight and staffing.

Field Overview
On-Ice activities will include maintenance and operations improvements to the existing IceCube infrastructure. This work will take place primarily in the South Pole IceCube Counting Laboratory (ICL). The following is planned: (1) replacing half of the dedicated IceCube servers in the ICL; (2) logging in the South Pole Ice Core (SPICECore) borehole; (3) training winter-over personnel; (4) calibration runs; (5) performing IceTop Marker pole maintenance; (6) installing additional IceACT (air Cherenkov telescope) detectors; (7) replacing and disposing of 2,000 pounds of uninterruptable power supply (UPS) batteries; (8) providing on-ice data acquisition upgrades support; (9) retrograding Jade disks and other IT-related tasks; and (10) scintillator maintenance, including elevating raised detector panels. Support contractor personnel will survey the locations of the scintillators and IceTops and provide requested copper grounding railings in the doghouse.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Paul Sullivan / Timothy Ager / Neal Scheibe / Leah Street

Radio detection of the highest energy neutrinos with a ground-based interferometric phased array

A-340-S

NSF/PHY 1607555
Dr. Abigail Vieregg, Principal Investigator
University of Chicago
Chicago, Illinois

Phone: 773.834.2988
Email: avieregg@kicp.uchicago.edu
Web: n/a

Research Locations
Dark Sector

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Mid November to early January; instruments operate year around.

Project Description
The ground-based interferometric phased-array high-energy neutrino detector is designed to discover the highest energy particles in our universe. Radio emission from particle cascades induced by neutrinos in glacial ice will be observed using an interferometric phased array that will be co-located with the Askaryan Radio Array (ARA) (Karle, A-107-S). These observations will be used to verify and extend IceCube astrophysical neutrino flux data to higher energies, inform design decisions for future detectors, and search for high-energy neutrinos. This project will be located at the South Pole to take advantage of the radio clarity and depth of the ice.

Field Overview
Two participants will deploy for four weeks to South Pole Station. They will retrofit the previously installed phased-array electronics with better heat sinking capacity, perform further calibration of the system, and install auxiliary surface channels to complement the phased-array trigger.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Paul Sullivan / Timothy Ager / Neal Scheibe

High-resolution mapping of thermospheric wind and temperature fields near the equatorward edge of the Antarctic polar cap

A-343-M/S

NSF/OPP Award 1341545
Dr. Mark Conde, Principal Investigator
University of Alaska Fairbanks
Physics Department
Fairbanks, Alaska

Phone: 907.474.7741
Email: mgconde@alaska.edu
Web: sdi_server.gi.alaska.edu/sdiweb/index.asp

Research Locations
Arrival Heights / Atmospheric Research Observatory (ARO)

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Early February to late December

Project Description
The project operates and maintains all-sky imaging Fabry-Perot spectrometers at McMurdo and South Pole Stations to map the wind and temperature fields that occur in the thermosphere above Antarctica. Data collected from these instruments will be used to test the hypothesis that the thermosphere's most dynamic weather occurs in latitudes just poleward of the boundary between the auroral oval and the polar cap.

Field Overview
This season, two team members will perform minor repairs and upgrades to the two Fabry-Perot instruments located at McMurdo and South Pole Stations. Work will include routine mechanical maintenance, optical alignment, and data archiving. They will spend about one week at each station.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Elizabeth Kauffman / Paul Sullivan

Continuing operation of the High Elevation Antarctic Terahertz (HEAT) telescope at Ridge A, Antarctica

A-364-M/S

NSF/OPP Award 1410896
Dr. Craig Kulesa, Principal Investigator
University of Arizona Tucson
Steward Observatory
Tucson, Arizona

Phone: 520.205.2872
Email: ckulesa@email.arizona.edu
Web: soral.as.arizona.edu/heat/

Research Locations
Ridge A

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
Stars within the Milky Way are formed when giant gas clouds, composed primarily of hydrogen and helium, collapse under their own gravity, thus heating up the gas to the point where nuclear fusion is triggered and stars are formed. The life cycles of these interstellar clouds drive the internal evolution of all galaxies. The HEAT science team studied the earliest stages of the formation of these clouds by observing the spectra from certain atomic and molecular species, which serve as tracers of these clouds. Outside of space, the Antarctic plateau on which the HEAT telescope is located is one of the few places on Earth that these observations can be made.

Field Overview
Three participants and one support contractor field safety coordinator will prepare at McMurdo Station for approximately one week before deploying to South Pole Station, where they will acclimatize before traveling to Ridge A by Twin Otter aircraft. The team will reside in a tent camp and begin the retrograde operations for the HEAT telescope and equipment. The retrograde activities will require up to five Twin Otter days to remove all items.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Jennifer Blum / Samina Ouda / Timothy Ager

Probing satellite interiors with long-duration photometric observations

A-368-S

NSF / AFOSR Interagency Agreement
Dr. Michael Nayak, Principal Investigator
Air Force Research Laboratory
Maui Optical and Supercomputing Site
Kihei, Hawaii

Phone: 386.983.6135
Email: michael.nayak@gmail.com
Web: www.michaelnayak.com/landit/

Research Locations
On station

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Mid November to early December

Project Description
This project will investigate the internal structure of the planets Jupiter and Saturn to discriminate between competing models for their formation, and subsequently advance understanding of solar-system evolution. The principal investigator will use the Lightweight Antarctic Day and Night Imaging Telescope (LANDIT) to provide the first unambiguous identification or normal modes of oscillation of Jupiter and Saturn, providing a probe into their deep internal structure and rotation profiles.

Field Overview
One participant will deploy to the South Pole in mid November and will work with support contractor station personnel and engineering to conduct a site survey for the telescope's deployment. In anticipation for next year's work, the participant will take atmospheric seeing measurements using a combination of a Differential Image Motion Monitor (DIMM) telescope and a scintillometer array.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Paul Sullivan / Timothy Ager / Neal Scheibe / Leah Street

Antarctic and conjugate research using SuperDARN

A-369-M/S

NSF/OPP Award 1443504
Dr. William Bristow, Principal Investigator
University of Alaska Fairbanks
Geophysical Institute
Fairbanks, Alaska

Phone: 907.474.7357
Email: wabristow@alaska.edu
Web: superdarn.gi.alaska.edu

Research Locations
Building 072

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
The Super Dual Auroral Radar Network (SuperDARN) is a global international radar network of 32 installations observing high-frequency bands between eight and 22 MHz. These systems help answer questions about geomagnetic conjugacy of global magnetic storms and substorms and differences in the ionospheric plasma convection caused by the asymmetry of solar illumination in both hemispheres. The SuperDARN network can observe global-scale convection with excellent temporal and spatial resolution, which makes it a powerful tool for ground-based research, enabling scientists to address fundamental and important questions of space physics. The data it acquires are also relevant to space-weather studies and enhances the usefulness of data from other instruments.

Field Overview
Each austral summer researchers deploy to McMurdo and South Pole Stations to perform system maintenance such as inspecting the equipment, tightening guy wires and antennas, replacing shackles, re-leveling the radar poles, and updating/ repairing the on-site computer system. Throughout the year, contractor staff maintain system components and vehicular access to the array. In addition, the team will install a small ionosonde at McMurdo Station. The installation will require the erection of the antennas and installation of electronic components.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Elizabeth Kauffman / Timothy Ager / Neal Scheibe

Troposphere-ionosphere coupling via atmospheric gravity waves

A-373-P

NSF/OPP Award 1341557
Dr. Vadym Paznukhov, Principal Investigator
Boston College
Institute for Scientific Research
Chestnut Hill, Massachusetts

Phone: 617.552.6589
Email: vadym.paznukhov@bc.edu
Web: n/a

Research Locations
On station

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Instruments operate year around.

Project Description
In the Earth's layered atmosphere, gravity (or internal) waves are quasi-periodic disturbances most familiar as the wave-like cloud patterns observed in the lee of mountain ranges. This project investigates the role of atmospheric gravity waves in the ionosphere-troposphere coupling. Researchers will investigate the dynamics of plasma density irregularities in the ionospheric F-region, and the connection of these irregularities with atmospheric gravity waves. Antarctica is ideally suited to this study as large numbers of gravity waves are observable there and the electromagnetic background is quiet, which is important for detection of the radio signals to be observed in this study.

Field Overview
This is the final season of this project. A support contractor research associate will assist in taking down and packing and shipping the equipment and instruments back to the researcher's home institution. Contractor science construction personnel will remove the three antennas in the Palmer Station "backyard."

Program Director
Dr. Peter Milne

ASC Points of Contact
John Rand / Jamee Johnson

The Balloon Air Sampler (BAS) experiment: Capture and analyses of noble-gas isotopes at high elevation above Antarctica

A-378-M

NSF Agreement
Dr. Alexander Meshik, Principal Investigator
Washington University
Saint Louis, Missouri

Phone: 314.935.5049
Email: ameshik@wustl.edu
Web: n/a

Research Locations
Long-Duration Balloon Facility

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
No deploying team members.

Project Description
This project will capture air samples at high elevation over Antarctica for noble-gas isotope analyses. These analyses will allow researchers to set the limit on preferential (to krypton) xenon loss due to enhanced ionization and therefore could provide an explanation for "missing terrestrial xenon," a long-standing "xenon paradox."

Field Overview
This is a piggyback experiment on the SuperTIGER (A-142-M) balloon-borne instrument. It will be shipped to Antarctica with the SuperTIGER equipment and will be bolted onto the instrument before launch by SuperTIGER personnel. In the event of a data recovery only this year, the team requests that their experiment be recovered along with the SuperTIGER data vaults. Launch and retrieval operations will be handled by the SuperTIGER team.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Kaija Webster / Chad Naughton

Cosmological research with the 10-meter South Pole Telescope

A-379-S

NSF/OPP Award 1248097
Dr. John Carlstrom, Principal Investigator
University of Chicago
Astronomy and Astrophysics
Chicago, Illinois

Phone: 773.834.0269
Email: jc@kicp.uchicago.edu
Web: pole.uchicago.edu

Research Locations
Dark Sector

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
November to mid-February; instruments operate year around.

Project Description
The South Pole Telescope (SPT) aids cosmological research by measuring the intensity and polarization anisotropy of the cosmic microwave background (CMB) radiation. The project's goal is detecting all galaxy clusters in this region of the sky through the spectral distortion they impart on the CMB. Called the Sunyaev-Zel'dovich effect, it has the remarkable property of being independent of the distance to the cluster. The second key project started in 2012 with the installation of an ultra-sensitive polarization receiver. Through measurements of the polarization, researchers can determine the sum of the masses of the neutrinos and either detect or set stringent upper limits on the energy scale of inflation.

Field Overview
The team will perform maintenance on the telescope drive electronics, and the SPT-3G and Event Horizon Telescope (EHT) receivers. The SPT-3G receiver upgrade will require removal of the cryostat from the telescope and opening it up to replace portions of the optics and cold-readout hardware. Most of this work will happen in November and December, with a goal of having the receiver reinstalled on the telescope by the end of December. Support contractor staff will install chain-link fencing in the former load-leveler room and work with the researchers on configuring the rest of the space.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
Paul Sullivan / Timothy Ager / Neal Scheibe / Leah Street

The PMC-turbo balloon mission to study gravity waves and turbulence through high-resolution imaging of polar mesospheric clouds

A-382-P

NSF / NASA Agreement
Dr. David Fritts, Principal Investigator
GATS
Geosciences
Boulder, Colorado

Phone: 720.274.4747
Email: dave@gats-inc.com
Web: www.gats-inc.com

Research Locations
King George Island

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Early February to mid March

Project Description
The project will reinstate the Drake Antarctic Agile MEteor Radar (DrAAMER) that was deployed at the Brazilian Antarctic Station Comandante Ferraz in 2010. Upon reinstatement, the radar will be employed in diverse observations along with the Southern Argentina Agile MEteor Radar (SAAMER), deployed in Southern Argentina. These observations will be used for studies of the coupling and dynamics of atmospheric waves generated at lower altitudes over the Drake Passage and then propagating into the mesosphere, lower thermosphere, and ionosphere regions. This research addresses topics that are of high interest and relevance to diverse scientific communities, especially for defining more accurate parameterizations of the mesosphere, lower thermosphere, and ionosphere (MLTI) dynamics for weather prediction and climate modeling.

Field Overview
USAP support for this project will consist of purchasing tickets for the science party to meet with international collaborators in Brazil. From there, one participant will travel, under the auspices of the Brazilian Antarctic Program, to Ferraz Base on King George Island to install and repair instrumentation on the DrAAMER.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
David Rivera / Cara Ferrier

E-MIST (Exposing Microorganisms In the STratosphere)

A-454-M

NSF / NASA Agreement
Dr. David Smith, Principal Investigator
NASA Ames Research Center
Space Biosciences Research Division
Moffett Field, California

Phone: 650.604.4819
Email: david.j.smith-3@nasa.gov
Web: www.nasa.gov/ames/research/space-biosciences/e-mist-2015

Research Locations
Williams Field

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
No deploying team members

Project Description
It is unknown how the extreme cold and dry Martian environment impacts the survival and response of terrestrial microbes. Exposing Microorganisms In the STratosphere (E-MIST) is a NASA balloon payload built to enable studies of Earth's stratosphere, which closely resembles the Martian environment. Using this payload, the project will evaluate the survival and response of two bacterial species to Mars-like conditions in the stratosphere over Antarctica, flying as an additional study on the A-142-M (Binns / SuperTIGER 2) Long-Duration Balloon (LDB) mission.

Field Overview
E-MIST is an autonomous hardware system that mounts to the exterior of scientific balloon gondolas. It comprises four independent sample holders for exposing pre-loaded microbiological samples to the stratosphere which can then be returned to the ground for analysis. The project will fly five dormant microbial strains inserted inside the E-MIST payload in triple containment. The small instrument will be attached to the SuperTIGER 2 payload gondola frame.

Program Director
Dr. Vladimir Papitashvili

ASC Points of Contact
John Rand / Kaija Webster

Antarctic Organisms and Ecosystems

NSF/OPP Program Director: Dr. Christian Fritsen

(Presented in order of science event number)

B-006-L	Watters, George	B-211-M	Catchen, Julian
B-009-M	Rotella, Jay	B-229-E	Sirovic, Ana
B-025-E	Polito, Michael	B-232-L	Costa, Daniel
B-030-M	Liwanag, Heather	B-234-P	Young, Jodi
B-031-M	Ainley, David	B-235-M	Salvatore, Mark
B-032-L	Van Mooy, Benjamin	B-236-L	Amsler, Charles
B-041-M	Schmidt, Britney	B-243-M	LaRue, Michelle
B-086-P	van Gestel, Natasja	B-258-L	Tarrant, Ann
B-195-M	Cziko, Paul	B-303-L	Sanders, Robert
B-199-M	Place, Sean	B-320-M	Schmidt, Steven
B-206-L	Friedlaender, Ari	B-459-L/P	Bernard, Kim
B-207-M	Todgham, Anne	B-461-L	Cassar, Nicolas

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

NOAA / AMLR

B-006-L

NSF / NOAA / AMLR Agreement

Dr. George Watters, Principal Investigator
National Oceanic and Atmospheric Administration
La Jolla, California

Phone: 858.546.7198
Email: george.watters@noaa.gov
Web: swfsc.noaa.gov/textblock.aspx?id=551&ParentMenuId=42

Research Locations
PAL-LTER Grid

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
November and February

Project Description

National Oceanic and Atmospheric Administration (NOAA) Fisheries' Antarctic Marine Living Resources (AMLR) program supports the development of US policy regarding the conservation and management of marine living resources in the Southern Ocean. For the past 25 years, the AMLR field program has been conducted in the vicinity of Elephant Island, the South Shetland Islands, and the Antarctic Peninsula during the austral summer. This austral summer, researchers will participate on two cruises aboard the ARSV *Laurence M. Gould* (LMG) to continue testing newly developed US AMLR sampling techniques using autonomous technology. The broad-scale survey will be augmented to better understand the small-scale patterns of krill distribution in relation to circulation and to understand habitat use in enclosed bays.

Field Overview

The team will deploy six subsurface moorings and two Slocum gliders from the LMG in December 2018 and will recover them in March 2019. Deployment and recovery operations will coincide with Cape Shirreff field camp opening and closing cruises. Two team members will sail on the deployment cruise and two on the recovery cruise. The Cape Shirreff field camp team will be available to assist as needed.

Program Director
Mr. Tim McGovern

ASC Points of Contact
David Rivera / Cara Ferrier

The consequences of maternal effects and environmental conditions on offspring success in an Antarctic predator

B-009-M

NSF/OPP Award 1640481

Dr. Jay Rotella, Principal Investigator
Montana State University Bozeman
Ecology
Bozeman, Montana

Phone: 406.994.5676
Email: rotella@montana.edu
Web: www.montana.edu/weddellseals

Research Locations
Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to mid December

Project Description
The consequences of variation in maternal effects on the ability of offspring to survive, reproduce, and contribute to future generations has rarely been evaluated in polar marine mammals. This is because of the challenges of having adequate data on the survival and reproductive outcomes for numerous offspring born in diverse environmental conditions to mothers with known and diverse sets of traits. This project will evaluate the survival and reproductive consequences of early-life environmental conditions and variation in offspring traits that are related to maternal attributes (e.g. birth date, birth mass, weaning mass, and swimming behavior) in a population of individually marked Weddell seals in the Ross Sea.

Field Overview
Researchers will work out of a field camp at Big Razorback Island and will focus on all pupping colonies and haul outs from Cape Evans to Pram Point, at White Island, Marble Point, and Lewis Bay. They will visit each colony every other day to find, tag, and weigh newborn pups. Pups will be located two more times during maturation for re-weighing. Researchers plan to sample 150 pups each year. The team will also conduct six to eight surveys per season throughout the study area to re-sight tagged individuals, tag unmarked animals, and replace broken or missing tags. Reconnaissance flights will be by helicopter; travel between sites will be by snowmobile.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Investigating Holocene shifts in the diets and paleohistory of Antarctic krill predators

B-025-E

NSF/OPP Award 1443585
Dr. Michael Polito, Principal Investigator
Louisiana State University
School of the Coast & Environment
Baton Rouge, Louisiana

Phone: 225.578.9403
Email: mpolito@lsu.edu
Web: n/a

Research Locations
King George Island

Supporting Station/Vessel
Carlini Station (Argentina), Great Wall Station (China)

Dates in Antarctica
Mid December to early March

Project Description
Researchers will sample active and abandoned penguin colonies for sediments and tissues and conduct radiocarbon, stable isotope, and mercury analyses to investigate the paleohistory and diet of penguins. Sediments will be analyzed by Chinese collaborators for bio-elements from past penguin occupations. Data will be correlated with paleoclimatic signals to assess population movement and occupation history in penguins. This project will also involve international collaborations to investigate the underlying mechanisms behind shifts in the diets and paleohistory of Antarctic krill predators, in concert with climate variability and anthropogenic harvesting during the Holocene. Modern and ancient Antarctic krill predator tissues from penguins, seals, and squid recovered during this project will be combined with historic museum specimens and modern and ancient tissues available from previous paleoecological excavations.

Field Overview
All support while in the field will be conducted in collaboration with cruise-ship companies and international partners. USAP support is primarily limited to providing physical qualification and travel support to and from the ports of departure for three participants. An additional three participants are scheduled to deploy for one of the field seasons through an international collaboration. These three participants will deploy to Carlini Station (Argentina) and Great Wall Station (China) in the King George Island vicinity, primarily through the support of an Argentine collaboration. The principal investigator (PI) requests northbound USAP sample shipment support on a case-by-case basis. Support will be limited to when samples are delivered directly by project participants to support contractor cargo personnel at Palmer Station or the ARSV *Laurence M. Gould*. No USAP extreme cold weather gear or camping equipment is required.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
David Rivera / Curt LaBombard

Growing up on ice: Physiological adaptations and developmental plasticity in Weddell seal pups across two extreme physical environments

B-030-M

NSF/OPP Award 1543539
Dr. Heather Liwanag, Principal Investigator
California Poly State University
Biological Sciences
San Luis Obispo, California

Phone: 805.756.5963
Email: hliwanag@calpoly.edu
Web: icyseals.com

Research Locations
Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to late December

Project Description
A large body and thick blubber keep Weddell seals warm on and under the ice. Their streamlined shape, oxygen storage capacity, and collapsible lungs allow them to reach depths of 600 meters and remain under water for over an hour. At birth, however, they have small bodies and virtually no blubber. Their oxygen storage capacity is similar to other small terrestrial mammals and they must develop diving capabilities over time. There is likely a trade-off in terms of energy allocated to thermoregulation or to development. Researchers seek to answer the following questions: (1) How do these animals develop the capacity to transition, in a matter of weeks, above, and then below, the Antarctic sea ice? and (2) What are the energetic trade-offs associated with the developmental period during the transition?

Field Overview
The team will make day trips to their sea-ice field sites. They will access water through natural cracks or holes in the sea ice, or they will drill holes with a Jiffy drill. Their work will record mass and morphometrics of the seal pups. They will use a forward-looking infrared (FLIR) camera to quantify surface body temperature, and an ultrasound machine to measure blubber thickness. They will place pups in a chamber outfitted with analytical equipment to measure metabolic rates. For some sampling, the group's veterinarian will anesthetize the pups to collect blood and muscle biopsies. Additionally, pups will be tagged with an accelerometer/transmitter/time-depth-recorder device.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Adélie penguin response to climate change in the Ross Sea region – a full life-cycle approach

B-031-M

NSF/OPP Award 1543541
Dr. David Ainley, Principal Investigator
H.T. Harvey & Associates
Los Gatos, California

Phone: 415.332.5718
Email: dainley@penguinscience.com
Web: www.penguinscience.com

Research Locations
On station / Capes Royds and Crozier

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to late January

Project Description
Sea-ice on the Ross Sea is expanding. How that affects Antarctic marine biota is unknown. This study aims to better understand the biotic effects of these changes using a widely recognized indicator species, the Adélie penguin. Researchers will outfit penguins with time-depth recorders to monitor foraging efforts and record breeding activities of marked individuals. These data will lead to a better understanding of how changing sea-ice conditions affect penguins through their annual cycles and through individuals' lifetimes, and will infer how climate change may influence their populations.

Field Overview
Participants will deploy this season to continue their long-term study of Adélie penguin demographics and response to environmental change in the Ross Sea. Deployments will be staggered throughout the field season. Team members will travel by helicopter and occupy camps at two field sites, Cape Royds and Cape Crozier, starting in late October. The team will also conduct surveys by helicopter along the fast-ice edge in McMurdo Sound. The team will identify marked penguins at each location, collect breeding behavior data, deploy various instrumentation to obtain foraging and location data, and band new penguins near the end of the season. If helicopter support via the United States Coast Guard were to become available, the team would request access to the Beaufort Island Adélie penguin colony.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Jennifer Blum

Production and fate of oxylipins in waters of the Western Antarctic Peninsula: Linkages between UV radiation, lipid peroxidation, and carbon cycling

B-032-L

NSF/OPP Award 1543328
Dr. Benjamin Van Mooy, Principal Investigator
Woods Hole Oceanographic Institution
Marine Chemistry & Geochemistry
Woods Hole, Massachusetts

Phone: 508.289.2322
Email: bvanmooy@whoi.edu
Web: n/a

Research Locations
Arthur Harbor / Sea Ice Edge

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Late October to late November

Project Description
Ozone depletion over Antarctica leads to high levels of ultraviolet radiation (UVR) from the sun reaching the ocean's surface. This is predicted to continue for the next half century, despite bans on ozone-destroying pollutants. Phytoplankton in the near-surface ocean are subjected to variable amounts of UVR and contain a lot of lipids. Because phytoplankton are at the base of the food chain, the lipids make their way into the Antarctic marine ecosystem's food web. The molecular structures of phytoplankton lipids are easily altered by UVR. When this happens, the lipids can be transformed from healthy into potentially harmful molecules known to be disruptive to reproduction and development. This project will answer questions about the extent to which UVR damages lipid molecules and how the resultant molecules might affect the Southern-Ocean food chain.

Field Overview
A team of three researchers will deploy on the ARSV *Laurence M. Gould* for a 14-day cruise in November 2018 that will include sea-ice-algae sample collection, drifting sediment-trap deployments, conductivity-temperature-depth (CTD) casts, and plankton net tows. Samples collected from the sea-ice-edge blooms, Marginal Ice Zone (MIZ) phytoplankton communities, MIZ zooplankton, and sinking particulate matter are the foci of the cruise. Zooplankton will be collected on the last day of the cruise and maintained in the aquarium facilities at Palmer Station for experimentation. Two participants will stay on station for an additional two weeks to complete this work. A Palmer LTER graduate student will also participate as a member of the team.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
David Rivera / Jamee Johnson

RISE-UP: Ross Ice Shelf and Europa Underwater Probe

B-041-M

NASA 15-PSTAR15_2-004
Dr. Britney Schmidt, Principal Investigator
Georgia Institute of Technology
Earth & Atmospheric Sciences
Atlanta, Georgia

Phone: 520.481.4006
Email: britneys@eas.gatech.edu
Web: schmidt.eas.gatech.edu/project-rise-up/

Research Locations
McMurdo Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to early January

Project Description
Researchers on the Ross Ice Shelf and Europa Underwater Probe (RISE-UP) project seek to improve understanding of the environments below ice shelves and sea ice. The science team will use the purpose-built remotely operated vehicle-autonomous underwater vehicle (ROV-AUV) "Icefin" to search for biological communities, map the ice and seafloor, and understand ocean-water structure and currents. Through improved constraint of terrestrial ice/ocean cryosphere processes, this project will enhance understanding of the evolution of other ocean-world environments in our solar system (e.g. Europa's ice shell), which are prime targets in NASA's search for life. This project aims to continue chasing the limits of life on Earth while developing techniques for future exploration of other planets or moons.

Field Overview
A research team of nine participants will reside at McMurdo Station for seven weeks and will make day and, occasionally, overnight trips by PistenBully or snowmobile to their dive sites in McMurdo Sound where they will continue refining the engineering goals of their Icefin AUV. The team will divide into two groups: the first team will scout locations, stage camp, predrill 10" holes with a Jiffy drill, and conduct profiling conductivity-temperature-depth (CTD) casts. The second team will then arrive, ready to deploy the Icefin AUV. Once deployed, they will test new electronics and sensors, integrate new autonomous navigation and mission-planning software, and continue building on the heritage data set begun under the previous SIMPLE and RISE-UP projects. They may also make helicopter reconnaissance trips to potential ice-shelf sites to determine whether future access is feasible.

Program Director
Ms. Jessie Crain

ASC Points of Contact
Samina Ouda / Elizabeth Kauffman / Chad Naughton

Antarctica as a model system for responses of terrestrial carbon balance to warming

B-086-P

NSF/OPP Award 1643871
Dr. Natasja van Gestel, Principal Investigator
Texas Tech University
Biological Sciences
Lubbock, Texas

Phone: 806.834.7089
Email: natasja.van-gestel@ttu.edu
Web: n/a

Research Locations
Palmer Station backyard and Stepping Stones Islands

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Mid December to early April

Project Description
This study will investigate carbon transformation processes and the microbial communities that are responsible for such transformations in soils of the Antarctic Peninsula. Researchers will examine net ecosystem carbon balance among soils with different exposure ages that have been uncovered by retreating glaciers. Researchers will identify individual members of the soil microbial community that are active versus those that are not active. This will create a better understanding of the fundamental processes of community succession in the Antarctic environment and whether continued warming could lead to community shifts in the active portion of the communities.

Field Overview
Team members will deploy to Palmer Station from December through April in order to overlap with the exposure and warming of soils. They will set out open-top chambers and collect environmental data and soil samples in four snow- and ice-free areas across a productivity gradient. Three of these sites are in exposed areas of the Palmer Station backyard and the fourth is on Stepping Stones Islands. Each site has five open-top chambers paired with five control plots and will be sampled once every two weeks. The team will make most of their measurements in the field but will also conduct a small number of nutrient analyses in the laboratory.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Rachel Shackelford

Habitat severity and internal ice in Antarctic notothenioid fishes

B-195-M

NSF/OPP Award 1644196
Mr. Paul Cziko, Principal Investigator
University of Oregon
Institute of Ecology and Evolution
Eugene, Oregon

Phone: 217.344.7474
Email: pcziko@gmail.com
Web: moo-antarctica.net

Research Locations
Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to late January

Project Description
Notothenioid fishes live in the world's coldest marine waters surrounding Antarctica and have evolved strategies to avoid freezing. Past studies have shown that most Antarctic notothenioids produce special antifreeze proteins that prevent the growth of ice crystals that enter the body. While these proteins help prevent individuals from being killed by growing ice crystals, it is unclear how these fish avoid the accumulation of these small ice crystals inside their tissues over time. This project will observe how ice-crystal accumulation relates to the harshness of the fish's habitat and its behavior within different habitats of McMurdo Sound, Antarctica.

Field Overview
A group of six team members will reside on station and occasionally at small, sea-ice field camps. They will make day trips to their sites by PistenBully, snowmobile, and possibly by helicopter if sea-ice sites are not accessible by tracked vehicle. They will use a Reed drill to create up to six holes at sites near the station for diving, hand-line fishing, and deploying and retrieving fish traps with a winch. Most of their experiments will be conducted in the Crary Laboratory, but some fish will be kept in a temporary outdoor aquarium. Tasking this season will also include maintenance on the McMurdo Oceanographic Observatory (MOO) and recovery of seawater-condition data loggers. The team will also collaborate with the Catchen (B-211-M) project.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Characterizing protein homeostasis and the regulatory mechanisms controlling molecular chaperone expression in the highly stenothermal notothenioid fish, Trematomus bernacchii

B-199-M

Research Locations
Sea Ice

NSF/OPP Award 1543419

Dr. Sean Place, Principal Investigator
Sonoma State University
Department of Biology
Rohnert Park, California

Phone: 707.664.3054
Email: places@sonoma.edu
Web: n/a

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to early December

Project Description

Antarctic fishes are distinguished by physiological adaptations that enable them to thrive in below-freezing waters. Consequently, they have lost some traits that enable survival in more variable environments. This study aims to identify regulatory mechanisms that control expression of the heat-shock response in a key fish species of the Southern Ocean, Trematomus bernacchii (T. bernacchii), and to determine if this mechanism has been permanently lost in this species. Ultimately, the study can infer how these fish might adapt to the effects of climate change in the Southern Ocean.

Field Overview

The group will reside on station and make day trips by PistenBully and snowmobile to their sea-ice fishing sites. They will use fish huts and a portable "apple" hut mounted on a sled. They will primarily use a Jiffy drill to create holes in the sea ice, and fish will be collected using a long line and barb-less hooks with synthetic bait. About 30 to 40 live T. bernacchii will be collected and transported live to Crary Laboratory on station, where they will be held in tanks of varying temperatures. Following temperature treatment, various tissue samples will be collected from each fish and cultured in cold rooms or flash-frozen in liquid nitrogen for shipment to the home institution.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Foraging behavior and ecological role of the least-studied Antarctic krill predator, the Antarctic minke whale (Balaenoptera bonaerensis)

B-206-L

NSF/OPP Award 1643877
Dr. Ari Friedlaender, Principal Investigator
University of California Santa Cruz
Institute of Marine Sciences
Santa Cruz, California

Phone: 919.672.0103
Email: ari.friedlaender@ucsc.edu
Web: n/a

Research Locations
Gerlache Strait / Wilhelmina & Andvord Bays / Crystal Sound

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
Researchers will measure the underwater behavior of minke whales to better understand how they exploit the sea-ice habitat. They will use video-recording motion-sensing tags to determine where and when the whales feed and unmanned aerial systems (UAS) to determine how much time whales spend in sea ice versus open water, and how their behavior changes between those two habitats. They will also use scientific echosounders to characterize the prey field that the whales are exploiting and will investigate the differences in krill availability in and out of the ice. The acquired information will help better understand the ecological role of Antarctic minke whales so that better predictions can be made regarding impacts of climate change, not only on these animals but on the structure and function of the Antarctic marine ecosystem.

Field Overview
This season, researchers will locate, tag, and track aggregations of minke whales in the vicinity of the Gerlache Strait. From small boats, they will attach suction cup and satellite tags to whales and obtain biopsy samples. To map whale prey, they will conduct net tows, use towfish-mounted echosounders on the ARSV *Laurence M. Gould* and smaller echosounders mounted on Zodiac boats. The team will also use fixed-wing and multi-rotor UAS to conduct surveys of whales and other marine species and habitats.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Samina Ouda / Bruce Felix

Interacting stressors: Metabolic capacity to acclimate under ocean warming and CO_2-acidification in early developmental stages of Antarctic fishes

B-207-M

NSF/OPP Award 1744999
Dr. Anne Todgham, Principal Investigator
University of California Davis
Department of Animal Science
Davis, California

Phone: 530.752.1897
Email: todgham@ucdavis.edu
Web: n/a

Research Locations
McMurdo Sound / Intake Jetty / Arrival Heights / Cape Evans / Cape Evans Wall

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to early January

Project Description
Many Antarctic marine organisms evolved in stable, cold-ocean conditions and possess limited capacities to respond to environmental fluctuations. Research on physiology and physiological limits of Antarctic fishes has focused largely on adult life stages with much less research on early life stages that likely prioritize energy allocations for growth and development over other necessary physiological processes. This project will examine the specific mechanisms that Antarctic fishes use to respond to changes in ocean conditions during early-life development (embryos, larvae and juveniles) to balance the organism's overall energetic needs for survival. The aim is to provide a unifying framework for linking environmental change, gene expression, metabolism, and organismal performance across a range of different fishes with different life-history strategies.

Field Overview
A four-person team will make day trips from the station to various sea-ice locations in McMurdo Sound, including the Intake Jetty, Arrival Heights, Cape Evans, and Cape Evans Wall. They will collect eggs and capture fish (primarily dragonfish and rock cod) at different life stages using traps suspended below the sea ice and placed on the ocean floor. Support contractor divers will also assist in collecting eggs and fish. The group will require Reed drill support, a dedicated fish hut to suspend winch-deployed traps, snowmobiles, and a PistenBully to transport live fish back to station. They will use Crary Laboratory aquaria to keep live fish and acclimate them to manipulated seawater conditions and will use the chemistry lab and the cold room for sample preparation and analyses.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Evolutionary genomic responses in Antarctic notothenioid fishes to climatic and environmental change

B-211-M

NSF/OPP Award 1645087
Dr. Julian Catchen, Principal Investigator
University of Illinois Urbana
Animal Biology c/o Art DeVries
Urbana, Illinois

Phone: 217.244.4298
Email: jcatchen@illinois.edu
Web: n/a

Research Locations
Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to mid January

Project Description
As plate tectonics pushed Antarctica into a polar position, the continent and its surrounding ocean became geographically and thermally isolated by the Antarctic Circumpolar Current. Terrestrial and marine glaciation followed, resulting in extinctions as well as the survival and radiation of unique flora and fauna. The notothenioid fish survived and arose from a common ancestral stock into 120 species that dominate today, largely by adapting traits including antifreeze proteins for survival in extreme cold. Researchers will investigate the full spectrum of these fishes' genomic and genetic responses to climatic and environmental change, how they adapted to the changing Southern Ocean environment over the evolutionary past, and how they may continue to evolve in the future.

Field Overview
Team members will reside on station and make day trips to their sea-ice sites in McMurdo Sound by PistenBully and snowmobile. They will work in conjunction with the Cziko (B-195-M) project to catch fish in traps from holes drilled in the sea ice. They will keep live fish in the Crary Laboratory aquaria and will use the lab to conduct most of their experiments and process samples for transport to their home institution for further analysis.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

EAGER: Acoustic ecology of foraging Antarctic blue whales in the vicinity of Antarctic krill

B-229-E

NSF/OPP Award 1746148
Dr. Ana Sirovic, Principal Investigator
University of California San Diego
Scripps Institution of Oceanography
La Jolla, California

Phone: 858.534.8210
Email: asirovic@ucsd.edu
Web: n/a

Research Locations
Southern Ocean

Supporting Station/Vessel
Special Project

Dates in Antarctica
Mid January to early March

Project Description
The Australian Antarctic Division and the University of Tasmania will lead an international voyage to the Antarctic in the austral summer of 2019. The goal of this project is to advance the understanding of blue whale behavior and krill dynamics through acoustic mapping. US participants will deploy passive and active acoustic technologies on a fixed mooring to track and localize blue whales. The acoustic information will allow better directing of ship operations towards aggregations of animals such that fine-scale acoustic tracking and prey-field mapping can be achieved.

Field Overview
Two USAP participants will deploy on the Australian research vessel, R/V Investigator, from mid January to early March in collaboration with the Australian Antarctic Division. The study area is south of 60° S and between 140° E and 175° W. USAP participants will contribute their acoustic expertise to the cruise. The combined effort will use autonomous underwater vehicles, short-term tags, photogrammetry and ship-based, real-time, active and passive acoustics in an international collaborative effort.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
David Rivera / Cara Ferrier

Foraging ecology and physiology of the leopard seal

B-232-L

NSF/OPP Award 1644256
Dr. Daniel Costa, Principal Investigator
University of California Santa Cruz
Dept of Ecology & Evolutionary Biology
Santa Cruz, California

Phone: 831.459.2786
Email: costa@ucsc.edu
Web: costa.eeb.ucsc.edu/category/antarctica/leopardseals2018/

Research Locations
Cape Shirreff

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
This project will examine the physiology and behavior of leopard seals in an effort to determine their ability to respond to potential changes in their habitat and foraging areas. Using satellite tracking devices, the research team will examine the movement and diving behavior of leopard seals and couple this information with measurements of their physiological capacity. The project will determine whether leopard seals—who feed on a diverse range of prey—are built differently than their deep-diving relatives the Weddell and elephant seal who feed on fish and squid.

Field Overview
A team of four will travel on the ARSV *Laurence M. Gould* to the Cape Shirreff field camp, where they will reside for about five weeks. While there, they will dart up to 11 leopard seals per season on land. This approach will allow collection of physiological and foraging samples and instrument attachment to track movements. Analysis of samples will be conducted later at the scientists' home institutions. Tag recovery will be attempted every season.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
Samina Ouda / Cara Ferrier

Spring blooms of sea-ice algae in the Western Antarctic Peninsula: Effects of warming and freshening on cell physiology and biogeochemical cycles

B-234-P

NSF/OPP Award 1744645
Dr. Jodi Young, Principal Investigator
University of Washington
School of Oceanography
Seattle, Washington

Phone: 206.543.0744
Email: youngjn@uw.edu
Web: n/a

Research Locations
Western Antarctic Peninsula

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Late October to early December

Project Description
This project will identify the physiological responses of sea-ice microalgae to increasing temperatures and decreasing salinity during the spring melt of sea ice in the Western Antarctic Peninsula. In particular, the research will focus on the temperature sensitivity of photosynthesis and respiration and the cycling of nitrogen-rich compatible solutes and carbon-rich extracellular polymeric substances (EPS). Ultimately, the team aims to understand how these adaptations enable high rates of primary production, alter cellular composition, and thus influence the biochemical cycling of carbon and nitrogen in coastal Antarctic waters during spring melt.

Field Overview
In this, the first of two seasons, three participants will deploy via the ARSV *Laurence M. Gould* to Palmer Station in October and November. They will conduct ice sampling on the Palmer Long-Term Ecological Research (LTER) grid using their own tools and equipment and will use one of the station's small boats to collect brash ice and sea-ice slurry and to sample ice-algal slushes on the underside of ice floes. On station, the team will process or filter all samples and will conduct incubations in the aquarium.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
David Rivera / Jamee Johnson

Remote characterization of microbial mats in Taylor Valley, Antarctica, through in-situ sampling and spectral validation

B-235-M

NSF/OPP Award 1745053
Dr. Mark Salvatore, Principal Investigator
Northern Arizona University
Department of Physics & Astronomy
Flagstaff, Arizona

Phone: 928.523.0324
Email: Mark.Salvatore@nau.edu
Web: n/a

Research Locations
Lake Fryxell

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late November to early February

Project Description

Microbial mats are pervasive throughout the McMurdo Dry Valleys. Recent technological advances in remote sensing allow detailed characterization of unique spectral signatures associated with microbial mats at higher spatial resolution than before. These advances may enable Antarctic microbial mat features to be mapped and characterized from satellites. Researchers will use satellite imagery and spectroscopic techniques to identify and map microbial mat communities across the landscape and relate their spectral properties and distributions to both field and lab-based measurements. They aim to document the spatial and temporal distributions of a major component of the Antarctic terrestrial ecosystem in the McMurdo Dry Valleys.

Field Overview

A team of three will work at Lake Fryxell camp and will sample primarily from Canada Stream. Additional sampling sites may include Huey, Green, and McKnight Creeks, Delta and Crescent Streams, and Relict Channel. They will access all sampling sites by foot or by helicopter. The team will establish study plots and will coordinate with the Polar Geospatial Center to synchronize satellite image captures with their sampling efforts. They will collect microbial mat, soil, and water samples, and will take spectral measurements. The team will also conduct one to two mid-season trips to Crary Laboratory for sample processing. Following pull-out from Lake Fryxell camp, they will spend a week in the lab packing samples for shipment.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Jennifer Blum

Sea ice as a driver of Antarctic benthic macroalgal community composition and near-shore trophic connectivity

B-236-L

NSF/OPP Award 1744550
Dr. Charles Amsler, Principal Investigator
University of Alabama Birmingham
Department of Biology
Birmingham, Alabama

Phone: 205.975.5622
Email: amsler@uab.edu
Web: n/a

Research Locations
Anvers Island to Marguerite Bay

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
The Western Antarctic Peninsula is a model for understanding cold-water communities and how they are changing in Antarctica. Brown macroalgae (seaweed) form extensive undersea forests in the northern portion of this region and provide physical structure and a food source for shallow-water communities. Between Anvers and Adelaide Islands these macroalgae are less abundant and diverse, probably because the area is covered by more sea ice for a longer period, which reduces the amount of light reaching the algae. The reduced macroalgal cover impacts other organisms in the food web, but the ways it alters sea-floor community processes and organization is unknown. This project will quantitatively document macroalgal communities at multiple sites between Anvers and Adelaide Islands using a combination of diving, video surveys, and algal collections.

Field Overview
A team of researchers will deploy on the ARSV *Laurence M. Gould*. They will use satellite data on sea-ice extent and water turbidity to choose study sites. The team will dive to survey and collect samples from nine to 18 sites. The divers will quantify macroalgal cover by video transect and will collect macroalgae and invertebrates for later biochemical and isotope analyses. Some of these collections will use an airlift suction device. The team will also collect benthic microalgae from dive sites and phytoplankton from nearby but deeper waters.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Rachel Shackelford / Jamee Johnson

A multi-scale approach to understanding spatial and population variability in emperor penguins

B-243-M

NSF/OPP Award 1744989
Dr. Michelle LaRue, Principal Investigator
University of Minnesota
Department of Geological Sciences
Stillwater, Minnesota

Phone: 612.625.6358
Email: larue010@umn.edu
Web: n/a

Research Locations
Ross Sea coastline

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to mid November

Project Description
Emperor penguins are found in colonies around the Antarctic coastline and rely on fast ice (sea ice physically adhered to land) for the majority of their life cycle. As such, they are susceptible to environmental change, such as decreases in the extent and duration of sea ice around Antarctica. Using satellite remote sensing, and ground and aerial survey estimates, this project will generate population estimates for every colony of emperor penguins (54 are known currently) over the course of 10 years. Researchers will also integrate the population trends with environmental variables (e.g., sea-ice extent and duration) to learn about conditions that may influence population fluctuations and whether those fluctuations are global or regional in nature.

Field Overview
A group of four team members will deploy to McMurdo Station in mid October. They will remain at the station four weeks and will fly aerial surveys over emperor penguin colonies within the vicinity of the station, including one Basler aircraft flight covering Beaufort Island, Franklin Island, Cape Washington, Coulman Island, and Cape Roget; and up to four helicopter flights over Cape Crozier and possibly Beaufort Island. During surveys, the researchers will take photographs through the windows and record bird counts. The four team members will work out of the Crary Laboratory on station.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Physiological ecology of herbivorous Antarctic copepods

B-258-L

NSF/OPP Award 1746087
Dr. Ann Tarrant, Principal Investigator
Woods Hole Oceanographic Institution
Biology Department
Woods Hole, Massachusetts

Phone: 508.289.3398
Email: atarrant@whoi.edu
Web: n/a

Research Locations
LTER study sites

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
This project focuses on the adaptations of copepods – small animals that live in the water column and are an important food source to predators. The overall goal is to examine and compare adaptations to varying food supplies across species that range in size and ecology, in order to understand how each species responds to short-term changes in food availability. The project contains three main objectives: (1) compare the sets of genes across species, especially looking at genes related to storage of energy from food; (2) measure and compare the responses of copepods to changes in food availability; and (3) determine how variation across the western Antarctic Peninsula habitat affects the feeding condition of the copepods.

Field Overview
One participant will sail on the ARSV *Laurence M. Gould* during the Long-Term Ecological Research (LTER) cruise and will collect copepods of three different species with routine oblique surface net tows from at least five stations per species. Slow vertical tows at process stations will supplement surface net-tow collections. All sampling will be conducted on an opportunistic basis from a subset of LTER sample sites. The participant will conduct incubations and will use a stereo microscope for sorting and photographing specimens. Specimens will be stored at -20° and -80° C and shipped with dry ice at the end of the cruise. A support contractor technician will assist with net tows and seawater collection.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
David Rivera / Bruce Felix

Diversity and ecological impacts of Antarctic mixotrophic phytoplankton

B-303-L

NSF/OPP Award 1744767
Dr. Robert Sanders, Principal Investigator
Central Michigan University
Biology Department
Philadelphia, Pennsylvania

Phone: 215.204.2056
Email: robert.sanders@temple.edu
Web: n/a

Research Locations
Western Antarctic Peninsula

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
Traditional models of oceanic food chains have consisted of algae (phytoplankton) being ingested by small animals (zooplankton), which are ingested by larger animals (fish). These traditional models changed as new methods allowed recognition of the importance of bacteria and non-photosynthetic "protozoa" in more complex food webs. More recently, the widespread existence of mixotrophy (the ability to both photosynthesize and ingest food particles) has been recognized in numerous species and many oceanographic areas. Mixotrophs are now known to have a large impact as predators of microbes in oceanic systems, yet little is known about mixotrophs in Antarctic regions. This project will advance understanding of mixotroph diversity and their ecological impact within the Southern Ocean microbial food web.

Field Overview
A team of five participants will deploy to the Western Antarctic Peninsula (WAP) area on the ARSV *Laurence M. Gould*. Their aim is to determine the diversity and role of mixotrophs in the Southern Ocean. The team will conduct experiments to examine bacterial grazing, bacterial production, and primary production. They will share ship time with a group that will be diving during daylight hours so the team will collect water via conductivity-temperature-depth (CTD) rosette casts during the evenings when the ship is in transit to the next dive site.

Program Director
Dr. Christian Fritsen

ASC Points of Contact
Rachel Shackelford / Jamee Johnson

Stochasticity and cryoconite community assembly and function

B-320-M

NSF/OPP Award 1443578
Dr. Steven Schmidt, Principal Investigator
University of Colorado Boulder
EPOB
Boulder, Colorado

Phone: 303.492.6248
Email: steve.schmidt@colorado.edu
Web: cryoholes.wordpress.com

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to mid February

Project Description
Cryoconite is a combination of dust and microbial material that can absorb solar radiation and cause localized melting when deposited on glacial surfaces. These melt areas, called cryoconite holes, become hosts to ice-bound microbe communities. Low temperatures in the Dry Valleys cause ice lids to form over the holes and entomb the communities. These lids can persist for decades. The holes melt internally each summer, and during very warm summers the ice lid can melt enough to create an open ecosystem that allows transfer of biological material and potential reorganization of the community. Through field sampling and creation of experimental cryoconite holes, researchers will investigate how the stochastic processes that guide microbial community assembly will affect patterns in biodiversity and ecosystem processes in the Dry Valleys.

Field Overview
In this third and final season for the project, the primary goal will be to monitor and sample experimental cryoconite holes that were established on Canada glacier in the previous season. Because of exceptionally snowy conditions during the 2017-18 season, they may need to create additional experimental holes. The group will be primarily based at the Lake Hoare camp in order to monitor and clear snow from experimental holes, with up to three returns to Crary Laboratory for processing samples. There will also be a final sample processing stage at McMurdo Station after removing all experiments at the end of the season.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Jennifer Blum

The omnivore's dilemma: The effect of autumn diet on winter physiology and condition of juvenile Antarctic krill

B-459-L/P

NSF/OPP Award 1753101
Dr. Kim Bernard, Principal Investigator
Oregon State University
College of Oceanic and Atmospheric Sciences
Corvallis, Oregon

Phone: 541.737.2217
Email: kbernard@coas.oregonstate.edu
Web: n/a

Research Locations
Palmer Station / Bransfield or Gerlache Straits

Supporting Station/Vessel
ARSV *Laurence M. Gould*, Palmer Station

Dates in Antarctica
Mid April to mid October

Project Description
Antarctic krill are essential in the Southern Ocean for supporting marine mammals, seabirds, and fishes. Antarctic krill are also a target species for industrial fisheries. The success of Antarctic krill populations is largely determined by the ability of their young to survive the long, dark winter when food is scarce. To survive the winter, young krill must have a high-quality diet in autumn. However, warming in certain parts of Antarctica is changing the dynamics and quality of the polar food web, resulting in a shift in the available food type. This project will study how warming is affecting young krill survival. The results derived from this work will contribute to the development of improved bioenergetic, population, and ecosystem models and will advance current scientific understanding of this critical Antarctic species.

Field Overview
A team of three will sail to Palmer Station on the ARSV *Laurence M. Gould*. While underway, they will collect krill with an Isaacs-Kidd Midwater Trawl (IKMT). The krill will be held in two large tanks. The tanks will be transferred to the aquarium room at Palmer Station, where they will be subjected to four different feeding treatments. The tanks will be stocked with cultured diatoms, maintained in an incubator in the lab, or with copepods, collected using a ring net from the Palmer Station pier or from a rigid-hull inflatable boat (RHIB). At set time intervals, researchers will remove subsamples of actively swimming krill to make bioenergetics and biochemistry measurements.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
Rachel Shackelford / Jamee Johnson

Biological and physical drivers of O_2 saturation and net community production variability at the Western Antarctic Peninsula

B-461-L

NSF/OPP Award 1643534

Dr. Nicolas Cassar, Principal Investigator
Duke University
Nicholas School of Environment
Durham, North Carolina

Phone: 919.681.8865
Email: nicolas.cassar@duke.edu
Web: n/a

Research Locations
PAL-LTER Grid

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Late December to mid February

Project Description

The project focuses on a high-resolution investigative survey of oxygen/Argon and total oxygen supersaturation along the Palmer Long-Term Ecological Research (LTER) grid to assess physical and biological drivers of the net community production (NCP) and oxygen-saturation variability. The primary goal is to elucidate and parameterize the key biological factors regulating carbon fluxes and NCP. To accomplish this, researchers will combine high-frequency underway NCP estimates by equilibrator inlet mass spectrometry (EIMS) with community characterization by imaging flowcytobot (IFCB) and DNA sequencing. The observations, complemented by a comprehensive suite of measurements made by the Palmer Long-Term Ecological Research (LTER) group, will identify plankton characteristics and mechanisms key to biological carbon fluxes and the fate of primary production.

Field Overview

Researchers will sail on ARSV *Laurence M. Gould* cruise LMG19-01 from Punta Arenas, Chile. Researchers will deploy the EIMS and the IFCB, which will be plumbed into the underway seawater line and set up in onboard laboratories. The team will also conduct discrete collections for DNA/RNA analysis from the underway seawater line. All instrument measurements and discrete collections will be made along the PAL-LTER cruise track. Comprehensive measurements conducted by the USAP and PAL-LTER will include IFCB, flow-through transmissometer, flowcytometry, Fluorescence Induction and Relaxation System (FIRe) fluorometer and delta-O-18.

Program Director
Dr. Jennifer Burns / Dr. Christian Fritsen

ASC Points of Contact
David Rivera / Bruce Felix

Antarctic Integrated System Science

NSF/OPP Program Director: Dr. Jennifer Burns

(Presented in order of science event number)

C-013-L/P	Fraser, William
C-019-L/P	Schofield, Oscar
C-020-L/P	Steinberg, Deborah
C-021-L	Martinson, Doug
C-024-L/P	Friedlaender, Ari
C-045-L/P	Ducklow, Hugh
C-443-N	Goehring, B.; Johnson, J.
C-444-M	Holland, D.; Nicholls, K.
C-445-N	Pettit, Erin; Heywood, K.
C-446-M	Tulaczyk, S.; Christoffersen, P.
C-447-N	Wellner, J.; Larter, R.
C-504-M	Gooseff, Michael
C-505-M	Priscu, John
C-506-M	Gooseff, Michael
C-507-M	Adams, Byron
C-508-M	Takacs-Vesbach, Cristina
C-509-M	Gooseff, Michael
C-511-M	Doran, Peter
C-516-M	Tulaczyk, Slawek
C-533-M	Priscu, John
C-534-M	Priscu, John

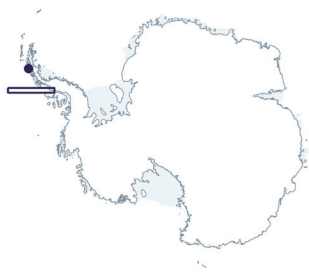
For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Palmer LTER: Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influenced pelagic ecosystem

C-013-L/P

NSF/OPP Award 1440435
Dr. William Fraser, Principal Investigator
Polar Oceans Research Group
Sheridan, Montana

Phone: 406.842.7442
Email: bfraser@3rivers.net
Web: pal.lternet.edu/



Research Locations
LTER study site / Islands in the Palmer Station extended boating area

Supporting Station/Vessel
ARSV *Laurence M. Gould*, Palmer Station

Dates in Antarctica
Early November to early April

Project Description
Palmer Long-Term Ecological Research (PAL-LTER) started in 1990 to address the hypothesis that the annual sea ice cycle may be the major determinant of spatial/ temporal changes in the structure and function of Antarctic marine communities. Research now includes bacteria, viruses, phytoplankton, krill, macrozooplankton, penguins, seabirds, and marine mammals. The PAL-LTER model traces the effects of changing climate, and the extent, duration, and seasonality of sea ice on ecosystem composition and dynamics in the Western Antarctic Peninsula (WAP), where satellite observations over the past 35 years indicate the average duration of sea ice cover is now about 90 days shorter. Six collaborative projects deploy on January's ARSV *Laurence M. Gould* (LMG) cruise and/or to Palmer Station. Team members use airborne and underwater vehicles, moorings, numerical modeling, oceanographic cruises, and environmental sampling to address core hypotheses.

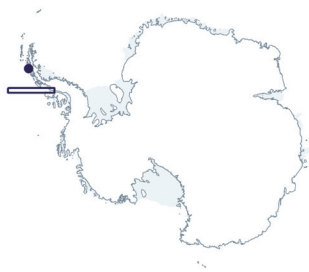
Field Overview

Penguins and other Seabirds
One component of the C-013-L/P project will sail on the LMG. The vessel will transport the team to Avian Island where they will establish a field camp and conduct research on penguins and other seabirds for five days. The second component of the project will be based at Palmer Station from late October to early April. The team will use small boats to access local islands in the station vicinity and will make some day trips to bird colonies in the extended boating area including Dream Island, Biscoe Point, the Joubin Islands, Cape Monaco, the Wauwermans Islands and the Rosenthal Islands.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Samina Ouda / Jamee Johnson / Bruce Felix

Palmer, Antarctica Long-Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influenced pelagic ecosystem



C-019-L/P

NSF/OPP Award 1440435
Dr. Oscar Schofield, Principal Investigator
Rutgers University
Institute for Marine & Coastal Sciences
New Brunswick, New Jersey

Phone: 732.932.6555
Email: oscar@marine.rutgers.edu
Web: pal.lternet.edu

Research Locations
LTER study site

Supporting Station/Vessel
ARSV *Laurence M. Gould*,
Palmer Station

Dates in Antarctica
Early October to mid March

Project Description
Palmer Long-Term Ecological Research (PAL-LTER) started in 1990 to address the hypothesis that the annual sea ice cycle may be the major determinant of spatial/ temporal changes in the structure and function of Antarctic marine communities. Research now includes bacteria, viruses, phytoplankton, krill, macrozooplankton, penguins, seabirds, and marine mammals. The PAL-LTER model traces the effects of changing climate, and the extent, duration, and seasonality of sea ice on ecosystem composition and dynamics in the Western Antarctic Peninsula (WAP), where satellite observations over the past 35 years indicate the average duration of sea ice cover is now about 90 days shorter. Six collaborative projects deploy on January's ARSV *Laurence M. Gould* (LMG) cruise and/or to Palmer Station. Team members use airborne and underwater vehicles, moorings, numerical modeling, oceanographic cruises, and environmental sampling to address core hypotheses.

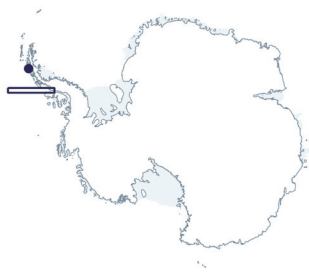
Field Overview

Phytoplankton and Optics
One component of the C-019-L/P team will sail on the LMG to the LTER research grid. At sea, they will use net and acoustic tows, conductivity-temperature-depth (CTD) casts, Slocum gliders, and other profiling sensors to assess phytoplankton community structure and abundance. The other component of the team, based at Palmer Station, will: (1) maintain the Palmer phytoplankton time series measurements at LTER stations B and E; (2) launch several gliders; (3) use the EK-80 sonar on the new rigid-hull inflatable boats (RHIBs) to assess how plankton communities change spatially and temporally; (4) use a new imaging flowcytobot to take pictures of individual phytoplankton cells; and (5) conduct video-conferences with K-12th-grade classrooms.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Samina Ouda / Jamee Johnson / Bruce Felix

Palmer, Antarctica Long-Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influenced pelagic ecosystem



C-020-L/P

NSF/OPP Award 1440435
Dr. Deborah Steinberg, Principal Investigator
Virginia Institute of Marine Sciences
Department of Biological Sciences
Gloucester Point, Virginia

Phone: 804.684.7838
Email: debbies@vims.edu
Web: pal.lternet.edu

Research Locations
LTER study site

Supporting Station/Vessel
ARSV *Laurence M. Gould*, Palmer Station

Dates in Antarctica
Late October to mid March

Project Description
Palmer Long-Term Ecological Research (PAL-LTER) started in 1990 to address the hypothesis that the annual sea ice cycle may be the major determinant of spatial/temporal changes in the structure and function of Antarctic marine communities. Research now includes bacteria, viruses, phytoplankton, krill, macrozooplankton, penguins, seabirds, and marine mammals. The PAL-LTER model traces the effects of changing climate, and the extent, duration, and seasonality of sea ice on ecosystem composition and dynamics in the Western Antarctic Peninsula (WAP), where satellite observations over the past 35 years indicate the average duration of sea ice cover is now about 90 days shorter. Six collaborative projects deploy on January's ARSV *Laurence M. Gould* (LMG) cruise and/or to Palmer Station. Team members use airborne and underwater vehicles, moorings, numerical modeling, oceanographic cruises, and environmental sampling to address core hypotheses.

Field Overview

Zooplankton
A team of five researchers will sail on the LMG to the LTER research grid west of the Antarctic Peninsula. The team will collect samples with a conductivity-temperature-depth (CTD) rosette and a variety of nets. They will use an acoustic towfish at process study stations to detect krill aggregations. At Palmer Station, two team members will use net tows and acoustic surveys to conduct sampling of the zooplankton community structure and grazing. Each station will consist of approximately five net tows. They will also collect live animals and water samples for zooplankton feeding experiments and will incorporate acoustic surveys and net tows with all LTER field teams, focusing on sampling krill swarms in predator foraging areas.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Samina Ouda / Jamee Johnson / Bruce Felix

Palmer, Antarctica Long-Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influenced pelagic ecosystem

C-021-L

NSF/OPP Award 1440435
Dr. Doug Martinson, Principal Investigator
Columbia University
Lamont-Doherty Earth Observatory
Palisades, New York

Phone: 845.365.8831
Email: dgm@ldeo.columbia.edu
Web: pal.lternet.edu

Research Locations
LTER study site

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Late July to late September

Project Description
Palmer Long-Term Ecological Research (PAL-LTER) started in 1990 to address the hypothesis that the annual sea ice cycle may be the major determinant of spatial/ temporal changes in the structure and function of Antarctic marine communities. Research now includes bacteria, viruses, phytoplankton, krill, macrozooplankton, penguins, seabirds, and marine mammals. The PAL-LTER model traces the effects of changing climate, and the extent, duration, and seasonality of sea ice on ecosystem composition and dynamics in the Western Antarctic Peninsula (WAP), where satellite observations over the past 35 years indicate the average duration of sea ice cover is now about 90 days shorter. Six collaborative projects deploy on January's ARSV *Laurence M. Gould* (LMG) cruise and/or to Palmer Station. Team members use airborne and underwater vehicles, moorings, numerical modeling, oceanographic cruises, and environmental sampling to address core hypotheses.

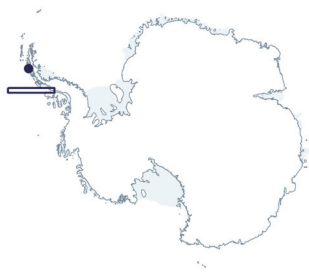
Field Overview

Physical Oceanography
During the annual LTER cruise aboard the LMG to the LTER research grid, support contractor vessel marine technicians will deploy and recover up to four moorings and will make about 70 conductivity-temperature-depth (CTD) casts to full depth for this project and in collaboration with C-019-L (Schofield) and C-045-L (Ducklow).

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Samina Ouda / Bruce Felix

Palmer, Antarctica Long-Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influenced pelagic ecosystem



C-024-L/P

NSF/OPP Award 1440435
Dr. Ari Friedlaender, Principal Investigator
University of California Santa Cruz
Institute of Marine Sciences
Santa Cruz, California

Phone: 919.672.0103
Email: ari.friedlaender@ucsc.edu
Web: pal.lternet.edu

Research Locations
Palmer Station local area / LTER study site

Supporting Station/Vessel
ARSV *Laurence M. Gould*, Palmer Station

Dates in Antarctica
Early January to Early April

Project Description
Palmer Long-Term Ecological Research (PAL-LTER) started in 1990 to address the hypothesis that the annual sea ice cycle may be the major determinant of spatial/ temporal changes in the structure and function of Antarctic marine communities. Research now includes bacteria, viruses, phytoplankton, krill, macrozooplankton, penguins, seabirds, and marine mammals. The PAL-LTER model traces the effects of changing climate, and the extent, duration, and seasonality of sea ice on ecosystem composition and dynamics in the Western Antarctic Peninsula (WAP), where satellite observations over the past 35 years indicate the average duration of sea ice cover is now about 90 days shorter. Six collaborative projects deploy on January's ARSV *Laurence M. Gould* (LMG) cruise and/or to Palmer Station. Team members use airborne and underwater vehicles, moorings, numerical modeling, oceanographic cruises, and environmental sampling to address core hypotheses.

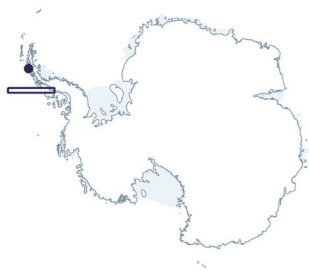
Field Overview

Cetaceans
Team members will deploy on the annual LTER cruise on the LMG from early January to early February. During the cruise, they will use small boats to deploy suction cup tags on baleen whales and to deploy an unmanned aerial system (UAS) to assess whale size and condition. Two project participants will reside at Palmer Station from January through early April and will use a dedicated small boat for visual surveys of marine mammals, quantitative prey mapping, biopsy sampling, and suction cup tag deployment and recovery. When a second small boat is able to accompany the team, these studies will take place in the extended boating area around Palmer Station.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Samina Ouda / Bruce Felix

Palmer, Antarctica Long-Term Ecological Research (LTER): Land-shelf-ocean connectivity, ecosystem resilience and transformation in a sea-ice influenced pelagic ecosystem



C-045-L/P

NSF/OPP Award 1440435
Dr. Hugh Ducklow, Principal Investigator
Columbia University
Lamont Doherty Earth Observatory
Palisades, New York

Phone: 845.365.8167
Email: hducklow@ldeo.columbia.edu
Web: pal.lternet.edu

Research Locations
Palmer Station local area / LTER grid

Supporting Station/Vessel
ARSV *Laurence M. Gould*, Palmer Station

Dates in Antarctica
Early October to early April

Project Description
Palmer Long-Term Ecological Research (PAL-LTER) started in 1990 to address the hypothesis that the annual sea ice cycle may be the major determinant of spatial/ temporal changes in the structure and function of Antarctic marine communities. Research now includes bacteria, viruses, phytoplankton, krill, macrozooplankton, penguins, seabirds, and marine mammals. The PAL-LTER model traces the effects of changing climate, and the extent, duration, and seasonality of sea ice on ecosystem composition and dynamics in the Western Antarctic Peninsula (WAP), where satellite observations over the past 35 years indicate the average duration of sea ice cover is now about 90 days shorter. Six collaborative projects deploy on January's ARSV *Laurence M. Gould* (LMG) cruise and/or to Palmer Station. Team members use airborne and underwater vehicles, moorings, numerical modeling, oceanographic cruises, and environmental sampling to address core hypotheses.

Field Overview

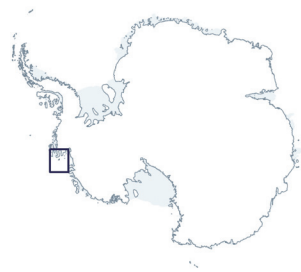
Microbial Biogeochemistry
Team members will deploy on the annual LTER cruise on the LMG. The cruise will consist of eight days of transit time; three days of cargo/science operations; one day NSF / NOAA personnel transfer; a visit to the UK station, Rothera; and 30 days of LTER science operations. While at sea, the C-045-L team will conduct repeated sampling with the conductivity-temperature-depth (CTD) rosette and nets at historical LTER grid stations. They will recover and redeploy moored sediment traps. At Palmer Station, researchers will deploy water-column profiling and sampling instruments using both rigid-hull inflatable boats (RHIBs) and Zodiac boats. They will incubate their seawater samples in the Environmental Room and will also conduct work in the Radioisotope Laboratory.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Samina Ouda / Bruce Felix

Geological history constraints on the magnitude of grounding line retreat in the Thwaites Glacier system

C-443-N



Edwards and Lindsay islands / Amundsen Sea

NSF/OPP Award 1738989
Dr. Brent Goehring, Principal Investigator
Tulane University
Department of Earth and Environmental Sciences
New Orleans, Louisiana
Email: bgoehrin@tulane.edu

NERC Award NE/S006710/1
Dr. Joanne Johnson, Principal Investigator
British Antarctic Survey
Paleo-Environments, Ice Sheets and Climate Change Team
Cambridge, United Kingdom
Email: jsj@bas.ac.uk

Web: thwaitesglacier.org/projects/

Supporting Station/Vessel

RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Late January to mid March

Project Description
Researchers on this project hope to obtain geological evidence from the Thwaites-Pine Island Glacier system that will show whether glaciers were less extensive than they are at present, and, if so, when. Their goals are: (1) to determine whether previous grounding-line retreat-advance cycles, as suggested by existing geological evidence, occurred in the late Holocene; (2) establish under what climate and sea-level boundary conditions they took place; and (3) investigate whether this sector of the ice sheet collapsed during previous warm Pleistocene interglacial periods. Determining the conditions under which the Thwaites and Pine Island Glacier grounding lines have retreated and re-advanced in the past is critically relevant to determining whether or not present-day grounding-line retreat is irreversible.

Field Overview
Field work during 2018-19 will focus on producing a record of relative sea-level change from islands in Pine Island Bay. Two researchers will sail on the RV/IB *Nathaniel B. Palmer* in late January to mid March and will coordinate with a seal tagging team (C-445-N, Heywood/Pettit) on the same cruise to conduct field research in the Edwards Islands. They may also conduct field work on other islands, if opportunities arise. Field work will consist of mapping raised beaches, collecting small samples of organic material for radiocarbon dating, and collecting rock samples for exposure-age dating. Samples will be shipped back to the University of Maine for analysis.

Program Director
Dr. Paul Cutler / Dr. Douglas Kowalewski

ASC Points of Contact
Samina Ouda / Jamee Johnson / Leslie Blank

Melting at Thwaites grounding zone and its control on sea level (THWAITES-MELT)

Eastern Thwaites Ice Shelf

C-444-M

NSF/OPP Award 1739003
Dr. David Holland, Principal Investigator
New York University
Department of Earth Sciences
New York, New York
Email: dmh4@nyu.edu

NERC Award NE/S006656/1
Dr. Keith Nicholls, Principal Investigator
British Antarctic Survey
Polar Oceans Team
Cambridge, United Kingdom
Email: kwni@bas.ac.uk
Email:

Web: thwaitesglacier.org/projects/

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late December to mid January

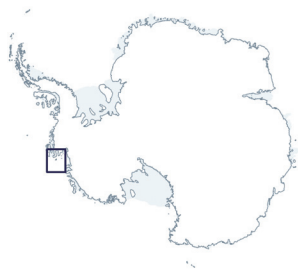
Project Description
Thwaites Glacier is a primary contributor to sea-level rise, and its flow is accelerating. This faster flow is a response to reduced buttressing from a thinning, floating ice shelf caused by ocean-driven melting from below. The degree to which sea-level rise will occur therefore depends largely on ice-ocean interaction beneath Antarctic ice shelves. Researchers will use autonomous sensors to monitor the ice column and ocean beneath the ice shelf in the critical area of the grounding line (where the glacier goes afloat). They will use airborne radar flights to study ice flow, seismic surveys to study the ocean floor under the ice shelf, and a remotely operated vehicle, Icefin, to examine the waters beneath the ice shelf. Ocean moorings will be used to monitor ocean conditions for a year or more. Ground-based phase-sensitive radar will monitor the basal melt rate.

Field Overview
This is the first year of a three-year science event. After completing aerial reconnaissance to confirm a safe landing area, a research team of two, plus a mountaineer, will deploy from WAIS Divide field camp to a location in the grounding zone of the Eastern Ice Shelf of Thwaites Glacier. Once on site the team will conduct an active seismic survey on foot to identify a target area for drilling operations that will be conducted in the 2019-20 field season. If additional landing sites are confirmed, team members will install instruments at other grounding-zone sites over the central Eastern Ice Shelf, as travel conditions permit.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Samina Ouda / Carrie Schaffner / Leslie Blank

Thwaites-Amundsen Regional Survey and Network (TARSAN) integrating atmosphere-ice-ocean processes affecting the sub-ice-shelf environment



C-445-N

NSF/OPP Award 1738992
Dr. Erin Pettit, Principal Investigator
University of Alaska
Fairbanks, Alaska
pettit@gi.alaska.edu

NERC Award NE/S006419/1
Dr. Karen Heywood, Principal Investigator
University of East Anglia
School of Environmental Sciences
Norwich, United Kingdom
Email: k.heywood@uea.ac.uk

Web: thwaitesglacier.org/projects/

Amundsen Sea / Thwaites Glacier / Edwards Islands

Supporting Station/Vessel
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Late January to late March

Project Description
Thwaites and neighboring glaciers in the Amundsen Sea Embayment are rapidly losing mass in response to recent climate warming and related changes in ocean circulation. Better understanding of the dominant processes at and near grounding zones is needed, especially with regard to their spatial and temporal variability and of the atmospheric and oceanic drivers of these processes. The TARSAN project will measure ocean circulation and thinning beneath the floating part of the glacier using state-of-the-art technology such as autonomous underwater vehicles (AUVs) and automated land-ice stations to investigate how the ocean and atmosphere are affecting the glacier.

Field Overview
Researchers will sail on the RV/IB *Nathaniel B. Palmer* from Punta Arenas, Chile to the Amundsen Sea. The goals this season are to test the new University of Gothenburg AUV, perform conductivity-temperature-depth (CTD) surveys, and to tag seals on both islands and sea ice. The team will camp for three days on Edwards Islands and make day trips to tag seals on the sea ice.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Samina Ouda / Jamee Johnson / Leslie Blank

TIME - Thwaites Interdisciplinary Margin Evolution - The role of shear margin dynamics in the future evolution of Thwaites Drainage Basin

C-446-M

NSF/OPP Award 1739027
NERC Award NE/S006788/1
Dr. Slawek Tulaczyk, Principal Investigator
University of California Santa Cruz
Earth Sciences
Santa Cruz, California
Email: stulaczy@ucsc.edu

NERC Award NE/S006788/1
Dr. Poul Christoffersen, Principal Investigator
Cambridge University
Scott Polar Research Institute
Cambridge, United Kingdom
Email: pc350@cam.ac.uk

Research Locations
Eastern Shear Margin of Thwaites Glacier

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid December to early February

Web: thwaitesglacier.org/projects/

Project Description
The Thwaites Interdisciplinary Margin Evolution (TIME) project will test the overarching hypothesis that shear-margin dynamics may exert powerful control on the future evolution of ice flow in the Thwaites Drainage Basin. The work will combine geophysical field data collection on the Eastern Shear Margin (ESM) of Thwaites Glacier with modeling of shear margins and basin-scale numerical investigations of future sea-level contributions. Field work includes instrument installations, active seismic experiments, and radar surveys.

Field Overview
This is the first year of a four-year science event. Two researchers and one mountaineer will deploy to WAIS Divide field camp to test design components of the active-source seismic survey experiment they will be conducting in years three and four using shot holes and explosives. This testing will be completed at a site greater than five kilometers from WAIS Divide. This three-person team will also complete one-to-two reconnaissance missions in the ESM via Twin Otter aircraft to confirm the landing conditions at their remote research sites known as T1 and T2.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Judy Shiple / Carrie Schaffner / Leslie Blank

Stability and instability—records of external drivers and resulting behavior of Thwaites Glacier

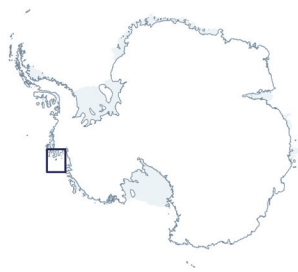
C-447-N

NSF/OPP Award 1738942
Dr. Julia Wellner, Principal Investigator
University of Houston
Dept. of Earth and Atmospheric Sciences
Houston, Texas
Email: jwellner@uh.edu

NERC Award NE/S006664/1
Dr. Robert Larter, Principal Investigator
British Antarctic Survey
Cambridge, United Kingdom

Phone: 44.12.1573
Email: rdla@bas.ac.uk

Web: thwaitesglacier.org/projects



Amundsen Sea / Thwaites Ice Shelf fronts / seaward of Thwaites Glacier

Supporting Station/Vessel
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Late January to mid March

Project Description
This project will conduct marine and sub-ice shelf research to: (1) establish boundary conditions seaward of the Thwaites Glacier grounding line; (2) obtain records of past external drivers of glacier change; and (3) determine the history of past changes in grounding-line migration and conditions at the glacier base. These objectives will be achieved through high-resolution geophysical surveys of the seafloor and analysis of sediment cores from the inner shelf seaward of the Thwaites Glacier grounding line. The team will use ship-based equipment and a corer deployed through the ice shelf via hot water drill holes. The results will be incorporated into numerical ocean/ice-sheet models and will improve projections of ice loss and sea-level rise originating from the glacier.

Field Overview
For this project, researchers will sail on the RV/IB *Nathaniel B. Palmer* from Punta Arenas, Chile to their research area in the Amundsen Sea. They will sail with other Thwaites Glacier research groups (Goehring/Johnson (C-443-N), Pettit/Heywood (C-445-N), and an NSF Artists and Writers grantee (Rush-Mueller, W-481-N) and plan to collect sediment cores using a combination of jumbo-piston, box, multi (mega), and Kasten cores. To help determine the best sites for coring, they will conduct multibeam swath bathymetry and sub-bottom profiling surveys.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Samina Ouda / Jamee Johnson / Leslie Blank

McMurdo LTER – Glaciers: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-504-M

NSF/OPP Award 1637708
Dr. Michael Gooseff, Principal Investigator
University of Colorado Boulder
Institute of Arctic and Alpine Research
Boulder, Colorado

Phone: 303.735.5333
Email: michael.gooseff@colorado.edu
Web: www.mcmlter.org

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to early February

Project Description
Initially funded in 1980, the U.S. Long-Term Ecological Research (LTER) network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers study ecological processes over long temporal and broad spatial scales. Glacier researchers will continue measurements of physical properties of Dry Valley glaciers and their response to meteorological conditions, with special emphasis on LTER core research areas. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview
Glaciers
Researchers will divide time between Lake Hoare and F6 camps, with short returns to McMurdo Station to process samples. From camp, they will make day trips to glaciers in the Taylor and Miers valleys. Over the season, they hope to: (1) maintain established active-layer monitoring stations (ALMS); (2) perform mass-balance measurements; (3) collect shallow ice cores and meltwater from glaciers; (4) collect landscape albedo measurements from a helicopter-slinged albedo box over the Taylor Valley; (5) measure dissolved oxygen in supraglacial and valley streams: deploy temperature sensors and a data logger into borehole #11; (6) conduct nutrient uptake experiments in two streams on top Canada Glacier; (7) maintain glacier ice temperature logging stations; (8) collect water samples from glacier cliff faces; and (9) collect stream water and sediment samples.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

McMurdo LTER – Limnology: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-505-M

NSF/OPP Award 1637708

Dr. John Priscu, Principal Investigator
Montana State University Bozeman
Land Resources and Environmental Sciences
Bozeman, Montana

Phone: 406.570.6761
Email: jpriscu@montana.edu
Web: www.mcmlter.org

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to late January

Project Description
Initially funded in 1980, the U.S. Long-Term Ecological Research (LTER) network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers study ecological processes over long temporal and broad spatial scales. Researchers focusing on lakes will continue their long-term measurements of biological, chemical, and physical limnological properties of Dry Valley lakes and lake ice, with special emphasis on LTER core research areas. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview

Limnology
A four-person research team will travel to and from the Dry Valleys by helicopter. The group will rotate through various field camps with a final stay at Lake Hoare in January. They will work from Polarhaven tents erected on Lakes Fryxell, Bonney, and Hoare and will drill and melt holes in lake ice underneath and nearby these structures to access the water. The researchers will also conduct similar work under a Scott tent at Lake Miers. They will use radioisotopes at field sites, at the fixed camps, and in Crary Laboratory. Field activities will include conducting "limno runs" (collecting lake water from various depths to create a profile of the lakes' basic chemical and physical parameters) and managing sediment traps deployed in Lakes Bonney and Hoare.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

McMurdo LTER – Streams/ Geochemistry: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-506-M

NSF/OPP Award 1637708
Dr. Michael Gooseff, Principal Investigator
University of Colorado Boulder
Institute of Arctic and Alpine Research
Boulder, Colorado

Phone: 303.735.5333
Email: michael.gooseff@colorado.edu
Web: www.mcmlter.org

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to mid February

Project Description
Initially funded in 1980, the U.S. LTER network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers study ecological processes over long temporal and broad spatial scales. Streams component researchers will continue to operate a network of 16 stream-flow gauges, collect water quality samples from 30 streams, and make hydrologic measurements. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview

Streams and Geochemistry
Participants with the "stream team" will stay at the F6 camp and occasionally work out of Lake Hoare camp for a few days at a time. Field work will be conducted in Wright, Taylor, and Miers Valleys. The group will also conduct analyses in Crary Laboratory. Field sites will be accessed on foot and by helicopter day trips. Field activities may include: (1) maintaining a stream-gauge network; (2) collecting water-quality samples; (3) monitoring microbial mats in an abandoned channel in the Taylor Valley; (4) measuring dissolved oxygen in streams in the Lake Hoare and Lake Fryxell basins; (5) deploying and maintaining Aeolian sediment collectors across stream channels for over-winter collection of wind-blown material; (6) permafrost degradation experiments (PDE); and (7) glacier-stream-soil (GSS) studies.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

McMurdo LTER – Soils: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-507-M

NSF/OPP Award 1637708

Dr. Byron Adams, Principal Investigator
Brigham Young University
College of Life Sciences
Provo, Utah

Phone: 801.422.3132
Email: bjadams@byu.edu
Web: www.mcmlter.org

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late December to early February

Project Description
Initially funded in 1980, the U.S. LTER network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers are studying ecological processes over long temporal and broad spatial scales. The soils team will maintain, monitor, and sample their long-term plots near Lakes Bonney, Fryxell, and Hoare and aims to determine impacts of natural factors and those associated with potential climate change on soil biota. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview

Soils
Participants will make overnight trips to Dry Valleys camps and day trips on foot and by helicopter to Taylor, Miers, and Garwood valleys' sites. The group will store samples at camps but will do all sample processing at Crary Lab. Field activities may include: continuing long-term measurements of soil biodiversity and biogeochemical processes; monitoring established soil meteorological stations; sampling soils near fixed and historic camps; continuing the long-term permafrost thaw experiment; continuing the long-term soil stoichiometry experiment; establishing permanent sampling transects for the soil-lake inundation moat experiment; establishing a new study monitoring moss and algal ground cover and production in near-stream environments and dry soils; and establishing soil sampling sites for the permafrost degradation experiment.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

McMurdo LTER – Integrative Science: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-508-M

NSF/OPP Award 1637708
Dr. Cristina Takacs-Vesbach, Principal Investigator
University of New Mexico
Department of Biology
Albuquerque, New Mexico

Phone: 505.264.9042
Email: cvesbach@unm.edu
Web: mcmlter.org

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to early February

Project Description
Initially funded in 1980, the U.S. Long-Term Ecological Research (LTER) network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers are studying ecological processes over long temporal and broad spatial scales. This event will focus on microbial ecology, activity, and biodiversity across a variety of Dry Valleys' habitats, including soils, streams, and lakes. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview
Integrative Science
Research team members will reside at fixed camps and access field sites by helicopter and on foot. They will process and analyze some samples in the field but will also perform work in Crary Laboratory, with radioisotopes used in some analyses. The team will also conduct diving operations in Lakes Bonney and Fryxell. Field activities may include: (1) collecting soils, lake water, and sampling microbial mats; (2) diving and snorkeling in moats to deploy benthic chambers, collect benthic mat and sediment samples, and conduct surveys; (3) recording cyanobacterial mat locations in the moats of Lakes Bonney and Fryxell; and (4) conducting the Lake Integrated Connectivity Experiment (LICE) and the transplant Lake Integrated Connectivity Experiment (tLICE).

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

McMurdo LTER – Algal Ops: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-509-M

NSF/OPP Award 1637708

Dr. Michael Gooseff, Principal Investigator
University of Colorado Boulder
Institute of Arctic and Alpine Research
Boulder, Colorado

Phone: 303.735.5333
Email: michael.gooseff@colorado.edu
Web: www.mcmlter.org/

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late December to late January

Project Description
Initially funded in 1980, the U.S. Long-Term Ecological Research (LTER) network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers study ecological processes over long temporal and broad spatial scales. Geochemistry researchers monitor the inorganic geochemistry of water and solid samples collected from Dry Valleys' glaciers, streams, ponds, lakes, and landscape. They also study upland seeps and ponds to gain a better understanding of their hydrologic and geochemical controls. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview

Algal Ops
Researchers will work out of the F6 and Lake Hoare camps in the Dry Valleys and will access sites by helicopter and on foot. They will survey and sample established algal transects in the Taylor, Wright, Garwood, and Miers Valleys and will use laboratory space at field camps to filter and process samples for transport to Crary Laboratory. Field activities may include: (1) surveying and sampling all 16 established algal transects; (2) continuing work on the Stream Mat Transplant Experiment (SMTE); (3) conducting terrestrial LiDAR surveys of the algal transects with assistance from UNAVCO; and (4) deploying sediment traps on lake surfaces to capture Aeolian deposits with C-505-M (Priscu).

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

McMurdo LTER – Meteorology/ Lakes: Ecosystem response to amplified landscape connectivity in the McMurdo Dry Valleys, Antarctica

C-511-M

NSF/OPP Award 1637708
Dr. Peter Doran, Principal Investigator
Louisiana State University Baton Rouge
Department of Geology and Geophysics
Baton Rouge, Louisiana

Phone: 630.430.4520
Email: pdoran@lsu.edu
Web: www.mcmlter.org/

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to early February

Project Description
Initially funded in 1980, the U.S. Long-Term Ecological Research (LTER) network is a collaborative effort of more than 1,800 scientists and students. The McMurdo LTER program is a multi-disciplinary aquatic and terrestrial ecosystems study in the McMurdo Dry Valleys. It is one of 26 LTER sites where researchers are studying ecological processes over long temporal and broad spatial scales. Researchers on this project will focus on the physical limnology of the McMurdo Dry Valleys' lakes. They will maintain long-term automated lake-monitoring equipment, monitor meteorological stations, and carry out manual measurements of lake properties. This six-year award cycle comprises seven collaborative projects: C-504-M (Gooseff), C-505-M (Priscu), C-506-M (Gooseff), C-507-M (Adams), C-508-M (Takacs-Vesbach), C-509-M (Gooseff), and C-511-M (Doran).

Field Overview

Meteorology
The research team will work out of Dry Valley camps at Lakes Fryxell, Bonney, and Hoare, with a stay at Lake Miers. They will also make day trips on foot and by helicopter to Wright and Victoria Valleys. Their field work will include maintaining long-term automated lake-monitoring equipment, monitoring meteorological stations, and conducting manual measurements of lake properties. They will also install cameras with wide-angle views of Taylor Valley for qualitative meteorological analysis and outreach and a GPS unit equipped with a time-lapse camera on the terminus of Taylor Glacier with a view of Blood Falls to monitor active brine outflow.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman / Jennifer Blum

ANTarctic Airborne ElectroMagnetics (ANTAEM) - revealing subsurface water in coastal Antarctica

C-516-M

NSF/OPP Award 1644187
Dr. Slawek Tulaczyk, Principal Investigator
University of California Santa Cruz
Earth Sciences
Santa Cruz, California

Phone: 831.459.3133
Email: stulaczy@ucsc.edu
Web: n/a

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to early December

Project Description
In Antarctica, millions of years of freezing have led to the development of hundreds of meters of permafrost. This slow freezing has trapped and concentrated water into local and regional briny aquifers that are many times saltier than seawater. Such unusual groundwater systems may support microbial life, supply nutrients to coastal ocean and ice-covered lakes, and influence glacier motion. These briny aquifers also represent potential terrestrial analogs for deep life habitats on other planets, such as Mars, and provide a testing ground for the search for extraterrestrial water. This project will reveal if cold polar deserts hide a subsurface pool of liquid water. This will have significant implications for understanding cold polar glaciers, ice-covered lakes, frozen ground, polar microbiology, and for predictions of their responses to future change.

Field Overview
A team of nine will deploy to McMurdo Station where they will spend a week constructing and calibrating a transient electromagnetic sensor (SkyTEM), which they will use to map the hidden distribution of groundwater and ice. Following construction of the SkyTEM, the team will conduct testing over the McMurdo Ice Shelf and surveys of the Miers and Garwood Valleys. They will then move to camps at Marble Point, Lake Bonney, and Round Mountain where the ANTarctic Airborne ElectroMagnetics (ANTAEM) and surface-sampling teams will conduct surveys and collect water, ice, and sediment samples.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Judy Shiple / Meghan Walker / Jennifer Blum

Subglacial Antarctic Lakes Scientific Access (SALSA): Integrated study of carbon cycling in hydrologically active subglacial environments

C-533-M

NSF/OPP Award 1543537
Dr. John Priscu, Principal Investigator
Montana State University Bozeman
Land Resources and Environmental Sciences
Bozeman, Montana

Phone: 406.570.6761
Email: jpriscu@montana.edu
Web: www.salsa-antarctica.org

Research Locations
Whillans Ice Plain / Subglacial Lake Mercer

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to mid January

Project Description
This project is the surface geophysics component of the Subglacial Antarctic Lakes Scientific Access (SALSA) project and has been underway for two years. The project's long-term GPS array on the Whillans Ice Plain comprises eight stations that capture subglacial lake activity and the resulting ice dynamics. The long-term array will be supplemented this season by temporary GPS experiments and collection of kinematic GPS data in order to examine important interfaces such as the shoreline of a subglacial lake.

Field Overview
A researcher and a mountaineer will deploy to McMurdo Station and join another two-participant team, working on the Whillans electromagnetic (EM) project (Fricker, I-353-M). The combined four-person field team will travel by LC-130 aircraft to the Whillans Ice Plain operating for eight weeks as an unsupported "roving" field camp, conducting EM surveys (I-353-M) and performing maintenance on GPS stations. The team will follow the SALSA traverse route to Subglacial Lake Mercer (SLM), servicing the remaining five GPS stations along the way. At SLM, two participants will remain at SALSA camp to conduct a four-day GPS experiment and deploy a fiber-optic cable down the SALSA borehole for year-long continuous temperature measurements.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Judy Shiple / Dean Einerson / Matthew Kippenhan

Subglacial Antarctic Lakes Scientific Access (SALSA): Integrated study of carbon cycling in hydrologically active subglacial environments: Drilling Component

C-534-M

NSF/OPP Award 1543537
Dr. John Priscu, Principal Investigator
Montana State University Bozeman
Land Resources and Environmental Sciences
Bozeman, Montana

Phone: 406.570.6761
Email: jpriscu@montana.edu
Web: salsa-antarctica.org

Research Locations
Whillans Ice Plain

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to mid January

Project Description
The Subglacial Antarctic Lakes Scientific Access (SALSA) project will use a clean access hot water drill to penetrate into Subglacial Lake Mercer (SLM), one of the largest and most dynamic subglacial lakes on the Whillans Ice Plain. The lake is hydraulically active with water replacement times on the order of a decade. The team will collect samples of basal ice, sediments, and lake water to explain how relict organic matter deposited during marine incursions influences contemporary biodiversity and carbon cycling and to provide new information on past climatic conditions.

Field Overview
Several members of the drill team (McManis, T-524-M) will assist ASC staff with preparations and loading of equipment to the launch and recovery system (LARS) deck, including the Submersible Capable of under Ice Navigation and Imaging (SCINI) winch, prior to the traverse departure. Upon establishing the SALSA field camp at SLM, science personnel and drillers will fly to the camp by mid December to open laboratories, set up drilling equipment, and coordinate the start of the hot water drilling operations. The remaining science team members will arrive several days later to begin sampling SLM once the borehole is completed. Science personnel will collect and prepare ice, water, and sediment samples for shipment to the United States. Outreach personnel will film and photograph all aspects of the SALSA season. Borehole operations will continue into early January until camp close out begins.

Program Director
Dr. Jennifer Burns

ASC Points of Contact
Judy Shiple / Dean Einerson / Matthew Kippenhan

Antarctic Instrumentation and Research Facilities

NSF/OPP Program Director: Dr. Michael Jackson

(Presented in order of science event number)

D-552-M	Goodge, John		D-553-S	de la Pena, Santiago	

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Phase 2 development of a Rapid Access Ice Drilling (RAID) platform for research in Antarctica

D-552-M

NSF/OPP Award 1419935
Dr. John Goodge, Principal Investigator
University of Minnesota
Department of Geological Sciences
Duluth, Minnesota

Phone: 218.726.7491
Email: jgoodge@d.umn.edu
Web: www.rapidaccessicedrill.org

Research Locations
South Pole Operations Traverse staging area (SPotSA)

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late January to mid February

Project Description
The Rapid Access Ice Drill (RAID) aims to rapidly drill to deep ice (up to 3,300-meter depth), followed by coring of ice, ice-sheet bed interface, and the bedrock substrate below. The RAID drilling platform will give the scientific community access to a rich record of geologic and climatic change on a variety of timescales, from the billion-year rock record to thousand-year ice and climate histories. The RAID drill was designed and commissioned for testing in 2015 and the drill has undergone two field tests near Minna Bluff.

Field Overview
A four-person team will conduct system updates, maintenance, and functional tests of a new drill head and cutting tool. All operations will be conducted from McMurdo Station. The RAID modules were stored over the winter at the Black Island-South Pole route junction and will need to be moved off the berms to the South Pole Traverse staging area (SPoTSA) and put into the drilling configuration. The team requests that the RAID modules be moved to a location on the ice shelf as close to McMurdo Station as possible in order to minimize commuting time. Once modules are in place, the RAID project staff will be self sufficient as they operate out of McMurdo Station.

Program Director
Dr. Michael Jackson

ASC Points of Contact
Judy Shiple / Dean Einerson / Matthew Kippenhan

EAGER: An operational system to measure surface mass balance deep in the interior of the Antarctic ice sheet

D-553-S

NSF/OPP Award 1654922

Dr. Santiago de la Pena, Principal Investigator
Ohio State University
Byrd Polar and Climate Research Center
Columbus, Ohio

Phone: 614.623.3220
Email: santiagodpr@gmail.com
Web: n/a

Research Locations
On station

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
Snow accumulation and redistribution by wind are important components of the climate of Antarctica yet remain largely unknown. Direct observations of snowfall and related weather are few, leaving a gap in the regional climate records of the continent. Because of Antarctica's size, even small fluctuations in the total snow accumulation at the surface have a significant effect on the mass budget of the ice sheet and thus on global sea level. This project will install sensors at South Pole to record weather, snow accumulation, and structural conditions within the layer of packed snow. The autonomous system will be tested in the austral winter and will provide the first continuous measurements of snow-accumulation processes in the interior of the ice sheet, which will be used to validate atmospheric and regional climate models.

Field Overview
The principal investigator will deploy for three days to the South Pole where he will inspect the previously installed instrument, repair damage it sustained during its first year of operation, and prepare it for the coming winter. Throughout the year, the system transmits data via Iridium satellites. Power is provided by wind and solar attached to the instrument and stored locally in a battery bank, so no connection to the South Pole Station power grid is necessary.

Program Director
Dr. Michael Jackson

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe

Antarctic Earth Sciences

NSF/OPP Program Director: Dr. Douglas Kowalewski

(Presented in order of science event number)

G-055-M	Lamp, Jennifer	G-079-M	Wilson, Terry
G-058-M	Harvey, Ralph	G-090-P/S	Anderson, Kent
G-065-M	Mitrovica, Jerry	G-094-P	Yu, ZiCheng
G-066-M	Phillips, Fred	G-116-N	Koppers, Antonius
G-071-M	Shubin, Neil	G-412-L	Simms, Alexander
G-078-M	Kemerait, Robert	G-437-E	Wilcock, William

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Landscape evolution in the McMurdo Dry Valleys: Erosion rates and real-time monitoring of rock breakdown in a hyper-arid, sub-zero environment

G-055-M

NSF/OPP Award 1744895
Dr. Jennifer Lamp, Principal Investigator
Columbia University
Lamont-Doherty Earth Observatory
Palisades, New York

Phone: 845.365.8435
Email: jlamp@ldeo.columbia.edu
Web: n/a

Research Locations
Beacon Valley

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late November to early February

Project Description
Moisture plays a part in the erosion of rocks, but in the ice-free Dry Valleys region of Antarctica – one of the driest places on the planet – little is known about the rates and causes of rock erosion. To better understand them, researchers will instrument boulders with sensors that act as miniature seismographs, recording even the smallest microcracking on and within the rocks. They will also monitor the weather and environment around the rocks to record the conditions that trigger cracking events and will collect a variety of rock samples to study how quickly rocks break down and how their characteristics change over geologic time. The combined datasets will allow future scientists to more accurately understand the paleoclimates and landscapes of Antarctica, and possibly even Mars.

Field Overview
A research team of three participants will travel by helicopter from McMurdo Station to a field camp in the Beacon Valley. Near the campsite, they will deploy an acoustic emission (AE) monitoring system and will instrument four boulders with AE sensors, micrometeorological sensors (surface temperature, surface moisture), and will construct a full meteorological station (wind speed/direction, air temperature/relative humidity, solar irradiance, and air pressure). A helicopter-supported day trip will drop off the research team near the headwall of Mullins Glacier; they will hike back down to their campsite, collecting rock and sediment samples while hiking, and caching their samples along the way to be retrieved by helicopter later in the season.

Program Director
Dr. Michael Jackson

ASC Points of Contact
Jenny Cunningham / Bija Sass

Antarctic Search for Meteorites (ANSMET)

G-058-M

NSF / NASA Agreement
Dr. Ralph Harvey, Principal Investigator
Case Western Reserve University
Department of Geological Sciences
Cleveland, Ohio

Phone: 216.368.0198
Email: rph@case.edu
Web: caslabs.case.edu/ansmet

Research Locations
Davis Nunataks / Mount Ward / Dominion Ice Fields

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid November to early February

Project Description
The Antarctic Search for Meteorites (ANSMET) program is a field-based science project that recovers meteorite specimens from Antarctica. Since 1976, teams have recovered more than 21,000 specimens from surfaces along the Transantarctic Mountains. These specimens are a reliable, continuous source of new, non-microscopic extraterrestrial material and support thousands of scientists from around the globe as they seek essential "ground-truth" concerning the materials that make up the asteroids, planets, and other bodies of our solar system. The study of ANSMET meteorites has extended knowledge of the materials and conditions from which our solar system was born and has revealed the geologic nature of asteroids.

Field Overview
Two teams will search for and recover meteorites from blue-ice areas within and near the Transantarctic Mountains. A team of six will explore ice fields near Beardmore and Mill Glaciers. They will work the ice fields near the Davis Nunataks and Mount Ward before making a camp move with snowmobiles and Twin Otter support to ice fields near the main Dominion Range.

Program Director
Dr. Michael Jackson

ASC Points of Contact
Samina Ouda / Bija Sass

Constraining West Antarctic Ice Sheet elevation during the last interglacial

G-065-M

NSF/OPP Award 1744927
Dr. Jerry Mitrovica, Principal Investigator
Harvard University
Cambridge, Massachusetts

Phone: 617.945.2564
Email: jxm@eps.harvard.edu
Web: n/a

Research Locations
Mount Waesche

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late November to mid January

Project Description
This project aims to place minimum constraints on the West Antarctic Ice Sheet elevations at Mount Waesche, a young volcano in Marie Byrd Land near the dome of the ice sheet, during recent interglacial periods. The team will use cosmogenic nuclide inventories and 40 Ar/39 Ar dating of lava flows near and below the present ice level to identify and date lower-than-present ice levels.

Field Overview
In the first year of the project, the team will focus on selecting suitable sites for the blue-ice drilling that will take place in the second season. In order to identify lava flows that have ages and lithologies that are suitable targets for drilling, the group will map lava flows on the flank of Mount Waesche that extend under the present ice surface and collect samples for exposure and 40 Ar/39 Ar dating. The team will map subglacial topography using ice-penetrating radar to select optimal locations for shallow ice drilling. They will also set stakes to measure ice ablation and movement between the two field seasons. All activities will take place within five miles of the group's campsite.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Judy Shiple / Bija Sass

A test of global and Antarctic models for cosmogenic-nuclide production rates using high-precision dating of 40 Ar/39 Ar lava flows from Mount Erebus

G-066-M

NSF/OPP Award 1644234
Dr. Fred Phillips, Principal Investigator
New Mexico Institute of Mining and Technology
Department of Earth and Environmental Science
Socorro, New Mexico

Phone: 575.835.5540
Email: phillips@nmt.edu
Web: n/a

Research Locations
Mount Erebus

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid November to early December

Project Description
Determining the age of Earth's surface rocks and soils can help answer human-welfare questions, including: What is the eruption history of a volcano and is it likely to erupt again? When did glaciers advance and what do they tell us about climate? What is the frequency of landslides, floods, and debris flows? How long does it take soils to form and is erosion of soils going to make farming unsustainable? To address these questions, researchers will use the "cosmogenic surface-exposure dating" method. This method takes advantage of cosmic rays produced by supernovae that constantly bombard Earth's atmosphere. Some cosmic rays reach Earth's surface and produce nuclear reactions that result in rare isotopes. Measuring the isotope quantity will enable researchers to calculate the length of time that the rock or soil has been exposed to the atmosphere.

Field Overview
This one-season project will include a team of three grantees and a mountaineer to make helicopter close-support day trips from McMurdo Station to sample lava flows at multiple sites on the flanks and near the summit of Mount Erebus. The team will collect rock samples at those locations and use 40 Ar/39 Ar dating methods to determine eruption ages of the lavas. They will then use these to calibrate the cosmogenic ages from the same samples.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Jenny Cunningham / Jennifer Blum

Middle-late Devonian vertebrates of Antarctica

G-071-M

NSF/OPP Award 1543367
Dr. Neil Shubin, Principal Investigator
University of Chicago
Department of Organismal Biology and Anatomy
Chicago, Illinois

Phone: 773.834.7472
Email: neil.shubin@gmail.com
Web: n/a

Research Locations
Victoria Land

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late November to mid January

Project Description
Understanding the relationships and history of sharks, fish, and limbed animals forms the backbone for both basic and applied science because fish often serve as models of human traits and diseases. Some of the main lines of evidence for these relationships come from fossils in rocks over 380 million years old that were originally deposited by ancient rivers and streams. Because rocks of this type and age are abundantly exposed on the flanks of mountains in Antarctica, the investigation of these areas holds exceptional promise for discoveries that can have a broad impact. Researchers hope to uncover fossilized vertebrates that may provide data on the emergence of anatomical structures, fauna, and habitats during a critical moment of evolution.

Field Overview
A team of six researchers will travel by Twin Otter aircraft to Deception Glacier where they will establish field camps for about one month. They will travel between camps and to their research sites by snowmobile and will collect fossils from the Middle and Upper Devonian periods along the nunataks in Skelton Névé and Deception Glacier. Geological maps and previous reconnaissance indicate that rocks in those areas are broadly exposed across outcrops extending from the Escalade, Warren, and Boomerang Ranges to the south, and Mount Portal to the north. A documentary film crew will join them for the last week of their field season.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Jenny Cunningham / Bija Sass

Dry Valley seismic project

G-078-M

NSF/PLR-DoD MOA
Dr. Robert Kemerait, Principal Investigator
United States Air Force
AFTAC
Patrick AFB, Florida

Phone: 321.494.8630
Email: robert.kemerait@us.af.mil
Web: n/a

Research Locations
Dry Valleys

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to mid November

Project Description
The Dry Valley seismic project monitors regional and global seismicity. The Dry Valleys' stations are part of the Air Force Technical Applications Center's (AFTAC) southern network, which accumulates near-real-time data from nine locations in the Southern Hemisphere. The data are transmitted to the National Data Center in Florida and made available to the international scientific community.

Field Overview
Six personnel will deploy from late October through late November to refuel diesel generators and perform annual equipment maintenance and inspections at the Bull Pass (Wright Valley) seismic and Mount Newall repeater sites. The team will camp at each site for seven to 10 days. Camp put-ins and pull-outs will be by helicopter.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

Investigating ice sheet - solid Earth feedbacks in West Antarctica: Implications for ice sheet evolution and stability

G-079-M

NSF/OPP Award 1745074
Dr. Terry Wilson, Principal Investigator
Ohio State University
Geological Sciences and Byrd Polar and Climate Research Center
Columbus, Ohio

Phone: 614.292.0723
Email: wilson.43@osu.edu
Web: www.polenet.org

Research Locations
On station / WAIS Divide

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early December to early February

Project Description
The POLENET-ANET autonomous GPS and seismic network will be reconfigured to acquire higher-resolution data across West Antarctica to capture spatially varying crustal motions and Earth structure in a region where the ice sheet is rapidly changing and the solid Earth is responding with some of the world's fastest glacial isostatic adjustment (GIA) rates. Observations will be integrated into three-dimensional modeling to investigate solid Earth-cryosphere feedback processes that influence the past, present, and future behavior of the West Antarctic Ice Sheet (WAIS). These advanced models, constrained by the new observations, will improve estimates of West Antarctic ice-mass changes, establish where the WAIS may be stabilized by ongoing Earth deformation, and reduce uncertainties in future sea-level-change projections.

Field Overview
This season, a team of five researchers and a mountaineer will travel by LC-130 aircraft to the WAIS Divide field camp, from which they will access their remote sites by Twin Otter aircraft. Planned work includes installing GPS and seismic stations in a high-density array to capture spatially varying crustal motions and Earth structure in a critical region where the ice sheet is rapidly changing and the solid Earth is responding with some of the world's fastest GIA rates. If time and resources allow, the research team will also remove one GPS system from a field site in the McMurdo Station area.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Judy Shiple / Bija Sass

Global seismograph station at South Pole, Scott Base, and Palmer Stations

G-090-P/S

NSF/EAR Award 1261681
Mr. Kent Anderson, Principal Investigator
Incorporated Research Institutions for Seismology (IRIS)
Socorro, New Mexico

Phone: 575.835.5070
Email: kent@iris.edu
Web: www.iris.edu/hq/programs/gs

Research Locations
B2 Science Building / SPRESSO Vault / Terra Lab / Scott Base (NZ)

Supporting Station/Vessel
Palmer Station, McMurdo Station, South Pole Station

Dates in Antarctica
Instruments operate year around.

Project Description
The Incorporated Research Institutions for Seismology (IRIS) is an NSF-sponsored university consortium dedicated to operating scientific facilities for the acquisition, management, and distribution of freely available seismic data. This project is a long-term seismicity study and is part of IRIS's 120-plus station Global Seismographic Network (GSN), a joint network operated by both IRIS and the United States Geological Survey (USGS), including installations at Palmer Station, Scott Base, and South Pole Station. Recently, the South Pole seismic station was moved from the V1 vault (near the old dome site) to the South Pole Remote Earth Science and Seismological Observatory (SPRESSO) to reduce station-related "cultural" noise. The move has made it the quietest seismic station in the entire GSN. Lower background noise levels will allow researchers to see smaller events from farther away and help identify and characterize Antarctic seismicity.

Field Overview
A support contractor research associate (RA) provides year-round, on-site support for this research project's instruments. In addition, every other season a two-person science field team deploys to the South Pole in mid December for routine maintenance on the installed instruments. The science team does not typically deploy to Palmer Station, but may deploy USGS personnel to Palmer as part of their field team. If work is necessary at either station during the off season, NSF approval is required because of limited bed space. The science team conducts training for the RA, which includes a site visit to the principal investigator's home institution for two days prior to deployment. Maintenance of the station at Scott Base (New Zealand) is accomplished using IRIS personnel at McMurdo Station.

Program Director
Dr. Michael Jackson

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe

Reconstructing late Holocene ecosystem and climate shifts from peat records in the western Antarctic Peninsula

G-094-P

NSF/OPP Award 1745068
Dr. Zicheng Yu, Principal Investigator
Lehigh University
Earth and Environmental Sciences
Bethlehem, Pennsylvania

Phone: 610.758.6751
Email: ziy2@lehigh.edu
Web: n/a

Research Locations
Western Antarctic Peninsula

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Mid January to late February

Project Description
Peat-forming ecosystems archive their own long-term history of ecosystem and climate changes in the accumulated peat deposits. Using proxy records preserved in peat deposits, this group will undertake a systematic survey and study to reconstruct ecosystem and climate change for the coastal low-elevation areas on the Western Antarctic Peninsula (WAP). Preliminary data show a pronounced warming of up to 6° C about 2,300 to 1,200 calendar years before present, in the terrestrial ice-free area of the mainland peninsula. The researcher's goal is to document and understand the transformations of the cryosphere as well as terrestrial ecosystems on the WAP in response to large-magnitude temperature shifts during the Late Holocene.

Field Overview
A three-person science team will conduct field observations and survey various peat-forming ecosystems using small boats from Palmer Station and the ARSV *Laurence M. Gould*. The team will install two microclimate stations and data loggers at Norsel Point and at a site in the Joubin or Gossler Islands. They will make reconnaissance trips using the Palmer Station rigid-hull inflatable boats (RHIBs) to help determine exact site locations. At each sample site, peat cores, peat basal samples, plant samples, and “dead” mosses re-exposed from retreating ice will be collected. Peat cores will be taken with a custom coring device. Some data retrieval and maintenance may be required from support contractor marine technicians and research associates.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
David Rivera / Cara Ferrier

Rio Grande Rise: New questions on plume dynamics, Atlantic tectonic evolution and an important window to the African Large Low Shear Velocity Province (LLSVP)

G-116-N

NCSF/OCE 1558681
Dr. Antonius Koppers, Principal Investigator
Oregon State University
College of Oceanic & Atmospheric Sciences
Corvalis, Oregon

Phone: 541.737.5425
Email: akoppers@coas.oregonstate.edu
Web: n/a

Research Locations
Rio Grande Rise

Supporting Station/Vessel
RV/IB *Nathaniel B. Palmer*

Research Dates
Early August to early October

Project Description
The Rio Grande Rise in the South Atlantic Ocean off the coast of Brazil is a volcanic oceanic plateau that formed on, or close to, the Mid-Atlantic Ridge spreading center. The Walvis Ridge, which is now located off Africa, also formed near the Mid-Atlantic Ridge close to the same time. The Rio Grande Rise is about twice the volume of Walvis Ridge, and together they record about 130 million years of intra-plate volcanism and are hypothesized to represent the products of a deep mantle plume. To understand the history of these large volcanic features, this project will sail on a science cruise to the Rio Grande Rise to survey and collect rock samples from 40 seamounts, rift zone valleys, and steep escarpments. These new data will allow a thorough investigation of the formation of the Rio Grande Rise and its relationship to the Walvis Ridge.

Field Overview
In the 2018-19 season, the science team will sail on the RV/IB *Nathaniel B. Palmer* and will have 38 days (including weather days) devoted to science. They will conduct multibeam sonar surveys over 14 seamounts and 26 target sites along relatively steep rift valley shoulders and escarpments; magnetometer and gravimeter surveys between dredge sites, during transits, and during multibeam surveys; and 40 dredges for rock samples. Science cargo will be onloaded in Punta Arenas, Chile, and the vessel will then sail to Montevideo, Uruguay, where the science party will embark. At the end of the cruise, the science team and their cargo will be offloaded at Montevideo. Transit to and from the study area from Montevideo will add nine days of transit time for a total 47 days at sea.

Program Director
Mr. Tim McGovern / Ms. Rose Dufour

ASC Points of Contact
Rachel Shackelford / Bruce Felix

New constraints on post-glacial rebound and Holocene environmental history along the northern Antarctic Peninsula from raised beaches

G-412-L

NSF/OPP Award 1644197
Dr. Alexander Simms, Principal Investigator
University of California Santa Barbara
Dept. of Geological Sciences
Santa Barbara, California

Phone: 805.893.7292
Email: asimms@geol.ucsb.edu
Web: n/a

Research Locations
Livingston Island (Byers Peninsula)

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
February and March

Project Description
An indication of accelerated ice loss across Antarctica is the increase in the rate that land is rising across the Antarctic Peninsula, as measured by GPS observations. However, GPS data are limited to the last two decades. Researchers hope to determine how recent observations of uplift compare to the average long-term uplift rate across the peninsula. The team will determine uplift rates over the past 5,000 years by reconstructing past sea levels through use of ground-penetrating radar. The radar data will unveil beach structure including ancient shorelines that can be used to understand further how sea-level rise and past climate changes are recorded in beach deposits. These new records will: (1) help determine natural variability of the Antarctic Ice Sheet and relative sea level; (2) provide new insight about uplift and the structure of Earth's interior; and (3) help refine methods used to determine the age of geologic deposits.

Field Overview
The team will sail from Punta Arenas, Chile on the ARSV *Laurence M. Gould* to visit ice-free areas on Byers Peninsula within the South Shetland Islands. They will: (1) collect ground-penetrating radar data across raised beaches; (2) collect cobbles and sands for optically stimulated luminescence (OSL) analysis to obtain the age of the beaches; (3) count ice-rafted debris and determine cobble roundness; (4) collect drone imagery of the raised beaches; and (5) sample historic whale bones from Deception Island to better constrain the radiocarbon reservoir for whale bones.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Samina Ouda / Cara Ferrier

The tectonic and magmatic structure and dynamics of back-arc rifting in Bransfield Strait: An international seismic experiment

G-437-E

NSF/OPP Award 1744651
Dr. William Wilcock, Principal Investigator
University of Washington
School of Oceanography
Seattle, Washington

Phone: 206.543.6043
Email: wilcock@uw.edu
Web: n/a

Research Locations
Bransfield Strait

Supporting Station/Vessel
Special Project

Dates in Antarctica
Early January to early February

Project Description
This project is the United States component of an international experiment led by Spain to conduct a study of the seismicity and volcanic structure of the Central Bransfield Basin, with the objective of characterizing the distribution of active extension across the basin and determining whether the volcanic structure and deformation of the rift are consistent with a back-arc basin that is transitioning from continental rifting to seafloor spreading.

Field Overview
A research team of 13 US participants will participate on the Spanish research vessel *Sarmiento de Gamboa*. The cruise will travel to the Bransfield Strait where the team will deploy the US ocean-bottom seismograph instrument pool (OBSIP), ocean-bottom seismometers (OBSs) and National Oceanographic and Atmospheric Administration (NOAA) and Oregon State University (OSU) hydrophone-moorings instruments, along with additional German OBSs and broadband land seismometers. Some US personnel will then disembark the vessel at King George Island and return by plane to South America. The remainder of the scientific party will sail to Ushuaia, Argentina.

Program Director
Dr. Douglas Kowalewski

ASC Points of Contact
Samina Ouda / Cara Ferrier

Antarctic Glaciology

NSF/OPP Program Director: Dr. Paul Cutler

(Presented in order of science event number)

I-155-E	Anandakrishnan, Sridhar	I-196-M	Hall, Brenda
I-160-M	Petrenko, Vasilii	I-344-E	Scambos, Theodore
I-175-M/S	Christianson, Knut	I-353-M	Fricker, Helen
I-193-M/S	Koutnik, Michelle		

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Rutford Ice Stream cooperative research program with British Antarctic Survey

I-155-E

NSF/OPP Award 1643304
Dr. Sridhar Anandakrishnan, Principal Investigator
Pennsylvania State University
Department of Geosciences and Environment Institute
University Park, Pennsylvania

Phone: 814.863.6742
Email: sxa17@psu.edu
Web: n/a

Research Locations
Rutford Ice Stream

Supporting Station/Vessel
Special Project

Dates in Antarctica
Mid November to early January

Project Description
The Rutford Ice Stream flows into the Filchner-Ronne Ice Shelf and is a major outlet for ice from West Antarctica. The sliding of ice over its bed is the least understood part of the glacial system and therefore is not well characterized in numerical models of glaciers and ice sheets. The goal of the USAP component of this project is to augment and enhance British Antarctic Survey (BAS) drilling operations with a network of three-component seismographs. The work will be integrated into the drilling and geophysics plans in order to understand the role of water and water pressures on till strength and the flow law of glaciers.

Field Overview
The principal investigator will deploy to the Rutford Ice Stream from Punta Arenas, Chile via the BAS logistics system. Once in the field, he will work with the BAS team to install an array of 36 seismic stations (called “geopebbles”) in a grid near the BAS drill site as well as eight more geopebbles in lines extending from that dense array. In addition, in order to better understand the tidal-forcing behavior of the Rutford Ice Stream, they will deploy three subarrays of five to six geopebbles at 10, 20, and 30 km from the grounding line.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Judy Shiple / Cara Ferrier

Reconstructing carbon-14 of atmospheric carbon monoxide from Law Dome, Antarctica to constrain long-term hydroxyl radical variability

I-160-M

NSF/OPP Award 1643669
Dr. Vasilii Petrenko, Principal Investigator
University of Rochester
Earth and Environmental Sciences
Rochester, New York

Phone: 585.276.6094
Email: vasilii.petrenko@rochester.edu
Web: n/a

Research Locations
Law Dome

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid November to mid February

Project Description
Hydroxyl radicals are responsible for removing most atmospheric pollutants and greenhouse gases and have been called the “detergent of the atmosphere.” Changes in hydroxyl radical concentration in response to large changes in reactive trace-gas emissions, which may happen in the future, are uncertain. Researchers aim to provide the first estimates of atmospheric hydroxyl radicals' variability since 1880 AD when reactive trace gas emissions from human activity were minimal. This will improve understanding of hydroxyl radical stability in response to large emissions changes. Researchers will also study whether ice cores show past changes in Southern Hemisphere westerly winds, which are a key component of the global climate system and have an important influence on ocean circulation and possibly on atmospheric carbon-dioxide concentrations.

Field Overview
A team of five, including two Ice Drilling Design and Operations (IDDO) personnel, will deploy to Law Dome with support from the Australian Antarctic Division. They will run three sampling operations. The first will drill one borehole to about 90 meters with the US three-inch Eclipse drill and sample firn air at a range of depths. The second will drill two boreholes to about 93 meters with the US Blue Ice Drill and perform on-site gas extractions from recovered ice in the 73 to 93 meter depth range. The third will drill two boreholes to about 233 meters with the US 4-inch drill and perform on-site gas extractions from recovered ice in the 93 to 223 meter depth range. Some of these ice cores will be sent to the home institution for further analyses.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Jenny Cunningham

Ice dynamics at the intersection of the West and East Antarctic Ice Sheets

I-175-M/S

NSF/OPP Award 1744649
Dr. Knut Christianson, Principal Investigator
University of Washington
Earth and Space Sciences
Seattle, Washington

Phone: 814.441.9880
Email: knut@uw.edu
Web: n/a

Research Locations
Hercules Dome

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Late November to mid January

Project Description
Researchers will use ground-based ice-penetrating radar to survey the stratigraphy and bed topography at Hercules Dome and infer changes in ice dynamics and ice-sheet elevation. The work will help determine past ice-sheet changes that may relate to collapse of the West Antarctic Ice Sheet and may verify existence of a Raymond Bump and internal stratigraphy that could help determine whether this site is suitable for a deep ice-core drilling project.

Field Overview
Four team members will deploy to McMurdo Station this austral summer. After checking out their gear, they will move to South Pole Station, where they will prepare their equipment while acclimatizing to the altitude at South Pole. They will then deploy by LC-130 aircraft to their Hercules Dome field site, where they will reside at a field camp for four weeks. The group will operate in teams of two and will drive snowmobiles towing radar equipment along transects to perform their surveys. The research team will use deep-sounding radar, shallow-sounding radar, and phase-sensitive radar. They will drive about 25 miles of transects per day and up to 500 miles over the season. The group will also conduct GPS surveys and establish a grid of coordinates with physical markers. Camp pull-out will be by LC-130 aircraft between McMurdo Station and the field site.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Jenny Cunningham / Bija Sass / Timothy Ager / Neal Scheibe

Characterization of upstream ice and firn dynamics affecting the South Pole Ice (SPICE) core

I-193-M/S

NSF/OPP Award 1443471
Dr. Michelle Koutnik, Principal Investigator
University of Washington
Department of Earth and Space Sciences
Seattle, Washington

Phone: 206.221.5041
Email: mkoutnik@uw.edu
Web: n/a

Research Locations
McMurdo area / 50 km from South Pole

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Early November to mid December

Project Description
Ice-core records are critical to understanding past climate variations. Analysis of an Antarctic ice core recently drilled at the South Pole will allow detailed investigation of atmospheric gases and fill an important gap in understanding the pattern of climate variability across Antarctica. Critical to the interpretation of any ice core are: (1) accurate chronologies for both the ice and the trapped gas; and (2) demonstration that records from the ice core reliably reflect climate. The data collected from this team's research, now in its fourth and final season, will improve the ice and gas chronologies by making measurements of snow compaction in the upstream catchment in order to constrain age models of the ice. These measurements will help to better understand and predict time-varying conditions in the upper part of the ice sheet.

Field Overview
Four participants will prepare in McMurdo Station for about one week before heading to South Pole Station where they will spend about two weeks. They will be based out of South Pole Station and at their tent camp 50 km from station where instruments were installed in previous seasons. Two team members will conduct GPS and radar surveys by snowmobile along transects radiating out up to 100km from South Pole. They will tow a Conestoga for shelter during these day trips. The other two team members will stay at the camp to perform instrument maintenance and borehole logging.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Judy Shiple / Jennifer Blum / Tim Ager / Neal Scheibe

Response of the Antarctic ice sheet to the last great global warming

I-196-M

NSF/OPP Award 1643248
Dr. Brenda Hall, Principal Investigator
The University of Maine
Climate Change Institute and
Department of Earth Sciences
Orono, Maine

Phone: 207.581.2191
Email: brendah@maine.edu
Web: n/a

Research Locations
Southern Royal Society Range

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late December to mid February

Project Description
The response of the Antarctic Ice Sheet to past episodes of rapidly warming climate can be understood through glacial geologic data. Researchers will use a combination of glacial geologic mapping and radiocarbon dating of algal deposits enclosed in recessional moraines at the glacial headlands of the southern Royal Society Range. They aim to reconstruct the evolution of the Antarctic Ice Sheet during the massive warming of the last glacial/interglacial transition and inform understanding of future ice-sheet response to global warming.

Field Overview
A four-person team will travel from McMurdo Station by helicopter to the Royal Society Range where they will camp in Scott tents at three different locations for six weeks. They will make some day trips to other sites by helicopter. The research team's work will consist of mapping and collecting algae and rock samples for radiocarbon and surface exposure age dating. Samples will be shipped back to McMurdo Station periodically during the field season for shipment to the research team's home institution.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Jenny Cunningham / Jennifer Blum

Antarctic firn aquifers: Extent, characteristics, and comparison with Greenland occurrences

I-344-E

NSF/OPP Award 1745116
Dr. Theodore Scambos, Principal Investigator
University of Colorado Boulder
National Snow & Ice Data Center
Boulder, Colorado

Phone: 303.492.1113
Email: teds@nsidc.org
Web: n/a

Research Locations
Wilkins Ice Shelf / George VI Ice Shelf

Supporting Station/Vessel
Special Project

Dates in Antarctica
Mid November to mid December

Project Description
Researchers will investigate areas in the Antarctic Peninsula where water from summer melting of snow drains down into the deeper snow (firn) and remains as a water-flooded snow layer throughout the Antarctic winter. These zones are called firn aquifers. The project aims to confirm indications from satellite data that these areas exist on the Wilkins Ice Shelf and the George VI Ice Shelf coast. Persistent water in the upper layers of an ice shelf can destabilize the ice shelf and cause it to fracture and disintegrate or, on a non-floating ice sheet, can cause it to flow faster by draining to the bottom of the ice and reducing the friction between bedrock and glacier. Under warmer conditions in the future, the extent of these firn aquifer areas could spread to regions in front of major outlet glaciers.

Field Overview
This year's field plan is centered on shallow ice-core drilling to about 60 m at the southern Wilkins Ice Shelf and the southern George VI Ice Shelf. These regions had the strongest modeled signal from the scatterometry data of perennial firn aquifers. In addition to drilling one or two cores at each of the sites, researchers will conduct ground-penetrating-radar surveys of the area around the cores (about 60 line-km at each site) to determine the varying depth and extent of the aquifers. They will also install weather stations at each site (automated meteorology–ice–geophysics observing stations, AMIGOS) similar to those installed for the Larsen B LARISSA project, with a sensor array that will measure weather, snow temperature and accumulation, and melt-season duration and intensity. As part of the ice coring, the researchers will also measure snow density and temperature in recovered ice.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Samina Ouda / Cara Ferrier

Mapping Antarctic subglacial water in three dimensions with novel electromagnetic techniques

I-353-M

NSF/OPP Award 1643917
Dr. Helen Fricker, Principal Investigator
University of California San Diego
Scripps Institution of Oceanography
La Jolla, California

Phone: 858.534.6145
Email: hafricker@ucsd.edu
Web: emlab.ldeo.columbia.edu/index.php/projects/subglacial-em-mapping

Research Locations
Whillans Ice Plain

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to mid January

Project Description
The Antarctic ice sheet is underlain by a dynamic water system that lubricates the flow of ice streams and outlet glaciers, provides a habitat for a diverse microbial ecosystem, and delivers freshwater and nutrients to the Southern Ocean. This team will use electromagnetic sounding to detect water at the ice-bed interface and in deeper groundwater reservoirs. Groundwater is estimated to be a significant part of the subglacial water budget in Antarctica, yet previous observational approaches have been unable to characterize its volume and distribution. This project will thus yield critical information about how ice-rock-water-ocean systems interact and inform our understanding of ice-sheet processes, global nutrient cycles, and freshwater flux to the ocean.

Field Overview
Two participants will travel with the Subglacial Antarctic Lakes Scientific Access (SALSA) GPS project (Priscu, C-533-M) by LC-130 aircraft to Camp 20 on the Whillans Ice Plain. They will then travel by snowmobile to Camp GZ1 to conduct the first of two electromagnetic surveys, each requiring three weeks and consisting of 55 survey locations. The second three-week survey will launch from Upper Whillans (UpW) camp, after which they will break camp and traverse to GPS LA14 and to the remainder of the GPS stations along the SALSA traverse route to Subglacial Lake Mercer (SLM). The team will camp along the way until they reach the main SALSA drilling camp at SLM. From there, the two participants will return to McMurdo Station for gear return and redeployment.

Program Director
Dr. Paul Cutler

ASC Points of Contact
Judy Shiple / Dean Einerson / Matthew Kippenhan

Antarctic Ocean and Atmospheric Sciences

NSF/OPP Program Director: Dr. Peter Milne

(Presented in order of science event number)

O-124-N	Thompson, Andrew	O-264-P	Butler, James
O-131-N	Dunbar, Robert	O-270-L	Shadwick, Elizabeth
O-214-L	Munro, David	O-283-M/S	Lazzara, Matthew
O-257-M	Butler, James	O-317-L	Chereskin, Teresa
O-257-S	Butler, James	O-399-S	Taylor, Susan
O-260-L	Sprintall, Janet	O-456-M	Seefeldt, Mark

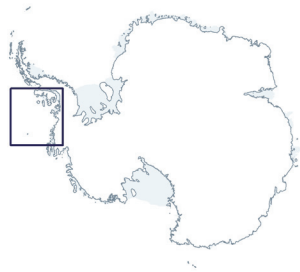
For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Initiation of the Antarctic slope front in West Antarctica

O-124-N

NSF/OPP Award 1644172
Dr. Andrew Thompson, Principal Investigator
California Institute of Technology
Geological and Planetary Sciences
Pasadena, California

Phone: 626.395.8345
Email: andrewt@caltech.edu
Web: n/a



Research Locations
Bellingshausen and Amundsen seas

Supporting Station/Vessel
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Early August to early October

Project Description
The Antarctic Slope Front (ASF) is a persistent, V-shaped feature of the continental shelf and slope around much of Antarctica. It is a notable yet under-sampled component of Southern Ocean circulation. The ASF is a primary source region for the renewal of Antarctic surface water from below and also bottom water flow into the global deep ocean. There is considerable interest in understanding the exchanges and transformations of ASF ocean heat, gases, salt, nutrients, particulates, and carbon through exchanges with components of the high-latitude ocean, polar atmosphere, sea ice, and land ice. This project will conduct a survey of the frontal circulation along the continental shelf break and the major troughs of the Bellingshausen Sea using both ocean gliders and ship-based instruments.

Field Overview
The team will sail to the Western Antarctic Peninsula (WAP) where they will deploy three gliders and collect high-resolution conductivity-temperature-depth (CTD) and lowered acoustic Doppler current profiler (ADCP) measurements to map the evolution of the ASF from the base of the WAP, across the Belgica Trough, to the border between the Bellingshausen and Amundsen Seas. The first glider will be deployed east of Latady Trough and fly west. The second glider will be deployed in the western Bellingshausen Sea and will travel east, eventually meeting up with the first glider. The gliders will survey the troughs for three months before transiting to Marguerite Trough for recovery by the British Antarctic Survey from Rothera Station.

Program Director
Dr. Peter Milne

ASC Points of Contact
David Rivera / Bruce Felix

Estimation of Antarctic ice melt using stable isotopic analyses of seawater

O-131-N

NSF/OPP Award 1644118
Dr. Robert Dunbar, Principal Investigator
Stanford University
Environmental Earth System Science
Stanford, California

Phone: 650.725.6830
Email: dunbar@stanford.edu
Web: n/a

Research Locations
Bellingshausen and Amundsen seas

Supporting Station/Vessel
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Late July to late September

Project Description
Current estimations of ice-sheet mass balance in Antarctica and Greenland rely directly on satellite-based observations of the ice-sheet surface, ice margins, and ice shelves. The extent of melting ice sheets as a driver of sea level rise is not yet well understood. This project will use independent tracers of freshwater introduction from the ice sheets to the surrounding ocean to improve the ability to track how fast and where continental ice is melting. Polar ice is greatly depleted in two stable isotopes, O-18 and deuterium, relative to Southern Ocean seawater and precipitation. Using these as tracers of freshwater introduction from the ice sheet, in conjunction with precise observations of seawater temperature and salinity, the inputs of freshwater derived from melting glacial ice can be discriminated from regional precipitation.

Field Overview
To collect the necessary samples for this work, one scientist on the RV/IB *Nathaniel B. Palmer* will conduct near-real-time isotopic and salinity analyses of conductivity-temperature-depth (CTD) samples. Samples collected near Thwaites Glacier and Pine Island Glacier are of particular interest. For each sample taken for isotopic analyses (O-18 and deuterium), high-quality salinity data must be collected on the same sample. Analyzing samples with a salinometer, especially in highly stratified areas, will be essential for post-processing comparisons with CTD data. The USAP salinometer will be used in conjunction with a Picarro cavity ring down spectroscopy (CRDS) system. The principal investigator may also bring a Guildline Portasal salinometer on the cruise. Samples will also be collected on ships of opportunity with the USAP and other national programs from Italy, South Korea, China, New Zealand, and the United Kingdom.

Program Director
Dr. Peter Milne

ASC Points of Contact
David Rivera / Jamee Johnson

Investigating biogeochemical fluxes and linkages to climate change with multi-scale observations in the Drake Passage

O-214-L

NSF/OPP Award 1543457
Dr. David Munro, Principal Investigator
University of Colorado Boulder
INSTAAR
Boulder, Colorado

Phone: 303.735.6582
Email: david.munro@colorado.edu
Web: www.ldeo.columbia.edu/res/pi/CO2/

Research Locations
Drake Passage

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
The Southern Ocean plays a key role in modulating the global carbon cycle, but the size and even the sign of the global ocean flux in terms of the atmospheric burden of man-made carbon dioxide is still uncertain. This is in part because of lack of measurements in this remote region of the world ocean. This project continues a multi-year time series of shipboard chemical measurements in the Drake Passage to detect changes in the ocean carbon cycle and to improve the understanding of mechanisms driving natural variability and long-term change in the Southern Ocean.

Field Overview
This project supports ongoing surface measurements of the partial pressure of CO_2 (pCO_2) from aboard the ARSV *Laurence M. Gould*. In addition, discrete measurements will be made from water samples collected underway. One participant may attend a vessel port call and one participant may sail on a cruise to perform maintenance on the system.

Program Director
Dr. Peter Milne

ASC Points of Contact
Rachel Shackelford / Bruce Felix

UV measurements at McMurdo Station for the NOAA/Global Monitoring Division (GMD) Antarctic UV network

O-257-M

NSF / NOAA agreement

Dr. James Butler, Principal Investigator
National Oceanic and Atmospheric Administration
Global Monitoring Division
Boulder, Colorado

Phone: 303.497.6898
Email: james.h.butler@noaa.gov
Web: www.esrl.noaa.gov/gmd/

Research Locations
Arrival Heights

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early January to early February

Project Description
The National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) GMD will continue measurements of ultra-violet (UV) radiation that influences climate and the ozone layer. McMurdo Station work is in conjunction with ongoing worldwide measurements of carbon dioxide, methane, carbon monoxide, aerosols, water vapor, surface and stratospheric ozone, chlorofluorocarbons, and the ozone layer. Measurements will be used for time-series analysis of multi-year data records that focus on stratospheric ozone depletion; trans-Antarctic transport and deposition; interplay of trace-gas aerosols with polar-plateau solar and terrestrial radiation fluxes; the magnitude of seasonal and temporal variations in greenhouse gases; and the development of polar stratospheric clouds over Antarctica.

Field Overview
At McMurdo Station, the research associate (RA) will support the instrument at Arrival Heights with daily checks, routine calibrations, and troubleshooting.

Program Director
Dr. Peter Milne

ASC Points of Contact
John Rand / Elizabeth Kauffman

UV measurements at McMurdo Station for the NOAA/Global Monitoring Division (GMD) Antarctic UV network

O-257-S

NSF / NOAA agreement

Dr. James Butler, Principal Investigator
National Oceanic and Atmospheric Administration
Global Monitoring Division
Boulder, Colorado

Phone: 303.497.6898
Email: james.h.butler@noaa.gov
Web: www.esrl.noaa.gov/gmd/

Research Locations
Atmospheric Research Observatory (ARO)

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Early January to early February

Project Description
The National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory (ESRL) GMD will continue long-term measurements of ultra-violet (UV) radiation that influences climate and the ozone layer. The McMurdo Station work is in conjunction with ongoing worldwide measurements of carbon dioxide, methane, carbon monoxide, aerosols, water vapor, surface and stratospheric ozone, chlorofluorocarbons, and the ozone layer. The measurements will be used for time-series analysis of multi-year data focusing on stratospheric ozone depletion; trans-Antarctic transport and deposition; interplay of the trace-gases aerosols with the solar and terrestrial radiation fluxes on the polar plateau; the magnitude of seasonal and temporal variations in greenhouse gases; and the development of polar stratospheric clouds over Antarctica.

Field Overview
At South Pole Station, the Atmospheric Research Observatory (ARO) will be used for the NOAA instrument suite and the management of the Clean Air Sector. Two NOAA personnel will staff the observatory year around. Scientists will deploy for short periods throughout the austral summer performing upgrades and routine maintenance on the instruments at the South Pole and working at the ARO, in addition to the two core staff.

Program Director
Dr. Peter Milne

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe

High-resolution underway air-sea observations in Drake Passage for climate science

O-260-L

NSF/OPP Award 1542902
Dr. Janet Sprintall, Principal Investigator
Scripps Institution of Oceanography
Physical Oceanography Research Division
La Jolla, California

Phone: 858.822.0589
Email: jsprintall@ucsd.edu
Web: www-hrx.ucsd.edu

Research Locations
Drake Passage

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
In collaboration with Chereskin (O-317-L), this project continues a long-term study of ocean properties and variability in the Antarctic Circumpolar Current (ACC) by repeat transects across the Drake Passage from Punta Arenas, Chile to Palmer Station. This aspect of the project measures the seasonal to interannual variability of upper-ocean temperature and geostrophic transport through the Drake Passage with closely spaced eXpendable BathyThermograph (XBT) deployments.

Field Overview
ARSV *Laurence M. Gould* (LMG) personnel and passenger volunteers will hand-launch about 70 XBTs at predetermined locations on each of six Drake Passage crossings of the LMG. Salinity bottle samples will also be collected at various sites. This bottle data will be used to calibrate the underway thermosalinograph (TSG) data.

Program Director
Dr. Peter Milne

ASC Points of Contact
Rachel Shackelford / Bruce Felix

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

O-264-P

NSF / NOAA Agreement
Dr. James Butler, Principal Investigator
National Oceanic and Atmospheric Administration
Global Monitoring Division
Boulder, Colorado

Phone: 303.497.6898
Email: james.h.butler@noaa.gov
Web: www.esrl.noaa.gov/gmd/

Research Locations
Terra Lab

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Mid March to early April

Project Description
The National Oceanographic and Atmospheric Administration (NOAA) Global Monitoring Division (GMD) team will continue long-term measurements of trace constituents that influence climate and the ozone layer. The work done at Palmer Station is in conjunction with the ongoing worldwide measurements of carbon dioxide, methane, carbon monoxide, aerosols, water vapor, surface and stratospheric ozone, chlorofluorocarbons, and the ozone layer. This is part of NOAA's effort to determine and assess long-term buildup of global pollutants in the atmosphere. Measurements will be used for time-series analysis of multi-year data records that focus on the stratospheric ozone depletion; trans-Antarctic transport and deposition; interplay of trace-gas aerosols with polar plateau solar and terrestrial radiation fluxes; magnitude of seasonal and temporal variations in greenhouse gases; and polar stratospheric cloud development over Antarctica.

Field Overview
One NOAA ultra-violet (UV) instrument participant will make a site visit to Palmer Station. The Palmer Station research associate (RA) provides year-round support for the UV monitoring instruments. Additionally, the RA performs sampling for the Scripps Institution of Oceanography oxygen program, the Carbon Cycle Greenhouse Gas (CCGG) program, and the Halocarbons and other Atmospheric Trace Gases (HATS) air-sampling program.

Program Director
Dr. Peter Milne

ASC Points of Contact
John Rand / Jamee Johnson

Resolving CO_2 system seasonality in the West Antarctic Peninsula with autonomous observations

O-270-L

NSF/OPP Award 1543380
Dr. Elizabeth Shadwick, Principal Investigator
College of William and Mary
Virginia Institute of Marine Science
Gloucester, Virginia

Phone: 804.684.7247
Email: shadwick@vims.edu
Web: n/a

Research Locations
Palmer LTER Site 300.100

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Late December to mid February

Project Description
The circumpolar Southern Ocean connects the major ocean basins. It returns carbon and nutrients to the surface ocean and transports heat and carbon to the ocean interior. Understanding the Southern Ocean response to both natural and human changes is critical to understanding changing global biogeochemical cycles. However, major uncertainties persist in our knowledge of the Southern Ocean carbon budget due in part to unresolved variability at the seasonal scale and also to a significant lack of observations in coastal regions.

Field Overview
A technician will travel to the LTER port call in Punta Arenas, Chile to set up instrumentation that will be mounted on a single LTER mooring at the M4 site. The participant will not be sailing on the cruise. ASC technicians will deploy the mooring.

Program Director
Dr. Peter Milne

ASC Points of Contact
David Rivera / Bruce Felix

Antarctic automatic weather station program

O-283-M/S

NSF/OPP Award 1543305
Dr. Matthew Lazzara, Principal Investigator
University of Wisconsin Madison
Space Science and Engineering Center/AMRC
Madison, Wisconsin

Phone: 608.262.0436
Email: mattl@ssec.wisc.edu
Web: amrc.ssec.wisc.edu

Research Locations
On station / WAIS Divide

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Late October to early February

Project Description
The Antarctic Automatic Weather Station (AWS) network has been making meteorological observations since the early 1980s. This continent-wide network is positioned to observe significant meteorological events and increase understanding of the Antarctic surface climate, helping researchers observe and learn about the Antarctic in a warming world. Numerous studies of surface climatology in regions around the continent, like the Ross Ice Shelf, have been possible because of the long duration of the AWS project and regular AWS maintenance. This AWS-based climatology also aids in other studies such as winter warming events.

Field Overview
The team will visit and repair AWS stations that develop problems during the Austral winter and as needed throughout the deployment. Specific location details include: (1) West Antarctic sites based out of WAIS Divide; (2) Ross Ice Shelf work: vehicle and rigger support at Alexander Tall Tower!; (3) Ross Island sites including Williams Field, Phoenix Airfield, and Windless Bight using ground transportation; (4) South Pole access to Henry and Nico stations. Helicopter support will be required to access Capes Bird and Lorne, Marble Point, Minna Bluff, and White Island for local software updates. One McMurdo Station research associate (RA) provides support year around.

Program Director
Dr. Peter Milne

ASC Points of Contact
Samina Ouda / Elizabeth Kauffman / Timothy Ager / Neal Scheibe

Southern Ocean current observations from the U.S. Antarctic research vessels

O-317-L

NSF/OPP Award 1542902
Dr. Teresa Chereskin, Principal Investigator
University of California San Diego
Scripps Institution of Oceanography
La Jolla, California

Phone: 858.534.6368
Email: tchereskin@ucsd.edu
Web: n/a

Research Locations
Drake Passage

Supporting Station/Vessel
ARSV *Laurence M. Gould*

Dates in Antarctica
Early August to early October

Project Description
The Antarctic Circumpolar Current (ACC) is the strongest ocean current in the world, with a flow rate more than 100 times greater than all the rivers on Earth combined. This project continues a long-term study of ocean properties and variability in the ACC by repeat transects across the Drake Passage from Punta Arenas, Chile to Palmer Station. This project will provide information about long-term trends and variability in Southern Ocean fronts, surface water mass properties, heat, and salinity budgets. This study will contribute to understanding the ACC response to atmospheric forcing on climate-relevant time scales, and its role in driving the Southern Ocean's meridional overturning circulation. This aspect of the project focuses on collecting acoustic Doppler current profiler (ADCP), thermosalinograph (TSG), fluorometer, and meteorological data on all ARSV *Laurence M. Gould* (LMG) cruises.

Field Overview
This science event collects ocean current and acoustic backscatter measurements from hull-mounted acoustic Doppler current profilers (ADCPs) onboard the LMG. Data are collected on all cruises with support from the shipboard electronics technicians. That support consists of starting and stopping data acquisition and monitoring and archiving data while at sea. During cruise events, contractor technical support may be required, as time allows, in the event that system maintenance or software changes need to be made while underway.

Program Director
Dr. Peter Milne

ASC Points of Contact
Rachel Shackelford / Bruce Felix

Sampling comet dust from Antarctic air

O-399-S

NSF / NASA Agreement
Dr. Susan Taylor, Principal Investigator
Army Corps of Engineers
Army Engineer Research and Development Center
Hanover, New Hampshire

Phone: 603.646.4239
Email: susan.taylor@erdc.dren.mil
Web: n/a

Research Locations
On station

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
Mid November to late January

Project Description
Analyses of interplanetary dust particles (IDPs) collected in the stratosphere by aircraft have shown that some of these particles, the chondritic porous IDPs (CP-IDPs), are primitive materials. They contain vapor-deposited silicates thought to be preserved interstellar materials transported to the inner solar system by comets. Past researchers have collected rare ultra-carbonaceous micrometeorites and particles indistinguishable from CP-IDPs from melted Antarctic snow. These particles have shown affinities to CP-IDPs and grains of the Wild 2 comet. This project aims to collect samples to analyze the isotopic and elemental composition and describe their microstructure. The results will be used to catalog the diversity of the primitive materials, origin of the comets, and increase the permanent collection for the extraterrestrial materials community.

Field Overview
In the 2018-19 season, the support contractor research associate (RA) will assist Cold Regions Research and Engineering Laboratory (CRREL) personnel to decommission the collector for return shipment. All researcher-owned items will be removed from station. The building will be relocated to the portable building line and the cable removed.

Program Director
Dr. Peter Milne

ASC Points of Contact
John Rand / Timothy Ager / Neal Scheibe / Leah Street

Implementing low-power, autonomous observing systems to improve the measurement and understanding of Antarctic precipitation

O-456-M

NSF/OPP Award 1543377
Dr. Mark Seefeldt, Principal Investigator
University of Colorado Boulder
CIRES
Boulder, Colorado

Phone: 303.735.4298
Email: mark.seefeldt@colorado.edu
Web: n/a

Research Locations
Williams Field / Phoenix Airfield
Alexander Tall Tower! / Lorne AWS

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to early December

Project Description
This project's objectives focus on improving measurement of precipitation in Antarctica, advancing understanding of precipitation processes, and using this knowledge to evaluate weather and climate models. Precipitation measurement in Antarctica is inherently difficult because of the small amount of annual precipitation and the challenge of distinguishing falling snow from blowing snow. However, accurate measurement is critical for calculating Antarctica's mass balance and contribution to global sea-level rise, interpreting ice-core records, and providing benchmarks for promising model- and satellite-based precipitation estimates.

Field Overview
The 2018-19 field season is focused on the maintenance, repairs, and data retrieval at each of four Antarctic precipitation system (APS) sites. The four sites are Alexander Tall Tower!, Williams Field, Phoenix Airfield, and Lorne automatic weather station (AWS). The level of work to be completed will not be known until this austral spring after assessing the instruments. The team will require two trips via helicopter to Lorne AWS and two trips to Tall Tower! via fixed-wing aircraft. The first visit to each location is for the retrieval of the equipment to be adjusted and repaired, and the second visit is to finalize the instrumentation for the second year of field observations. UNAVCO will also be involved with the field work in order to do any maintenance work on UNAVCO-provided power systems for the APS sites.

Program Director
Dr. Peter Milne

ASC Points of Contact
Samina Ouda / Elizabeth Kauffman

Antarctic Technical Events

(Presented in order of science event number)

T-150-M	Albert, Mary
T-295-M	Pettit, Joseph
T-299-M/S	Nikolaus, Kevin
T-396-M	Szuberla, Curt
T-434-M	Morin, Paul
T-524-M	McManis, James
T-913-M	Heine, John
T-927-M	O'Brien, Joseph
T-933-L/N	Hummon, Julia
T-942-S	Melendy, Renee
T-998-P	Hosticka, Bouvard

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Ice Drilling Program Office (IDPO) - McMurdo

T-150-M

NSF Agreement
Dr. Mary Albert, Principal Investigator
Dartmouth College
Thayer School of Engineering
Hanover, New Hampshire

Phone: 603.646.0277
Email: mary.r.albert@dartmouth.edu
Web: www.icedrill.org/

Research Locations
Around station

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late November to mid January

Project Description
The Ice Drilling Program Office (IDPO): (1) provides community leadership in ice drilling research and development; (2) identifies new technology needs and plans technology development and funding; (3) acquires new drilling technology to support science objectives for new discoveries; (4) provides the drills, equipment, and drilling expertise needed by the science groups; (5) enhances communication and information exchange related to ice coring and drilling science and technology; and (6) establishes activities in collaboration with the polar science and engineering community to contribute to NSF's strategic goals for desired societal outcomes.

Field Overview
This season will be a continuation of coordinated retrograde cargo efforts from the WAIS Divide DISC drill project. IDPO personnel will be deploying for the Rapid-Access Ice Drilling (RAID) maintenance season January to early February 2019, and to Casey Station with the Australian Antarctic Program.

Program Director
Dr. Michael Jackson

ASC Points of Contact
John Rand / Dean Einerson

UNAVCO GPS survey support

T-295-M

NSF/OPP Award 1261833
Mr. Joseph Pettit, Principal Investigator
UNAVCO
Boulder, Colorado

Phone: 303.381.7615
Email: pettit@unavco.org
Web: www.unavco.org/projects/project-support/polar/polar.html

Research Locations
Crary Lab / Minna Bluff / Fishtail Point / Lorne AWS

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to mid February

Project Description
University NAVSTAR Consortium (UNAVCO) provides support and equipment for geodetic observations. Survey-grade GPS, terrestrial laser scanners, unmanned aerial vehicles (UAV), power and communications systems for high-precision campaign surveying and continuous data collection are available. UNAVCO operates a network of Global Navigation Satellite System (GNSS) stations around McMurdo Station, Mount Erebus, and the Dry Valleys. Support infrastructure includes a real-time kinematic differential GPS broadcasting station covering McMurdo Sound, a Mount Erebus repeater for GPS data retrieval from the Transantarctic Mountains, and an Iridium satellite hub in Colorado. Support is also provided for Palmer Station's GPS survey system. Operation and maintenance is provided for NASA's International GNSS Service (IGS) stations MCM4 and PALM, POLENET (ANET), West Antarctic Ice Sheet Divide, and South Pole GPS stations.

Field Overview
Field team members will reside on station to provide technical and field engineering support and to manage the UNAVCO equipment pool. They will occasionally travel to the field as support requirements dictate. This season they are planning to install a radio repeater on Minna Bluff, which will be used to send telemetry data from the Minna Bluff GPS station and possibly Fishtail Point. The radio link will eliminate the need for Iridium communications from these two sites. Also, the team will convert the ozone system to a GPS site at Lorne automatic weather station (AWS) for the Seefeldt (O-456-M) science group.

Program Director
Dr. Michael Jackson

ASC Points of Contact
John Rand / Elizabeth Kauffman

IRIS/PASSCAL seismic support

T-299-M/S

NSF Agreement
Mr. Kevin Nikolaus, Principal Investigator
New Mexico Institute of Mining and Technology
IRIS/PASSCAL
Socorro, New Mexico

Phone: 575.835.5538
Email: knikolaus@passcal.nmt.edu
Web: www.passcal.nmt.edu/content/polar

Research Locations
As required to support NSF-funded projects

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Mid October to early February

Project Description
The IRIS Program for Array Seismic Studies of the Continental Lithosphere (PASSCAL) Instrument Center supports NSF/OPP-funded projects. PASSCAL provides OPP support through: (1) equipment testing as it arrives on continent and rapid deployment to the field; (2) training to researchers; (3) on-continent instrument troubleshooting, performance evaluation, and data QC; (4) assisting researchers with data backup and archiving; and (5) field support, including installation and maintenance as required. Each year, the facility provides instrumentation and support to NSF-funded seismological projects while also developing cold-station deployment strategies, collaborating with vendors to develop and test equipment rated -55° C / -67° F, building an equipment pool, and creating a cold-station techniques repository. NSF also tasked the team with installing and maintaining a five-station permanent network on Mount Erebus.

Field Overview
The T-299-M/S team will support Wilson (G-079-M), Thwaites Margins, any T-299-managed sites on Mount Erebus, and any as-yet-unplanned support, as feasible. Team members will also continue to maintain testing sites established in previous seasons.

Program Director
Dr. Michael Jackson

ASC Points of Contact
John Rand / Elizabeth Kauffman / Tim Ager / Neal Scheibe

Operation and maintenance of a CTBT class infrasound array at Windless Bight

T-396-M

NSF/CTBT MOA
Dr. Curt Szuberla, Principal Investigator
University of Alaska Fairbanks
Geophysical Institute
Fairbanks, Alaska

Phone: 907.474.7347
Email: caszuberla@alaska.edu
Web: n/a

Research Locations
Windless Bight

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Instruments operate year around.

Project Description
This project operates, maintains, upgrades, calibrates, and services the joint U.S. Comprehensive Nuclear Test Ban Treaty (CTBT) station at Windless Bight. Windless Bight's location on the Ross Ice Shelf is unique for its very-low wind levels, which makes infrasound detection possible. Infrasound can detect volcanic eruptions, winds over distant mountain ranges, large storms at sea, auroral and meteor events, earthquakes, avalanches, and human-caused events such as very large explosions.

Field Overview
The field team, equipped with standard remote field equipment (including snowmobiles, PistenBully, and Mattrack vehicles) will stay in a self-supporting field camp at Windless Bight for four weeks. The camp will consist of two Polarhavens and six individual mountain tents. The team will typically stay at the field site but will intermittently return one or two team members to McMurdo Station for supplies and overnight stays. The USAP also provides year-round on-site support from a support contractor research associate (RA), who occasionally visits the site during winter months for maintenance and troubleshooting.

Program Director
Ms. Jessie Crain

ASC Points of Contact
John Rand / Elizabeth Kauffman

The Polar Geospatial Information Center: Joint support

T-434-M

NSF/OPP Award 1559691
Mr. Paul Morin, Principal Investigator
University of Minnesota
Geology & Geophysics
St. Paul, Minnesota

Phone: 612.626.0505
Email: lpaul@umn.edu
Web: www.pgc.umn.edu

Research Locations
On station

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to late January

Project Description
The Polar Geospatial Center (PGC) was founded in 2007 as the Antarctic Geospatial Information Center (AGIC) and has since expanded to include both polar regions. PGC provides geospatial support in the form of mapping, data delivery, and geographic information systems (GIS) analysis to science and logistics communities of the NSF's Arctic and Antarctic research programs. Deployed PGC technicians provide on-site cartographic assistance in the form of GIS data formats, maps, and paper documents to science-project grantees and other USAP entities, collect ground-control points to calibrate imagery, and gather satellite and aerial imagery from a variety of national and international sources.

Field Overview
Deploying team members will be based at McMurdo Station throughout the season. PGC will maintain a presence in the Crary Laboratory and will support other field and logistics groups for general mapping and imagery services as needed.

Program Director
Dr. Alexandra Isern

ASC Points of Contact
Jenny Cunningham / Elizabeth Kauffman

UNL hot water drilling support

T-524-M

NSF Agreement
Mr. James McManis, Principal Investigator
University of Nebraska Lincoln
College of Engineering
Lincoln, Nebraska

Phone: 402.472.2555
Email: mcmanis@unl.edu
Web: n/a

Research Locations
Near station

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid December to early February

Project Description
The Subglacial Antarctic Lakes Scientific Access (SALSA) hot-water drill will be operated at Subglacial Lake Mercer (SLM) this season. The University of Nebraska, Lincoln drill team will complete preparation, configuration, and loading of the drill onto the launch and recovery system (LARS) deck for transportation to the drilling site at SLM. The team will drill one main hole for science operations and a secondary access hole for collection of basal ice and instrument installation.

Field Overview
An initial group of team members will deploy to McMurdo Station to prepare supplies for transport to SLM. The traverse is expected to take about 15 days, after which the entire field team will fly to SLM to begin set up and operation of the drill.

Program Director
Dr. Michael Jackson

ASC Points of Contact
Judy Shiple / Dean Einerson / Matthew Kippenhan

OPP/USAP Diving Safety Officer (DSO) and Scientific Diving Control Board (SDCB) visit

T-913-M

Mr. John Heine, Principal Investigator
Jacksonville University
Marine Science Research Institute
Jacksonville, Florida

Phone: 904.521.3526
Email: jheine@ju.edu
Web: n/a

Research Locations
McMurdo Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early October to mid November

Project Description
Project participants will participate in and observe scientific diving operations and dive locker activities and procedures. They will also interact with all of the science groups that are participating in diving operations for the season. The OPP/USAP diving safety officer (DSO) will create an annual report, which is then presented to the Scientific Diving Control Board (SDCB) at the annual meeting in Washington, D.C. the following year. This visit assists the team members in making suggestions for improvements to the diving program.

Field Overview
The principal investigator of T-913 is the OPP/USAP diving safety officer (DSO) and will be accompanied by two members of the Scientific Diving Control Board (SDCB). They will visit McMurdo Station for a week and a half to oversee and observe the USAP diving program. They will use dive equipment and space in the dive locker, and they will travel to dive sites in the Dive Services dedicated PistenBully.

Program Director
Mr. Jon Fentress

ASC Points of Contact
Jenny Cunningham / Rob Robbins

NASA / McMurdo Ground Station (MG1)

T-927-M

NSF / NASA Agreement

Mr. Joseph O'Brien, Principal Investigator
NASA Goddard Space Flight Center
Electrical Engineering Division
Wallops Island, Virginia

Phone: 757.824.1326
Email: joseph.s.obrien@nasa.gov
Web: www.nasa.gov/directorates/heo/scan/services/networks/nen/

Research Locations
On station

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Station operates year around.

Project Description
NASA's McMurdo Ground Station (MG1) is a 10-meter antenna housed in a white radome visible on the hill above McMurdo Station. It is used primarily for data recovery from polar-orbiting science satellites. MG1 also provides launch and early operations phase (LEOP) support for launches from Vandenberg Air Force Base involving satellite missions that require downrange telemetry support; telemetry and command for satellite housekeeping, and recovery from satellite operational emergencies; and, in collaboration with the National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite and Data Information Service, data recovery for the EUMETSAT MetOp polar weather satellite constellation. MG1 has a McMurdo Tracking and Data Relay Satellite (TDRS) Relay System (MTRS) system for high-speed data transfers.

Field Overview
The MG1 activity is a year-round effort for which two NASA technicians are deployed to McMurdo Station to operate and maintain the systems. During the austral summer, additional personnel deploy to support special projects, perform systems and infrastructure checks, and conduct crew turnovers. Missions planned for MG1 for the 2018-19 field season include: Soil Moisture Active Passive (SMAP), Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC), Ice, Cloud and land Elevation Satellite (ICESat-2), Interface Region Imaging Spectrograph (IRIS), Hinode Solar Mission, and Landsat-7.

Program Director
Mr. Pat Smith

ASC Points of Contact
Sheryl Seagraves / Bill Jirsa

University of Hawaii Data Acquisition System (UHDAS) support

T-933-L/N

NSF Agreement
Dr. Julia Hummon, Principal Investigator
University of Hawaii Manoa
JIMAR
Honolulu, Hawaii

Phone: 808.956.7037
Email: hummon@hawaii.edu
Web: n/a

Research Locations
Punta Arenas, Chile

Supporting Station/Vessel
ARSV *Laurence M. Gould*,
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Early August to early October

Project Description
This project maintains the acoustic Doppler current profiler (ADCP) computer systems on the RV/IB *Nathaniel B. Palmer* (NBP) and ARSV *Laurence M. Gould* (LMG). These computer systems are used to manage and post-process data from the ADCP sonars on the NBP and the LMG. On the LMG, the ADCP data is specifically collected and managed under the Chereskin (O-317-L) project, but is available to all cruise participants. On the NBP, the systems are maintained for general grantee requests.

Field Overview
Testing of the systems is completed once a year during a scheduled port call. During these maintenance port calls, the system is tested extensively, which requires the ability to actively ping the sonars in port to ensure proper system function. Testing these systems requires activating the sonars at the pier for four or five cycles of up to 10 minutes each.

Program Director
Mr. Tim McGovern

ASC Points of Contact
Rachel Shackelford / Bruce Felix

Autonomous GPR survey and hazard assessment of Old South Pole Station

T-942-S

EP-ANT-16-06

Ms. Renee Melendy, Principal Investigator
US Army Cold Regions Research & Engineering Lab
Hanover, New Hampshire

Phone: 603.646.4405
Email: Renee.D.Melendy@usace.army.mil
Web: n/a

Research Locations
Old South Pole Station site

Supporting Station/Vessel
South Pole Station

Dates in Antarctica
January

Project Description
This project will conduct a comprehensive autonomous ground-penetrating radar (GPR) survey of the Old South Pole Station area to determine and map any subsurface hazards. This will enable the USAP to locate and remediate the hazards to ensure the area is safe for travel and reuse.

Field Overview
One person will deploy to South Pole in early January to stage field operations. Work will require use of a small tracked vehicle to tow the South Pole Traverse robot (SPoTbot) automated rover to the Old South Pole Station site as well as to operate the control electronics from inside the vehicle. The robot will return to a storage space on station each evening.

Program Director
Ms. Margaret Knuth

ASC Points of Contact
Samina Ouda / Ian McEwen

Operation and maintenance of a CTBT radionuclide monitoring station at Palmer Station

T-998-P

NSF/OPP CTBTO MOA
Mr. Bouvard Hosticka, Principal Investigator
University of Virginia
Charlottesville, Virginia

Phone: 434.924.1463
Email: bh@virginia.edu
Web: n/a

Research Locations
Terra Lab

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
Mid April to late May

Project Description
This project services and calibrates the automated radionuclide air-particulate monitoring system in the International Monitoring Station (IMS) building (Terra Lab) at Palmer Station. The IMS continuously collects and automatically analyzes daily air samples for radiation. The collected filter media samples from the Radionuclide Aerosol Sampler/Analyzer (RASA) are sent to Vienna, Austria for archiving on a quarterly basis. Additionally, single samples are shipped, upon request, to various laboratories elsewhere in the world.

Field Overview
The USAP provides year-round, on-site support via support contractor research associate (RA). In addition, one engineer or scientist from the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) deploys each season for maintenance of the RASA, network switches, the uninterruptable power supply (UPS), and other computer hardware. Training for the RA is conducted by the science project and includes a site visit to the principal investigator's home institution for two days prior to deployment to Antarctica.

Program Director
Mr. Tim McGovern

ASC Points of Contact
John Rand / Jamee Johnson

Antarctic Artists and Writers

NSF/OPP Program Director: Ms. Valentine Kass

(Presented in order of science event number)

W-219-P	Waters, April	W-481-N	Rush-Mueller, Elizabeth
W-220-M	Waldman, Ariel	W-482-M	Scarano, Caitlin

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Water-Ice-Sky

W-219-P

NSF/OPP Award 1745372
Ms. April Waters, Principal Investigator
Salem, Oregon

Phone: 503.569.7681
Email: april@aprilwaters.com
Web: aprilwaters.com

Research Locations
Palmer area

Supporting Station/Vessel
Palmer Station

Dates in Antarctica
November

Project Description
During her time in Antarctica, the artist will create an exhibition of oil paintings depicting the environment around Palmer Station. She will observe, sketch, paint, and photograph the ocean, sea ice, icebergs, and the Marr Glacier. Upon returning to her home studio, she will produce 10-12 large-scale paintings of the water, ice, and sky for exhibit in multiple galleries to help communicate the region's ecosystem and beauty to the public. She will also have multiple opportunities to present and talk about her work and her experience collaborating with scientists in Antarctica.

Field Overview
The artist will deploy to Palmer Station via the ARSV *Laurence M. Gould*. She will take short hikes around the station, exploring the Marr Ice Piedmont. She will join small-boat outings with science groups to experience and examine the ocean, sea ice and icebergs and will participate in recreational boating when space is available. To supplement her own photos, and to get an aerial perspective, she may partner with the Palmer LTER group to gain access to images taken of the area when they do unmanned aircraft system (UAS) operations. She may also request aerial imagery from Polar Geospatial Center.

Program Director
Ms. Valentine Kass

ASC Points of Contact
Rachel Shackelford / Elaine Hood

Life under the ice

W-220-M

NSF/OPP Award 1745408
Ms. Ariel Waldman, Principal Investigator
San Francisco, California

Phone: 415.312.8088
Email: ariel@arielwaldman.com
Web: arielwaldman.com

Research Locations
On station / Taylor Valley

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Early November to early December

Project Description
Life Under The Ice will bring to light the microscopic world of Antarctica. The artist will image extremophile microorganisms endemic to Antarctica through macrophotography and microscope photography and video, and present them to the public in a novel way - turning viewers into Antarctic explorers. This interactive web exhibition will seek to elicit the same sense of wonder that scientists feel about how even the smallest, simplest life forms of Antarctica, shaped by their harsh home environments, are also immensely complex.

Field Overview
Based at McMurdo Station, the artist will work with science groups studying extremophile organisms on the sea ice and in Taylor Valley. She will photograph sites of sample collection and the surrounding landscape and will image microbial life through macrophotography and microscope photography and video. Additionally, she will either collect or be given small microbial samples to use in her imaging. For her work with the Schmidt (B-041-M) group, the artist will accompany them on day trips from McMurdo Station. For the Taylor Valley work, she will deploy to the Lake Hoare fixed camp to join supporting science teams and will stay for at least three days. Her photography work will be conducted in either the Dry Valleys lab space or in a dark tent. While deployed, and following her return to the United States, she will post photos and videos online to document her work.

Program Director
Ms. Valentine Kass

ASC Points of Contact
Jenny Cunningham / Michael Lucibella

Dispatches from Thwaites Glacier: A creative nonfiction inquiry into ice loss in Antarctica

W-481-N

NSF/OPP Award 1745471
Ms. Elizabeth Rush-Mueller, Principal Investigator
Providence, Rhode Island

Phone: 978.518.7186
Email: elizabetharush@gmail.com
Web: n/a

Research Locations
Thwaites Glacier

Supporting Station/Vessel
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Late January to mid March

Project Description
The International Thwaites Glacier Collaboration (ITGC) is the largest joint US-UK project undertaken on the southern continent in 70 years. The writer will participate in ITGC fieldwork. She plans to produce a collection of essays that bear witness to the changes physically transforming Antarctica and relay how those changes impact the polar scientists at the forefront of this research. Upon returning from Antarctica, she will design and teach a new advanced creative nonfiction writing workshop, based on her Antarctic experience, to help students develop the skills necessary to communicate science to a broader public.

Field Overview
The writer will sail on the RV/IB *Nathaniel B. Palmer* from Punta Arenas, Chile, to the Thwaites Glacier region on a cruise supporting the work of Pettit/Heywood (C-445-N), and Wellner/Larter (C-447-N). While onboard, she will interview and shadow members of the science party as they conduct their work and will capture the scenery, operations, and scientists through photography, audio recordings, and notes. Science planned for this cruise includes: sediment coring, multibeam swath bathymetry and sub-bottom profiling surveys for core sites, seal tagging, autonomous underwater vehicle (AUV) deployments and recoveries, conductivity-temperature-depth (CTD) casts, and rock collection at island sites.

Program Director
Ms. Valentine Kass

ASC Points of Contact
Samina Ouda / Elaine Hood

Intersections of landscape and humanity in Antarctica

W-482-M

NSF/OPP Award 1745282
Ms. Caitlin Scarano, Principal Investigator
Marblemount, Washington

Phone: 360.503.9982
Email: caitlinscarano@gmail.com
Web: n/a

Research Locations
On station

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Late October to late November

Project Description
This project will focus on the intersections between landscape and humanity in Antarctica and the different ways in which individuals make meaning of the socio-ecosystem of the region. The artist will seek to learn about how people inside and outside of Antarctica imagine and understand it, and how humans can inhabit, study, and use the land (and, by extension, other regions) in the most intentional ways. Her time in Antarctica will result in the completion of a full-length collection of poems.

Field Overview
The artist will deploy to McMurdo Station where she will interview scientists and support staff about their experiences living and working on the continent. She will also visit and observe developed and undeveloped sites in the vicinity of McMurdo Station including historic huts, the sea ice, and publicly accessible areas of McMurdo Station and areas accessed by the Ross Island roads and trail system.

Program Director
Ms. Valentine Kass

ASC Points of Contact
Jenny Cunningham / Elaine Hood

Other Science Events

(Presented in order of science event number)

X-591-E	Goebel, Michael	X-594-M/S	Brunt, Kelly
X-592-L/N	Dolk, Shaun		

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Cape Shirreff

X-591-E

NSF-OPP / NOAA-AMLR Agreement
Dr. Michael Goebel, Principal Investigator
National Oceanic and Atmospheric Administration
NMFS, Southwest Fisheries Science Center
La Jolla, California

Phone: 858.546.5677
Email: mike.goebel@noaa.gov
Web: swfsc.noaa.gov/aerd

Research Locations
Livingston Island

Supporting Station/Vessel
Special Project

Dates in Antarctica
Late December to late March

Project Description
Cape Shirreff is located on Livingston Island in Antarctic Specially Protected Area (ASPA) 149. The facility at this site, also referred to as Cape Shirreff, is operated by the National Oceanic and Atmospheric Administration (NOAA), specifically under the Antarctic Marine Living Resource (AMLR) program of NOAA's Southwest Fisheries Science Center (SWFC). Cape Shirreff currently supports a NOAA-funded project conducting marine-mammal research. The facility was built in the 1996-97 austral summer at NSF direction by Antarctic Support Associates, the NSF Antarctic contractor at that time. Since then it has been NOAA occupied with USAP support limited to personnel transport and camp openings and closings.

Field Overview
Each season the ARSV *Laurence M. Gould* (LMG) supports the Cape Shirreff camp opening, one mid-season participant turnover and resupply, and the camp closing. This year, the camp is scheduled to open in late December and close around mid March. There will be no turnover/resupply this season. USAP support includes small-boat operations from the LMG, ASC ship personnel and science volunteers to help open and close the camp, and cargo transport for camp supplies and waste.

Program Director
Mr. Tim McGovern

ASC Points of Contact
David Rivera / Cara Ferrier

NOAA's Global Drifter Program (GDP)

X-592-L/N

NSF / NOAA Agreement
Dr. Shaun Dolk, Principal Investigator
National Oceanic and Atmospheric Administration
Miami, Florida

Phone: 305.361.4546
Email: shaun.dolk@noaa.gov
Web: n/a

Research Locations
Drake Passage

Supporting Station/Vessel
ARSV *Laurence M. Gould*,
RV/IB *Nathaniel B. Palmer*

Dates in Antarctica
Early August to early October

Project Description
The Global Drifter Program (GDP) is the principal component of the Global Surface Drifting Buoy Array, a branch of NOAA's Global Ocean Observing System (GOOS) and a scientific project of the Data Buoy Cooperation Panel (DBCP). Its objectives are: (1) to maintain a global 5x5 degree array of 1,250 ARGOS-tracked surface drifting buoys to meet the need for an accurate and globally dense set of in-situ observations of mixed-layer currents, sea-surface temperature, atmospheric pressure, winds, and salinity; and (2) to provide a data processing system for scientific use of these data. These data support short-term climate predictions as well as climate research and monitoring.

Field Overview
The project principal investigator (PI) will ship all NOAA sound-velocity-profiling (SVP) drifters directly to Punta Arenas, Chile, for onload to the ARSV *Laurence M. Gould* (LMG), or to the port of operation for onload to the RV/IB *Nathaniel B. Palmer*. For LMG cruises, one drifter will be deployed by staff technicians during each crossing of the Drake Passage (one southbound and one northbound). After each deployment, staff technicians will send an email to the PI indicating the buoy identification number, date, and the latitude and longitude where it was released.

Program Director
Dr. Peter Milne

ASC Points of Contact
Rachel Shackelford / Bruce Felix

88S traverse: GPS survey for calibration and validation of ICESat-2 altimetry data

X-594-M/S

NSF / NASA Agreement
Dr. Kelly Brunt, Principal Investigator
National Aeronautics and Space Administration
Marshall Space Flight Center
Greenbelt, Maryland

Phone: 301.286.5943
Email: kelly.m.brunt@nasa.gov
Web: n/a

Research Locations
Traverse from South Pole along the 88° S line of latitude

Supporting Station/Vessel
McMurdo Station, South Pole Station

Dates in Antarctica
Early December to mid January

Project Description
This project will conduct a high-precision GPS survey based out of South Pole Station, along the 88° S line of latitude. The goal is producing a large-scale dataset for the calibration of airborne and space-borne altimetry and to validate ICESat-2 elevation measurements. The traverse along the ICESat-2 ground track convergence zone represents the only large-scale, ice-based validation effort on a cold, relatively stable part of the ice-sheet interior.

Field Overview
This team will perform a second PistenBully traverse associated with a ground-based GPS survey for the validation of NASA's ICESat-2 elevation and elevation-change data products. The 750 km traverse route is along the 87.979° S line of latitude, approximately 224 km from South Pole. Each traverse will have two NASA participants, one support-contractor mountaineer, and one support-contractor mechanic. Participants will initially spend about one week at McMurdo Station to gather field gear. Once at South Pole, the team will acclimatize and prepare for the traverse. Each vehicle will have a roof-mounted GPS receiver operating at all times, and a third GPS antenna and receiver will be available for instrument redundancy. Each vehicle will also use two roof-mounted, downward-pointing ice-surface-roughness laser scanners. The traverse is estimated to again take about 15 days to complete.

Program Director
Dr. Michael Jackson

ASC Points of Contact
J. Rand / J. Blum / T. Ager / N. Scheibe / C. Naughton

Antarctic Education and Outreach

(Presented in order of science event number)

Y-601-M	Apsell, Paula	Y-610-E	Virginia, Ross

For more information, and for a complete list of deploying participants, go to www.usap.gov/sps

Polar extremes: enhancing experiential digital learning

Y-601-M

NSF/OPP Award 1713552
Ms. Paula Apsell, Principal Investigator
Public Broadcasting Service
Boston, Massachusetts

Phone: 617.300.4341
Email: psa@wgbh.org
Web: n/a

Research Locations
Dry Valleys / Cape Royds / Sea Ice

Supporting Station/Vessel
McMurdo Station

Dates in Antarctica
Mid October to mid November

Project Description
This project is an integrated media and research project produced by the Public Broadcasting Service (PBS) science series, NOVA, that will bring polar science to informal learners through traditional storytelling and experiential, digital-learning environments. The project includes a two-hour nationally broadcast PBS documentary; a NOVA polar lab, an experiential interactive learning platform on polar science; and a polar exploration initiative consisting of a 10-part YouTube series, a collection of 360 videos, virtual field trips, and social media reporting "on location" from Antarctica, along with other polar-themed video, radio, and digital journalism. The project's overarching goal is to determine the best way to combine and leverage traditional and interactive media technologies to educate the public about polar science.

Field Overview
The team will deploy to McMurdo Station to collect footage of scientists at work as well as landscapes, historical huts, wildlife, and aspects of life at McMurdo Station. They intend to bring two drones for camera work in addition to other camera equipment; details of this work will be provided in a concept of operations document that lays out operational plans and considers appropriate risks. The team will visit the Dry Valleys and Cape Royds. They will also film under the sea ice via the observation tube near McMurdo Station.

Program Director
Ms. Valentine Kass

ASC Points of Contact
Judy Shiple / Elaine Hood

Joint Antarctic Science Expedition (JASE)

Y-610-E

NSF/OPP Award 1748137
Dr. Ross Virginia, Principal Investigator
Dartmouth College
Environmental Studies Program
Hanover, New Hampshire

Phone: 603.646.0192
Email: ross.a.virginia@dartmouth.edu
Web: dickey.dartmouth.edu/jsep/program-info/jase

Research Locations
King George Island

Supporting Station/Vessel
Special Project

Dates in Antarctica
Early January to late February

Project Description
The Joint Antarctic Science Expedition (JASE) program is designed to promote polar science education and cross-cultural exchange and is run in parallel with the Joint Science Education Project (JSEP), currently led by faculty at Dartmouth College. Dartmouth has a lead role in the JASE program, a collaborative venture of the NSF's Office of Polar Programs (NSF/OPP) and the Chilean National Antarctic Institute (Instituto Antártico Chileno (INACH)). INACH has invited the United States to participate in an expedition to King George Island that will provide high-school students and teachers the opportunity to gain hands-on experience with ecosystems research in Antarctica.

Field Overview
Participants will fly from the United States to Punta Arenas, Chile (PA) in mid-January 2019. They will be outfitted with extreme cold weather (ECW) gear from the USAP facilities in PA and will then travel to and from King George Island via air support provided by INACH. Flights between PA and the United States, and food and lodging while in PA, will be coordinated and paid for by Dartmouth College through this grant. No USAP travel support is required, but the group will be tracked as USAP participants.

Program Director
Dr. Elizabeth Rom

ASC Points of Contact
Samina Ouda / Cara Ferrier

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G-066-M	Phillips, Fred
G-071-M	Shubin, Neil
G-078-M	Kemerait, Robert
G-079-M	Wilson, Terry
G-090-P/S	Anderson, Kent
G-094-P	Yu, Zicheng
G-116-N	Koppers, Antonius
G-412-L	Simms, Alexander
G-437-E	Wilcock, William
I-155-E	Anandakrishnan, Sridhar
I-160-M	Petrenko, Vasilii
I-175-M/S	Christianson, Knut
I-193-M/S	Koutnik, Michelle
I-196-M	Hall, Brenda
I-344-E	Scambos, Theodore
I-353-M	Fricker, Helen

Science Event Number	Principal Investigator
O-124-N	Thompson, Andrew
O-131-N	Dunbar, Robert
O-214-L	Munro, David
O-257-M	Butler, James
O-257-S	Butler, James
O-260-L	Sprintall, Janet
O-264-P	Butler, James
O-270-L	Shadwick, Elizabeth
O-283-M/S	Lazzara, Matthew
O-317-L	Chereskin, Teresa
O-399-S	Taylor, Susan
O-456-M	Seefeldt, Mark
T-150-M	Albert, Mary
T-295-M	Pettit, Joseph
T-299-M/S	Nikolaus, Kevin
T-396-M	Szuberla, Curt
T-434-M	Morin, Paul
T-524-M	McManis, James
T-913-M	Heine, John
T-927-M	O'Brien, Joseph
T-933-L/N	Hummon, Julia
T-942-S	Melendy, Renee
T-998-P	Hosticka, Bouvard
W-219-P	Waters, April
W-220-M	Waldman, Ariel
W-481-N	Rush-Mueller, Elizabeth
W-482-M	Scarano, Caitlin
X-591-E	Goebel, Michael
X-592-L/N	Dolk, Shaun
X-594-M/S	Brunt, Kelly
Y-601-M	Apsell, Paula
Y-610-E	Virginia, Ross

Principal Investigators (Alphabetical)

Principal Investigator	Science Event Number
Adams, Byron	C-507-M
Ainley, David	B-031-M
Albert, Mary	T-150-M
Amsler, Charles	B-236-L
Anandakrishnan, Sridhar	I-155-E
Anderson, Kent	G-090-P/S
Apsell, Paula	Y-601-M
Barwick, Steven	A-127-M/S
Bernard, Kim	B-459-L/P
Binns, Walter	A-142-M
Bristow, William	A-369-M/S
Brunt, Kelly	X-594-M/S
Butler, James	O-257-M
Butler, James	O-257-S
Butler, James	O-264-P
Carlstrom, John	A-379-S
Cassar, Nicolas	B-461-L
Catchen, Julian	B-211-M
Chartier, Alex	A-100-M/S
Chereskin, Teresa	O-317-L
Christianson, Knut	I-175-M/S
Christoffersen, Poul	C-446-M
Chu, Xinzhao	A-123-M
Chu, Xinzhao	A-130-M
Clauer, C. Robert	A-106-M/S
Conde, Mark	A-343-M/S
Costa, Daniel	B-232-L
Cziko, Paul	B-195-M

Principal Investigator	Science Event Number
de la Pena, Santiago	D-553-S
Devlin, Mark	A-147-M
Dolk, Shaun	X-592-L/N
Doran, Peter	C-511-M
Ducklow, Hugh	C-045-L/P
Dunbar, Robert	O-131-N
Evenson, Paul	A-118-S
Franco, Hugo	A-145-M
Fraser, William	C-013-L/P
Fricker, Helen	I-353-M
Friedlaender, Ari	B-206-L
Friedlaender, Ari	C-024-L/P
Fritts, David	A-382-P
Gerrard, Andrew	A-111-M/P/S
Gerrard, Andrew	A-112-M/S
Goebel, Michael	X-591-E
Goehring, Brent	C-443-N
Goodge, John	D-552-M
Gooseff, Michael	C-504-M
Gooseff, Michael	C-506-M
Gooseff, Michael	C-509-M
Hall, Brenda	I-196-M
Halzen, Francis	A-333-S
Harvey, Ralph	G-058-M
Heine, John	T-913-M
Heywood, Karen	C-445-N
Holland, David	C-444-M
Hosticka, Bouvard	T-998-P
Hummon, Julia	T-933-L/N
Johnson, Joanne	C-443-N
Karle, Albrecht	A-107-S
Kemerait, Robert	G-078-M
Koppers, Antonius	G-116-N

Principal Investigator	Science Event Number
Koutnik, Michelle	I-193-M/S
Kovac, John	A-149-S
Krawczynski, Henric	A-115-M
Kulesa, Craig	A-364-M/S
LaBelle, James	A-128-S
Lamp, Jennifer	G-055-M
Larter, Robert	C-447-N
LaRue, Michelle	B-243-M
Lazzara, Matthew	O-283-M/S
Liwanag, Heather	B-030-M
Martinson, Doug	C-021-L
McManis, James	T-524-M
Melendy, Renee	T-942-S
Meshik, Alexander	A-378-M
Mitrovica, Jerry	G-065-M
Morin, Paul	T-434-M
Munro, David	O-214-L
Nayak, Michael	A-368-S
Nicholls, Keith	C-444-M
Nikolaus, Kevin	T-299-M/S
O'Brien, Joseph	T-927-M
Palo, Scott	A-284-M
Paznukhov, Vadym	A-373-P
Petrenko, Vasilii	I-160-M
Pettit, Erin	C-445-N
Pettit, Joseph	T-295-M
Phillips, Fred	G-066-M
Place, Sean	B-199-M
Polito, Michael	B-025-E
Priscu, John	C-505-M
Priscu, John	C-533-M
Priscu, John	C-534-M
Rotella, Jay	B-009-M

Principal Investigator	Science Event Number
Rush-Mueller, Elizabeth	W-481-N
Salvatore, Mark	B-235-M
Sanders, Robert	B-303-L
Scambos, Theodore	I-344-E
Scarano, Caitlin	W-482-M
Schmidt, Britney	B-041-M
Schmidt, Steven	B-320-M
Schofield, Oscar	C-019-L/P
Seefeldt, Mark	O-456-M
Shadwick, Elizabeth	O-270-L
Shubin, Neil	G-071-M
Simms, Alexander	G-412-L
Sirovic, Ana	B-229-E
Smith, David	A-454-M
Sprintall, Janet	O-260-L
Steinberg, Deborah	C-020-L/P
Szuberla, Curt	T-396-M
Takacs-Vesbach, Cristina	C-508-M
Tarrant, Ann	B-258-L
Taylor, Michael	A-119-M/P/S
Taylor, Susan	O-399-S
Thompson, Andrew	O-124-N
Todgham, Anne	B-207-M
Tulaczyk, Slawek	C-446-M
Tulaczyk, Slawek	C-516-M
van Gestel, Natasja	B-086-P
Van Mooy, Benjamin	B-032-L
Vieregg, Abigail	A-340-S
Virginia, Ross	Y-610-E
Waldman, Ariel	W-220-M
Waters, April	W-219-P
Watters, George	B-006-L
Wellner, Julia	C-447-N

Principal Investigator	Science Event Number
Wilcock, William	G-437-E
Wilson, Terry	G-079-M
Young, Jodi	B-234-P
Yu, Zicheng	G-094-P

Principal Investigators (by Institution)

Institution	Principal Investigator	Event Number
Air Force Research Laboratory	Nayak, Michael	A-368-S
Army Corps of Engineers	Taylor, Susan	O-399-S
Boston College	Paznukhov, Vadym	A-373-P
Brigham Young University	Adams, Byron	C-507-M
British Antarctic Survey	Johnson, Joanne	C-443-N
British Antarctic Survey	Larter, Robert	C-447-N
British Antarctic Survey	Nicholls, Keith	C-444-N
California Institute of Technology	Thompson, Andrew	O-124-N
California Poly State University	Liwanag, Heather	B-030-M
Cambridge University	Christoffersen, Poul	C-446-M
Case Western Reserve University	Harvey, Ralph	G-058-M
Central Michigan University	Sanders, Robert	B-303-L
College of William and Mary	Shadwick, Elizabeth	O-270-L
Columbia Scientific Balloon Facility	Franco, Hugo	A-145-M
Columbia University	Ducklow, Hugh	C-045-L/P
Columbia University	Lamp, Jennifer	G-055-M
Columbia University	Martinson, Doug	C-021-L
Dartmouth College	Albert, Mary	T-150-M
Dartmouth College	LaBelle, James	A-128-S
Dartmouth College	Virginia, Ross	Y-610-E
Duke University	Cassar, Nicolas	B-461-L
GATS, Inc.	Fritts, David	A-382-P
Georgia Institute of Technology	Schmidt, Britney	B-041-M
H.T. Harvey & Associates	Ainley, David	B-031-M
Harvard University	Kovac, John	A-149-S
Harvard University	Mitrovica, Jerry	G-065-M
Jacksonville University	Heine, John	T-913-M
Johns Hopkins University	Chartier, Alex	A-100-M/S

Institution	Principal Investigator	Event Number
Lehigh University	Yu, Zicheng	G-094-P
Louisiana State University Baton Rouge	Doran, Peter	C-511-M
Louisiana State University Baton Rouge	Polito, Michael	B-025-E
Montana State University Bozeman	Priscu, John	C-505-M
Montana State University Bozeman	Priscu, John	C-533-M
Montana State University Bozeman	Priscu, John	C-534-M
Montana State University Bozeman	Rotella, Jay	B-009-M
NASA Ames Research Center	Smith, David	A-454-M
National Aeronautics and Space Administration	Brunt, Kelly	X-594-M/S
National Aeronautics and Space Administration	O'Brien, Joseph	T-927-M
National Oceanic and Atmospheric Administration	Butler, James	O-257-M
National Oceanic and Atmospheric Administration	Butler, James	O-257-S
National Oceanic and Atmospheric Administration	Butler, James	O-264-P
National Oceanic and Atmospheric Administration	Dolk, Shaun	X-592-L/N
National Oceanic and Atmospheric Administration	Goebel, Michael	X-591-E
National Oceanic and Atmospheric Administration	Watters, George	B-006-L
New Jersey Institute of Technology	Gerrard, Andrew	A-111-M/P/S
New Jersey Institute of Technology	Gerrard, Andrew	A-112-M/S
New Mexico Institute of Mining and Technology	Nikolaus, Kevin	T-299-M/S
New Mexico Institute of Mining and Technology	Phillips, Fred	G-066-M
New York University	Holland, David	C-444-M
Northern Arizona University	Salvatore, Mark	B-235-M
Ohio State University	de la Pena, Santiago	D-553-S
Ohio State University	Wilson, Terry	G-079-M

Institution	Principal Investigator	Event Number
Oregon State University	Bernard, Kim	B-459-L/P
Oregon State University	Koppers, Antonius	G-116-N
Pennsylvania State University	Anandakrishnan, Sridhar	I-155-E
Polar Oceans Research Group	Fraser, William	C-013-L/P
Public Broadcasting Service	Apsell, Paula	Y-601-M
Rutgers University	Schofield, Oscar	C-019-L/P
Scripps Institution of Oceanography	Sprintall, Janet	O-260-L
Sonoma State University	Place, Sean	B-199-M
Stanford University	Dunbar, Robert	O-131-N
Texas Tech University	van Gestel, Natasja	B-086-P
The University of Maine	Hall, Brenda	I-196-M
Tulane University	Goehring, Brent	C-443-N
UNAVCO	Pettit, Joseph	T-295-M
United States Air Force	Kemerait, Robert	G-078-M
United States Geological Survey	Anderson, Kent	G-090-P/S
University of Alabama Birmingham	Amsler, Charles	B-236-L
University of Alaska Fairbanks	Bristow, William	A-369-M/S
University of Alaska Fairbanks	Conde, Mark	A-343-M/S
University of Alaska Fairbanks	Pettit, Erin	C-445-N
University of Alaska Fairbanks	Szuberla, Curt	T-396-M
University of Arizona Tucson	Kulesa, Craig	A-364-M/S
University of California Davis	Todgham, Anne	B-207-M
University of California Irvine	Barwick, Steven	A-127-M/S
University of California San Diego	Chereskin, Teresa	O-317-L
University of California San Diego	Fricker, Helen	I-353-M
University of California San Diego	Sirovic, Ana	B-229-E
University of California Santa Barbara	Simms, Alexander	G-412-L
University of California Santa Cruz	Costa, Daniel	B-232-L
University of California Santa Cruz	Friedlaender, Ari	B-206-L
University of California Santa Cruz	Friedlaender, Ari	C-024-L/P
University of California Santa Cruz	Tulaczyk, Slawek	C-446-M

Institution	Principal Investigator	Event Number
University of California Santa Cruz	Tulaczyk, Slawek	C-516-M
University of Chicago	Carlstrom, John	A-379-S
University of Chicago	Shubin, Neil	G-071-M
University of Chicago	Vieregg, Abigail	A-340-S
University of Colorado Boulder	Chu, Xinzhao	A-123-M
University of Colorado Boulder	Chu, Xinzhao	A-130-M
University of Colorado Boulder	Gooseff, Michael	C-504-M
University of Colorado Boulder	Gooseff, Michael	C-506-M
University of Colorado Boulder	Gooseff, Michael	C-509-M
University of Colorado Boulder	Munro, David	O-214-L
University of Colorado Boulder	Palo, Scott	A-284-M
University of Colorado Boulder	Scambos, Theodore	I-344-E
University of Colorado Boulder	Schmidt, Steven	B-320-M
University of Colorado Boulder	Seefeldt, Mark	O-456-M
University of Delaware	Evenson, Paul	A-118-S
University of East Anglia	Heywood, Karen	C-445-N
University of Hawaii Manoa	Hummon, Julia	T-933-L/N
University of Houston	Wellner, Julia	C-447-N
University of Illinois Urbana	Catchen, Julian	B-211-M
University of Minnesota	Goodge, John	D-552-M
University of Minnesota	LaRue, Michelle	B-243-M
University of Minnesota	Morin, Paul	T-434-M
University of Nebraska Lincoln	McManis, James	T-524-M
University of New Mexico	Takacs-Vesbach, Cristina	C-508-M
University of Oregon	Cziko, Paul	B-195-M
University of Pennsylvania	Devlin, Mark	A-147-M
University of Rochester	Petrenko, Vasilii	I-160-M
University of Virginia	Hosticka, Bouvard	T-998-P
University of Washington	Christianson, Knut	I-175-M/S
University of Washington	Koutnik, Michelle	I-193-M/S
University of Washington	Wilcock, William	G-437-E
University of Washington	Young, Jodi	B-234-P
University of Wisconsin Madison	Halzen, Francis	A-333-S

Institution	Principal Investigator	Event Number
University of Wisconsin Madison	Karle, Albrecht	A-107-S
University of Wisconsin Madison	Lazzara, Matthew	O-283-M/S
US Army Cold Regions Research & Engineering Lab	Melendy, Renee	T-942-S
Utah State University	Taylor, Michael	A-119-M/P/S
Virginia Institute of Marine Sciences	Steinberg, Deborah	C-020-L/P
Virginia Tech	Clauer, C. Robert	A-106-M/S
Washington University	Binns, Walter	A-142-M
Washington University	Krawczynski, Henric	A-115-M
Washington University	Meshik, Alexander	A-378-M
Woods Hole Oceanographic Institution	Tarrant, Ann	B-258-L
Woods Hole Oceanographic Institution	Van Mooy, Benjamin	B-032-L
	Rush-Mueller, Elizabeth	W-481-N
	Scarano, Caitlin	W-482-M
	Waldman, Ariel	W-220-M
	Waters, April	W-219-P

ARSV *Laurence M. Gould* Projects

(by PI Last Name)

Principal Investigator	Science Event Number
Amsler, Charles	B-236-L
Bernard, Kim	B-459-L/P
Cassar, Nicolas	B-461-L
Chereskin, Teresa	O-317-L
Costa, Daniel	B-232-L
Dolk, Shaun	X-592-L/N
Ducklow, Hugh	C-045-L/P
Fraser, William	C-013-L/P
Friedlaender, Ari	B-206-L
Friedlaender, Ari	C-024-L/P
Hummon, Julia	T-933-L/N
Martinson, Doug	C-021-L
Munro, David	O-214-L
Sanders, Robert	B-303-L
Schofield, Oscar	C-019-L/P
Shadwick, Elizabeth	O-270-L
Simms, Alexander	G-412-L
Sprintall, Janet	O-260-L
Steinberg, Deborah	C-020-L/P
Tarrant, Ann	B-258-L
Van Mooy, Benjamin	B-032-L
Watters, George	B-006-L

RV/IB *Nathaniel B. Palmer* Projects

(by PI Last Name)

Principal Investigator	Science Event Number
Dolk, Shaun	X-592-L/N
Dunbar, Robert	O-131-N
Goehring, Brent	C-443-N
Heywood, Karen	C-445-N
Hummon, Julia	T-933-L/N
Johnson, Joanne	C-443-N
Koppers, Antonius	G-116-N
Larter, Robert	C-447-N
Pettit, Erin	C-445-N
Rush-Mueller, Elizabeth	W-481-N
Thompson, Andrew	O-124-N
Wellner, Julia	C-447-N

McMurdo Station Projects

(by PI Last Name)

Principal Investigator	Science Event Number
Adams, Byron	C-507-M
Ainley, David	B-031-M
Albert, Mary	T-150-M
Apsell, Paula	Y-601-M
Barwick, Steven	A-127-M/S
Binns, Walter	A-142-M
Bristow, William	A-369-M/S
Brunt, Kelly	X-594-M/S
Butler, James	O-257-M
Catchen, Julian	B-211-M
Chartier, Alex	A-100-M/S
Christianson, Knut	I-175-M/S
Christoffersen, Poul	C-446-M
Chu, Xinzhao	A-123-M
Chu, Xinzhao	A-130-M
Clauer, C. Robert	A-106-M/S
Conde, Mark	A-343-M/S
Cziko, Paul	B-195-M
Devlin, Mark	A-147-M
Doran, Peter	C-511-M
Franco, Hugo	A-145-M
Fricker, Helen	I-353-M
Gerrard, Andrew	A-111-M/P/S
Gerrard, Andrew	A-112-M/S
Goodge, John	D-552-M

Principal Investigator	Science Event Number
Gooseff, Michael	C-504-M
Gooseff, Michael	C-506-M
Gooseff, Michael	C-509-M
Hall, Brenda	I-196-M
Harvey, Ralph	G-058-M
Heine, John	T-913-M
Holland, David	C-444-M
Kemerait, Robert	G-078-M
Koutnik, Michelle	I-193-M/S
Krawczynski, Henric	A-115-M
Kulesa, Craig	A-364-M/S
Lamp, Jennifer	G-055-M
LaRue, Michelle	B-243-M
Lazzara, Matthew	O-283-M/S
Liwanag, Heather	B-030-M
McManis, James	T-524-M
Meshik, Alexander	A-378-M
Mitrovica, Jerry	G-065-M
Morin, Paul	T-434-M
Nicholls, Keith	C-444-M
Nikolaus, Kevin	T-299-M/S
O'Brien, Joseph	T-927-M
Palo, Scott	A-284-M
Petrenko, Vasilii	I-160-M
Pettit, Joseph	T-295-M
Phillips, Fred	G-066-M
Place, Sean	B-199-M
Priscu, John	C-505-M
Priscu, John	C-533-M

Principal Investigator	Science Event Number
Priscu, John	C-534-M
Rotella, Jay	B-009-M
Salvatore, Mark	B-235-M
Scarano, Caitlin	W-482-M
Schmidt, Britney	B-041-M
Schmidt, Steven	B-320-M
Seefeldt, Mark	O-456-M
Shubin, Neil	G-071-M
Smith, David	A-454-M
Szuberla, Curt	T-396-M
Takacs-Vesbach, Cristina	C-508-M
Taylor, Michael	A-119-M/P/S
Todgham, Anne	B-207-M
Tulaczyk, Slawek	C-446-M
Tulaczyk, Slawek	C-516-M
Waldman, Ariel	W-220-M
Wilson, Terry	G-079-M

Palmer Station Projects

(by PI Last Name)

Principal Investigator	Science Event Number
Anderson, Kent	G-090-P/S
Bernard, Kim	B-459-L/P
Butler, James	O-264-P
Ducklow, Hugh	C-045-L/P
Fraser, William	C-013-L/P
Friedlaender, Ari	C-024-L/P
Fritts, David	A-382-P
Gerrard, Andrew	A-111-M/P/S
Hosticka, Bouvard	T-998-P
Paznukhov, Vadym	A-373-P
Schofield, Oscar	C-019-L/P
Steinberg, Deborah	C-020-L/P
Taylor, Michael	A-119-M/P/S
van Gestel, Natasja	B-086-P
Waters, April	W-219-P
Young, Jodi	B-234-P
Yu, Zicheng	G-094-P

South Pole Station Projects

(by PI Last Name)

Principal Investigator	Science Event Number
Anderson, Kent	G-090-P/S
Barwick, Steven	A-127-M/S
Bristow, William	A-369-M/S
Brunt, Kelly	X-594-M/S
Butler, James	O-257-S
Carlstrom, John	A-379-S
Chartier, Alex	A-100-M/S
Christianson, Knut	I-175-M/S
Clauer, C. Robert	A-106-M/S
Conde, Mark	A-343-M/S
de la Pena, Santiago	D-553-S
Evenson, Paul	A-118-S
Gerrard, Andrew	A-111-M/P/S
Gerrard, Andrew	A-112-M/S
Halzen, Francis	A-333-S
Karle, Albrecht	A-107-S
Koutnik, Michelle	I-193-M/S
Kovac, John	A-149-S
Kulesa, Craig	A-364-M/S
LaBelle, James	A-128-S
Lazzara, Matthew	O-283-M/S
Melendy, Renee	T-942-S
Nayak, Michael	A-368-S
Nikolaus, Kevin	T-299-M/S
Taylor, Michael	A-119-M/P/S
Taylor, Susan	O-399-S
Vieregg, Abigail	A-340-S

Projects Not Supported by a USAP Station or Vessel

(by PI Last Name)

Principal Investigator	Science Event Number
Anandakrishnan, Sridhar	I-155-E
Goebel, Michael	X-591-E
Polito, Michael	B-025-E
Scambos, Theodore	I-344-E
Sirovic, Ana	B-229-E
Virginia, Ross	Y-610-E
Wilcock, William	G-437-E

Antarctic Astrophysics and Geospace Sciences

(by PI Last Name)

Principal Investigator	Science Event Number
Barwick, Steven	A-127-M/S
Binns, Walter	A-142-M
Bristow, William	A-369-M/S
Carlstrom, John	A-379-S
Chartier, Alex	A-100-M/S
Chu, Xinzhao	A-123-M
Chu, Xinzhao	A-130-M
Clauer, C. Robert	A-106-M/S
Conde, Mark	A-343-M/S
Devlin, Mark	A-147-M
Evenson, Paul	A-118-S
Franco, Hugo	A-145-M
Fritts, David	A-382-P
Gerrard, Andrew	A-111-M/P/S
Gerrard, Andrew	A-112-M/S
Halzen, Francis	A-333-S
Karle, Albrecht	A-107-S
Kovac, John	A-149-S
Krawczynski, Henric	A-115-M
Kulesa, Craig	A-364-M/S
LaBelle, James	A-128-S
Meshik, Alexander	A-378-M
Nayak, Michael	A-368-S
Palo, Scott	A-284-M
Paznukhov, Vadym	A-373-P
Smith, David	A-454-M
Taylor, Michael	A-119-M/P/S
Vieregg, Abigail	A-340-S

Antarctic Organisms and Ecosystems

(by PI Last Name)

Principal Investigator	Science Event Number
Ainley, David	B-031-M
Amsler, Charles	B-236-L
Bernard, Kim	B-459-L/P
Cassar, Nicolas	B-461-L
Catchen, Julian	B-211-M
Costa, Daniel	B-232-L
Cziko, Paul	B-195-M
Friedlaender, Ari	B-206-L
LaRue, Michelle	B-243-M
Liwanag, Heather	B-030-M
Place, Sean	B-199-M
Polito, Michael	B-025-E
Rotella, Jay	B-009-M
Salvatore, Mark	B-235-M
Sanders, Robert	B-303-L
Schmidt, Britney	B-041-M
Schmidt, Steven	B-320-M
Sirovic, Ana	B-229-E
Tarrant, Ann	B-258-L
Todgham, Anne	B-207-M
van Gestel, Natasja	B-086-P
Van Mooy, Benjamin	B-032-L
Watters, George	B-006-L
Young, Jodi	B-234-P

Antarctic Integrated System Science

(by PI Last Name)

Principal Investigator	Science Event Number
Adams, Byron	C-507-M
Christoffersen, Poul	C-446-M
Doran, Peter	C-511-M
Ducklow, Hugh	C-045-L/P
Fraser, William	C-013-L/P
Friedlaender, Ari	C-024-L/P
Goehring, Brent	C-443-N
Gooseff, Michael	C-504-M
Gooseff, Michael	C-506-M
Gooseff, Michael	C-509-M
Heywood, Karen	C-445-N
Holland, David	C-444-M
Johnson, Joanne	C-443-N
Larter, Robert	C-447-N
Martinson, Doug	C-021-L
Nicholls, Keith	C-444-M
Pettit, Erin	C-445-N
Priscu, John	C-505-M
Priscu, John	C-533-M
Priscu, John	C-534-M
Schofield, Oscar	C-019-L/P
Steinberg, Deborah	C-020-L/P
Takacs-Vesbach, Cristina	C-508-M
Tulaczyk, Slawek	C-446-M
Tulaczyk, Slawek	C-516-M
Wellner, Julia	C-447-N

Antarctic Instrumentation and Technology Development

(by PI Last Name)

Principal Investigator	Science Event Number
de la Pena, Santiago	D-553-S
Goodge, John	D-552-M

Antarctic Earth Sciences

(by PI Last Name)

Principal Investigator	Science Event Number
Anderson, Kent	G-090-P/S
Harvey, Ralph	G-058-M
Kemerait, Robert	G-078-M
Koppers, Antonius	G-116-N
Lamp, Jennifer	G-055-M
Mitrovica, Jerry	G-065-M
Phillips, Fred	G-066-M
Shubin, Neil	G-071-M
Simms, Alexander	G-412-L
Wilcock, William	G-437-E
Wilson, Terry	G-079-M
Yu, Zicheng	G-094-P

Antarctic Glaciology

(by PI Last Name)

Principal Investigator	Science Event Number
Anandakrishnan, Sridhar	I-155-E
Christianson, Knut	I-175-M/S
Fricker, Helen	I-353-M
Hall, Brenda	I-196-M
Koutnik, Michelle	I-193-M/S
Petrenko, Vasilii	I-160-M
Scambos, Theodore	I-344-E

Antarctic Ocean and Atmospheric Sciences

(by PI Last Name)

Principal Investigator	Science Event Number
Butler, James	O-257-M
Butler, James	O-257-S
Butler, James	O-264-P
Chereskin, Teresa	O-317-L
Dunbar, Robert	O-131-N
Lazzara, Matthew	O-283-M/S
Munro, David	O-214-L
Seefeldt, Mark	O-456-M
Shadwick, Elizabeth	O-270-L
Sprintall, Janet	O-260-L
Taylor, Susan	O-399-S
Thompson, Andrew	O-124-N

Antarctic Technical Events

(by PI Last Name)

Principal Investigator	Science Event Number
Albert, Mary	T-150-M
Heine, John	T-913-M
Hosticka, Bouvard	T-998-P
Hummon, Julia	T-933-L/N
McManis, James	T-524-M
Melendy, Renee	T-942-S
Morin, Paul	T-434-M
Nikolaus, Kevin	T-299-M/S
O'Brien, Joseph	T-927-M
Pettit, Joseph	T-295-M
Szuberla, Curt	T-396-M

Antarctic Artists and Writers

(by PI Last Name)

Principal Investigator	Science Event Number
Rush-Mueller, Elizabeth	W-481-N
Scarano, Caitlin	W-482-M
Waldman, Ariel	W-220-M
Waters, April	W-219-P

Other Science Events

(by PI Last Name)

Principal Investigator	Science Event Number
Brunt, Kelly	X-594-M/S
Dolk, Shaun	X-592-L/N
Goebel, Michael	X-591-E

Antarctic Outreach and Education

(by PI Last Name)

Principal Investigator	Science Event Number
Apsell, Paula	Y-601-M
Virginia, Ross	Y-610-E

Deploying Participants (by Science Event Number)

Science Event Number	Participant
A-100-M/S	Chartier, Alex
A-106-M/S	Edwards, Thomas
A-106-M/S	Xu, Zhonghua
A-107-S	Besson, Dave
A-107-S	Friedman, Elizabeth
A-107-S	Khandelwal, Rishabh
A-107-S	Kravchenko, Ilya
A-107-S	Pan, Yue
A-111-M/P/S	Burch, Hunter
A-111-M/P/S	Gerrard, Andrew
A-111-M/P/S	Jeffer, Gilbert
A-111-M/P/S	Melville, Robert
A-111-M/P/S	Salzano, Michelle
A-111-M/P/S	Stillinger, Andrew
A-112-M/S	Gerrard, Andrew
A-112-M/S	Jeffer, Gilbert
A-112-M/S	Melville, Robert
A-112-M/S	Stillinger, Andrew
A-115-M	Abarr, Quincy
A-115-M	Bose, Richard
A-115-M	Braun, Dana
A-115-M	Gadson, Thomas
A-115-M	Heatwole, Scott
A-115-M	Kislat, Fabian
A-115-M	Krawczynski, Henric
A-115-M	Okajima, Takashi
A-115-M	Peterson, Zachary
A-115-M	Simburger, Garry

Science Event Number	Participant
A-115-M	Stuchlik, David
A-115-M	Takahashi, Hiromitsu
A-118-S	Seunarine, Surujhdeo
A-118-S	Zeit, Grace
A-119-M/P/S	Pautet, Pierre-Dominique
A-119-M/P/S	Taylor, Michael
A-123-M	Chu, Xinzhao
A-123-M	Geraghty, Ian
A-127-M/S	Barwick, Steven
A-127-M/S	Bernhoff, Hans
A-127-M/S	Persichilli, Christopher
A-127-M/S	Zierke, Simon
A-130-M	Berland, Grant
A-130-M	Li, Zimu
A-142-M	Bose, Richard
A-142-M	Braun, Dana
A-142-M	Fitzsimmons, Sean
A-142-M	Rauch, Brian
A-142-M	Sakai, Kenichi
A-142-M	Sasaki, Makoto
A-142-M	Simburger, Garry
A-145-M	Anderson, Aaron
A-145-M	Bath, Brian
A-145-M	Battaion, Scott
A-145-M	Beange, Alexander
A-145-M	Breeding, Garrison
A-145-M	Cooper, Dewell
A-145-M	De Luna, Juan
A-145-M	Fox, Larry
A-145-M	Frazier, Curtis
A-145-M	Gregg, Gerald
A-145-M	Hadley, Scott
A-145-M	Hamilton, Andrew

Science Event Number	Participant
A-145-M	Hays, Jack
A-145-M	Henderson, Randall
A-145-M	Hogg, Derek
A-145-M	Johnson, Arlo
A-145-M	Jones, Joseph
A-145-M	Manigo, Leroy
A-145-M	Marsh, Justin
A-145-M	Masters, Otto
A-145-M	McDaniel, Scott
A-145-M	McDonald, Randall
A-145-M	Millan, Robyn
A-145-M	Miller, Scott
A-145-M	Moore, Zbigniew
A-145-M	Mullin, Matthew
A-145-M	Richard, Jacob
A-145-M	Richard, Mitchell
A-145-M	Stelly, Robert
A-145-M	Sullivan, David
A-145-M	Villasana, Cesar
A-145-M	Weber, Corey
A-145-M	Williams, Danny
A-145-M	Wooten, Curtis
A-147-M	Coppi, Gabriele
A-147-M	Devlin, Mark
A-147-M	Dober, Bradley
A-147-M	Fissel, Laura
A-147-M	Galitzki, Nicholas
A-147-M	Gordon, Samuel
A-147-M	Lourie, Nathan
A-147-M	Lowe, Ian
A-147-M	Mauskopf, Phillip
A-147-M	Nati, Federico
A-147-M	Novak, Giles

Science Event Number	Participant
A-147-M	Romualdez, Javier
A-147-M	Sinclair, Adrian
A-147-M	Williams, Paul
A-149-S	Ahmed, Zeeshan
A-149-S	Barkats, Denis
A-149-S	Cornelison, James
A-149-S	Cukierman, Ariel
A-149-S	D'Ewart, John
A-149-S	Dierickx, Marion
A-149-S	Frisch, Josef
A-149-S	Karkare, Kirit
A-149-S	Kovac, John
A-149-S	Kovacs, Attila
A-149-S	Palladino, Steven
A-149-S	Schwarz, Robert
A-149-S	St Germaine, Michael
A-149-S	Van Winkle, Daniel
A-149-S	Young, Edward
A-149-S	Yu, Cyndia
A-284-M	Marino, John
A-284-M	Palo, Scott
A-284-M	Schwab, Bennet
A-333-S	Aartsen, Mark
A-333-S	Auer, Ralf
A-333-S	Axani, Spencer
A-333-S	Bay, Ryan
A-333-S	Bendfelt, Timothy
A-333-S	Blot, Summer
A-333-S	Dujmovic, Hrvoje
A-333-S	DuVernois, Michael
A-333-S	Eberhardt, Benjamin
A-333-S	Hall, Michelle
A-333-S	Lyu, Lu

Science Event Number	Participant
A-333-S	Mallot, Ann Kathrin
A-333-S	Pollmann, Anna
A-333-S	Sandstrom, Perry
A-333-S	Schaufel, Merlin
A-333-S	Shepard, Alec
A-340-S	Hughes, Kaeli
A-340-S	Oberla, Eric
A-343-M/S	Branning, Kylee
A-343-M/S	Elliott, John
A-364-M/S	Kulesa, Craig
A-368-S	Nayak, Michael
A-369-M/S	Bristow, William
A-369-M/S	Klug, Bryant
A-379-S	Anderson, Adam
A-379-S	Avva, Jessica
A-379-S	Bender, Amy
A-379-S	Benson, Bradford
A-379-S	Carlstrom, John
A-379-S	Crawford, Thomas
A-379-S	Foster, Allen
A-379-S	Gambrel, Anne
A-379-S	Guns, Sam
A-379-S	Huang, Nicholas
A-379-S	Kim, Junhan
A-379-S	Korman, Milo
A-379-S	Kubik, Donna
A-379-S	Lowitz, Amy
A-379-S	Marrone, Daniel
A-379-S	Montgomery, Joshua
A-379-S	Nadolski, Andrew
A-379-S	Natoli, Tyler
A-379-S	Padin, Stephen
A-379-S	Pernic, David

Science Event Number	Participant
A-379-S	Rahlin, Alexandra
A-379-S	Rose, Mel
A-379-S	Sobrin, Joshua
A-379-S	Stephen, Judith
A-379-S	Young, Matthew
A-382-P	Hocking, Wayne
B-006-L	Cutter, George
B-006-L	Reiss, Christian
B-009-M	Anderson, Alissa
B-009-M	Cunningham, Kaitlin
B-009-M	DeVoe, Jesse
B-009-M	Link, William
B-009-M	Macdonald, Kaitlin
B-009-M	Petch, Shane
B-009-M	Rotella, Jay
B-009-M	Villalobos, Victor
B-030-M	Harris, Heather
B-030-M	Liwanag, Heather
B-030-M	Pearson, Linnea
B-030-M	Voisinet, Melissa
B-030-M	Ward, Bridget
B-030-M	Weitzner, Emma
B-030-M	Whoriskey, Sophie
B-031-M	Aguilar Clapés-Sagañoles, Virginia
B-031-M	Ainley, David
B-031-M	Ballard, Grant
B-031-M	Dugger, Katie
B-031-M	Elrod, Megan
B-031-M	Lescroel, Amelie
B-031-M	Pennycook, Jean
B-031-M	Polish, Nathaniel
B-031-M	Ross, Ronald
B-031-M	Schmidt, Anne

Science Event Number	Participant
B-031-M	Stoner, Katelyn
B-031-M	Varsani, Arvind
B-032-L	Holm, Henry
B-032-L	Schrange, Kharis
B-032-L	Van Mooy, Benjamin
B-041-M	Bryson, Frances
B-041-M	Dichek, Daniel
B-041-M	Hobbs, Tiegan
B-041-M	Lawrence, Justin
B-041-M	Meister, Matthew
B-041-M	Mullen, Andrew
B-041-M	Ramey, Charles
B-041-M	Schmidt, Britney
B-086-P	Hungate, Bruce
B-086-P	McMillen, Kelly
B-086-P	Purcell, Alicia
B-086-P	van Gestel, Natasja
B-195-M	Cziko, Paul
B-195-M	DeVries, Arthur
B-195-M	Kaiser, Henry
B-195-M	Meister, Konrad
B-195-M	Munger, Lisa
B-195-M	Turner, Weston
B-199-M	Allen, Elizabeth
B-199-M	Barden, Allison
B-199-M	Place, Sean
B-199-M	Tercero, Anthony
B-206-L	Cade, David
B-206-L	Friedlaender, Ari
B-206-L	Goldbogen, Jeremy
B-206-L	Johnston, David
B-206-L	Taylor, James
B-207-M	Frazier, Amanda

Science Event Number	Participant
B-207-M	Naslund, Andrew
B-207-M	Todgham, Anne
B-207-M	Zillig, Kenneth
B-211-M	Catchen, Julian
B-211-M	Cheng-DeVries, Chi-Hing
B-211-M	Willis, Macgregor
B-229-E	Sirovic, Ana
B-229-E	Stafford, Kathleen
B-232-L	Crocker, Daniel
B-232-L	Goebel, Michael
B-232-L	Kanatous, Shane
B-232-L	Kienle, Sarah
B-232-L	Trumble, Stephen
B-234-P	Dawson, Hannah
B-234-P	Rundell, Susan
B-234-P	Young, Jodi
B-235-M	Borges, Schuyler
B-235-M	Salvatore, Mark
B-235-M	Stanish, Lee
B-236-L	Amsler, Charles
B-236-L	Amsler, Margaret
B-236-L	Galloway, Aaron
B-236-L	Heiser, Sabrina
B-236-L	Iken, Katrin
B-236-L	Klein, Andrew
B-236-L	Lowe, Alex
B-236-L	Schram, Julie
B-236-L	Whippo, Ross
B-243-M	Iles, David
B-243-M	Labrousse, Sara
B-243-M	LaRue, Michelle
B-243-M	Salas, Leonardo
B-258-L	Tarrant, Ann

Science Event Number	Participant
B-303-L	Gast, Rebecca
B-303-L	Jeffrey, Wade
B-303-L	Sanders, Robert
B-303-L	Simmering, Arianna
B-320-M	Cawley, Kaelin
B-320-M	Cross, Julian
B-320-M	Porazinska, Dorota
B-320-M	Solon, Adam
B-320-M	Sommers, Pacifica
B-320-M	Vimercati, Lara
B-459-L/P	Bernard, Kim
B-459-L/P	Steinke, Kirsten
C-013-L/P	Cimino, Megan
C-013-L/P	Fraser, Donna
C-013-L/P	Fraser, William
C-013-L/P	Roberts, Darren
C-013-L/P	Roberts, Megan
C-013-L/P	Schaefer, Anne
C-013-L/P	Yates, Florence
C-019-L/P	Bashkirova, Kimberlee
C-019-L/P	Conrad, Hailey
C-019-L/P	Nardelli, Schuyler
C-019-L/P	Schofield, Samantha
C-019-L/P	Slesinger, Emily
C-019-L/P	Thamatrakoln, Kimberlee
C-019-L/P	Waite, Nicole
C-019-L/P	Zahn, Marie
C-020-L/P	Conroy, John
C-020-L/P	Cope, Joseph
C-020-L/P	Malmquist, Samuel
C-020-L/P	Sacks, Joshua
C-020-L/P	Steinberg, Deborah
C-020-L/P	Thibodeau, Patricia

Science Event Number	Participant
C-020-L/P	West, Leigh
C-024-L/P	Larsen, Greg
C-024-L/P	Modest, Michelle
C-024-L/P	Nichols, Ross
C-024-L/P	Pallin, Logan
C-045-L/P	Dasarathy, Srishti
C-045-L/P	Gu, Shuai
C-045-L/P	Manahan, Naomi
C-045-L/P	Ruff, Johanna
C-045-L/P	Traylor, Shawnee
C-045-L/P	Trinh, Rebecca
C-443-N	Braddock, Scott
C-443-N	Spoth, Meghan
C-444-M	Anandakrishnan, Sridhar
C-444-M	Riverman, Kiya
C-445-N	Andersson, Jonas
C-445-N	Boehme, Lars
C-445-N	Karam, Salar
C-445-N	Mazur, Aleksandra
C-445-N	Queste, Bastien
C-445-N	Rolandsson, Rolf
C-445-N	Sheehan, Peter
C-445-N	Stedt, Filip
C-445-N	Waahlin, Anna
C-445-N	Zheng, Yixi
C-446-M	Kaip, Galen
C-446-M	Karplus, Marianne
C-446-M	Roberts, Mike
C-446-M	Walter, Jacob
C-447-N	Clark, Rachel
C-447-N	Graham, Alastair
C-447-N	Hogan Pires de Matos, Kelly
C-447-N	Kirkham, James

Science Event Number	Participant
C-447-N	Larter, Robert
C-447-N	Minzoni, Rebecca
C-447-N	Nitsche, Frank-Oliver
C-447-N	Welzenbach, Linda
C-504-M	Bergstrom, Anna
C-504-M	Cohen, Matthew
C-504-M	Gooseff, Michael
C-504-M	Singley, Joel
C-505-M	Chiuchiolo, Amy
C-505-M	Harris, Carolynn
C-505-M	Lulak, Martin
C-505-M	Robinson, David
C-506-M	Brandes, Henry
C-506-M	Heindel, Ruth
C-506-M	Lawrence, Jade
C-506-M	Treibergs, Lija
C-506-M	Welch, Kathleen
C-507-M	Adams, Byron
C-507-M	Barrett, John
C-507-M	Dickerson, Kevin
C-507-M	Griffin, Natasha
C-507-M	Hedin, Matthew
C-507-M	Pike, Alyssa
C-507-M	Power, Sarah
C-507-M	Powers, Thomas
C-508-M	Devlin, Shawn
C-508-M	Kalra, Isha
C-508-M	Penzkover, Kathryn
C-508-M	Sherwell, Shasten
C-509-M	Brown, Renee
C-509-M	Darling, Joshua
C-509-M	McKnight, Diane
C-511-M	McClure, James

Science Event Number	Participant
C-511-M	Myers, Krista
C-511-M	Myers, Madeline
C-511-M	Stone, Michael
C-516-M	Auken, Esben
C-516-M	Doran, Peter
C-516-M	Foged, Nikolaj
C-516-M	Grombacher, Denys
C-516-M	Jensen, Lars
C-516-M	Jørgensen, Jan
C-516-M	Mikucki, Jill
C-516-M	Rogers, Timothy
C-516-M	Tulaczyk, Slawomir
C-533-M	Seifert, Meghan
C-533-M	Siegfried, Matthew
C-534-M	Barker, Joel
C-534-M	Burnett, Justin
C-534-M	Campbell, Tim
C-534-M	Christner, Brent
C-534-M	Collins, William
C-534-M	Davis, Christina
C-534-M	Dean, Cynthia
C-534-M	Dore, John
C-534-M	Gagnon, Alan
C-534-M	Gardner, Christopher
C-534-M	Harwood, David
C-534-M	Kasic, Kathryn
C-534-M	Leventer, Amy
C-534-M	Li, Wei
C-534-M	Michaud, Alexander
C-534-M	Patterson, Molly
C-534-M	Priscu, John
C-534-M	Rosenheim, Brad
C-534-M	Skidmore, Mark

Science Event Number	Participant
C-534-M	Tranter, Martyn
C-534-M	Venturelli, Ryan
C-534-M	Vick-Majors, Trista
C-534-M	Winans, John
C-534-M	Zook, Robert
D-552-M	Armstrong, Clayton
D-552-M	Johnson, Jay
D-552-M	Little, Owen
D-552-M	Vecchiarelli, Anthony
D-553-S	de la Pena, Santiago
G-055-M	Eppes, Martha
G-055-M	Lamp, Jennifer
G-055-M	Swanger, Kate
G-058-M	Ackiss, Sheridan
G-058-M	Dobrica, Elena
G-058-M	Hynek, Brian
G-058-M	Karner, James
G-058-M	Rougeux, Brian
G-058-M	Scholar, Paul
G-058-M	Schutt, John
G-065-M	Ackert, Robert
G-065-M	Campbell, Seth
G-065-M	Dunbar, Nelia
G-065-M	McComas, Jeremy
G-065-M	McIntosh, William
G-065-M	Zimmerer, Matthew
G-066-M	Burrill, Christine
G-066-M	Kyle, Philip
G-066-M	Parmelee, David
G-066-M	Turner, Alasdair
G-071-M	Daeschler, Edward
G-071-M	Long, John
G-071-M	Maloof, Adam

Science Event Number	Participant
G-071-M	McCarthy, Forrest
G-071-M	Mitchell, Andrew
G-071-M	Robinson, Corey
G-071-M	Senden, Tim
G-071-M	Shubin, Neil
G-078-M	Kvasager, Tyrel
G-078-M	Pauldine, Andrew
G-078-M	Phelps, Jacob
G-078-M	Pouncy, Andrew
G-078-M	Richards, Raymond
G-078-M	Stone, Robert
G-090-P/S	Anderson, Jared
G-090-P/S	Jones, David
G-090-P/S	Kromer, Edward
G-090-P/S	Sandoval, Samuel
G-094-P	Stelling, Jonathan
G-094-P	Yu, Zicheng
G-116-N	Koppers, Antonius
G-412-L	Garcia, Christopher
G-412-L	Gernant, Cameron
G-412-L	Simms, Alexander
G-412-L	Theilen, Brittany
G-437-E	Dziak, Robert
G-437-E	Gardner, Alan
G-437-E	Kane, Timothy
G-437-E	Roche, Lauren
G-437-E	Soule, Dax
G-437-E	Wilcock, William
I-155-E	Anandakrishnan, Sridhar
I-160-M	Boeckmann, Grant
I-160-M	Crosier, Edward
I-160-M	Etheridge, David
I-160-M	Kuhl, Tanner

Science Event Number	Participant
I-160-M	Neff, Peter
I-160-M	Petrenko, Vasilii
I-160-M	Smith, Andrew
I-160-M	Smith, Richard
I-160-M	Thornton, David
I-175-M/S	Christianson, Knut
I-175-M/S	Fudge, Tyler
I-175-M/S	Holschuh, Nicholas
I-175-M/S	Steig, Eric
I-193-M/S	Conway, Howard
I-193-M/S	Lilien, David
I-193-M/S	Stevens, Christopher
I-196-M	Hall, Brenda
I-196-M	Mattas, Laura
I-196-M	Miles, Maraina
I-196-M	Walther, Tessa
I-344-E	Miege, Clement
I-344-E	Miller, Julie
I-344-E	Scambos, Theodore
I-344-E	Wallin, Bruce
I-353-M	Gustafson, Chloe
I-353-M	Key, Kerry
M-ATS-S	Clark, Bruce
M-ATS-S	Thomas, Gregory
M-SFA-M	Wheeler, Christopher
O-124-N	Flexas, Mar
O-124-N	Oelerich, Ria
O-124-N	Ruan, Xiaozhou
O-124-N	Schubert, Ryan
O-124-N	Schulze, Lena
O-124-N	Scott, David
O-124-N	Simons, Elizabeth
O-124-N	Speer, Kevin

Science Event Number	Participant
O-124-N	Thompson, Andrew
O-131-N	Hennig, Andrew
O-214-L	Munro, David
O-214-L	Newberger, Timothy
O-214-L	Sweeney, Colm
O-214-L	Wolter, Sonja
O-257-M/S	Booth, John
O-257-M/S	Friedlander, Cherisa
O-257-M/S	Kaiser, Benjamin
O-257-M/S	Shemet, Sabrina
O-257-M/S	Sheridan, Patrick
O-264-P	Disterhoft, Patrick
O-283-M/S	Filip, Forbes
O-283-M/S	Mikolajczyk, David
O-283-M/S	Penn, Michael
O-283-M/S	Valkonen, Elina
O-283-M/S	Welhouse, Lee
O-399-S	Lever, James
O-399-S	Stroud, Rhonda
O-456-M	Landolt, Scott
O-456-M	Seefeldt, Mark
T-295-M	Bayou, Nicolas
T-295-M	Niebuhr, Spencer
T-295-M	Nylen, Thomas
T-295-M	Pettit, Joseph
T-295-M	Williams, Keith
T-295-M	Zaino, Anne
T-299-M/S	Arnell, Kirsten
T-299-M/S	Lingutla, Narendra Naidu
T-299-M/S	Nikolaus, Kevin
T-299-M/S	Roth, Aurora
T-299-M/S	Woodward, Robert
T-396-M	Blom, Lukas

Science Event Number	Participant
T-396-M	Buurman, Helena
T-396-M	Byrd, Don
T-396-M	Helmericks, Jay
T-396-M	Pomraning, Dale
T-396-M	Winkelman, Andrew
T-434-M	Cloutier, Michael
T-434-M	Foga, Steven
T-434-M	Herried, Bradley
T-434-M	Kelleher, Cole
T-524-M	Duling, Dennis
T-524-M	Gibson, Dar
T-524-M	Kalin, Jonas
T-524-M	Krula, Edwin
T-524-M	Mironov, Anatoly
T-524-M	Roberts, Graham
T-913-M	Amsler, Margaret
T-913-M	Heine, John
T-913-M	Rigaud, Christopher
T-927-M	Cotten, Rex
T-927-M	Cox, Jennifer
T-927-M	Funk, Raymond
T-927-M	Kambarn, William
T-927-M	Obrien, Joseph
T-927-M	Sinkola, Nikolas
T-927-M	Wendell, Edward
T-940-M	Barna, Lynette
T-940-M	Courville, Zoe
T-942-S	Hoch, Garrett
T-943-M	Campbell, Seth
T-943-M	Courville, Zoe
T-943-M	Hoch, Garrett
T-998-P	Hosticka, Bouvard
W-219-P	Waters, April

Science Event Number	Participant
W-220-M	Waldman, Ariel
W-481-N	Rush-Mueller, Elizabeth
W-482-M	Scarano, Caitlin
X-591-E	Brazier, Laura
X-591-E	Fox, Adam
X-591-E	Goebel, Michael
X-591-E	Krause, Douglas
X-591-E	Reynaga, Andrew
X-591-E	Walden, Stephanie
X-594-M/S	Brunt, Kelly
X-594-M/S	Greeley, Adam
Y-601-M	Fink, Zachary
Y-601-M	Giertz, Simone
Y-601-M	Saks, Caitlin
Y-610-E	Alcantar, Raul
Y-610-E	Culler, Lauren
Y-610-E	Edgar, Sofia
Y-610-E	Hamby, Frances
Y-610-E	Loveland, Frank
Y-610-E	Wallstrom, Erica

Deploying Participants (Alphabetical)

Participant	Science Event Number
Aartsen, Mark	A-333-S
Abarr, Quincy	A-115-M
Ackert, Robert	G-065-M
Ackiss, Sheridan	G-058-M
Adams, Byron	C-507-M
Aguilar Clapés-Sagañoles, Virginia	B-031-M
Ahmed, Zeeshan	A-149-S
Ainley, David	B-031-M
Alcantar, Raul	Y-610-E
Allen, Elizabeth	B-199-M
Amsler, Charles	B-236-L
Amsler, Margaret	B-236-L
Amsler, Margaret	T-913-M
Anandakrishnan, Sridhar	C-444-M
Anandakrishnan, Sridhar	I-155-E
Anderson, Aaron	A-145-M
Anderson, Adam	A-379-S
Anderson, Alissa	B-009-M
Anderson, Jared	G-090-P/S
Andersson, Jonas	C-445-N
Armstrong, Clayton	D-552-M
Arnell, Kirsten	T-299-M/S
Auer, Ralf	A-333-S
Auken, Esben	C-516-M
Avva, Jessica	A-379-S
Axani, Spencer	A-333-S
Ballard, Grant	B-031-M
Barden, Allison	B-199-M

Participant	Science Event Number
Barkats, Denis	A-149-S
Barker, Joel	C-534-M
Barna, Lynette	T-940-M
Barrett, John	C-507-M
Barwick, Steven	A-127-M/S
Bashkirova, Kimberlee	C-019-L/P
Bath, Brian	A-145-M
Battaion, Scott	A-145-M
Bay, Ryan	A-333-S
Bayou, Nicolas	T-295-M
Beange, Alexander	A-145-M
Bender, Amy	A-379-S
Bendfelt, Timothy	A-333-S
Benson, Bradford	A-379-S
Bergstrom, Anna	C-504-M
Berland, Grant	A-130-M
Bernard, Kim	B-459-L/P
Bernhoff, Hans	A-127-M/S
Besson, Dave	A-107-S
Blom, Lukas	T-396-M
Blot, Summer	A-333-S
Boeckmann, Grant	I-160-M
Boehme, Lars	C-445-N
Booth, John	O-257-M/S
Borges, Schuyler	B-235-M
Bose, Richard	A-115-M
Bose, Richard	A-142-M
Braddock, Scott	C-443-N
Brandes, Henry	C-506-M
Branning, Kylee	A-343-M/S
Braun, Dana	A-115-M
Braun, Dana	A-142-M
Brazier, Laura	X-591-E

Participant	Science Event Number
Breeding, Garrison	A-145-M
Bristow, William	A-369-M/S
Brown, Renee	C-509-M
Brunt, Kelly	X-594-M/S
Bryson, Frances	B-041-M
Burch, Hunter	A-111-M/P/S
Burnett, Justin	C-534-M
Burrill, Christine	G-066-M
Buurman, Helena	T-396-M
Byrd, Don	T-396-M
Cade, David	B-206-L
Campbell, Seth	G-065-M
Campbell, Seth	T-943-M
Campbell, Tim	C-534-M
Carlstrom, John	A-379-S
Catchen, Julian	B-211-M
Cawley, Kaelin	B-320-M
Chartier, Alex	A-100-M/S
Cheng-DeVries, Chi-Hing	B-211-M
Chiuchiolo, Amy	C-505-M
Christianson, Knut	I-175-M/S
Christner, Brent	C-534-M
Chu, Xinzhao	A-123-M
Cimino, Megan	C-013-L/P
Clark, Bruce	M-ATS-S
Clark, Rachel	C-447-N
Cloutier, Michael	T-434-M
Cohen, Matthew	C-504-M
Collins, William	C-534-M
Conrad, Hailey	C-019-L/P
Conroy, John	C-020-L/P
Conway, Howard	I-193-M/S
Cooper, Dewell	A-145-M

Participant	Science Event Number
Cope, Joseph	C-020-L/P
Coppi, Gabriele	A-147-M
Cornelison, James	A-149-S
Cotten, Rex	T-927-M
Courville, Zoe	T-940-M
Courville, Zoe	T-943-M
Cox, Jennifer	T-927-M
Crawford, Thomas	A-379-S
Crocker, Daniel	B-232-L
Crosier, Edward	I-160-M
Cross, Julian	B-320-M
Cukierman, Ariel	A-149-S
Culler, Lauren	Y-610-E
Cunningham, Kaitlin	B-009-M
Cutter, George	B-006-L
Cziko, Paul	B-195-M
D'Ewart, John	A-149-S
Daeschler, Edward	G-071-M
Darling, Joshua	C-509-M
Dasarathy, Srishti	C-045-L/P
Davis, Christina	C-534-M
Dawson, Hannah	B-234-P
de la Pena, Santiago	D-553-S
De Luna, Juan	A-145-M
Dean, Cynthia	C-534-M
Devlin, Mark	A-147-M
Devlin, Shawn	C-508-M
DeVoe, Jesse	B-009-M
DeVries, Arthur	B-195-M
Dichek, Daniel	B-041-M
Dickerson, Kevin	C-507-M
Dierickx, Marion	A-149-S
Disterhoft, Patrick	O-264-P

Participant	Science Event Number
Dober, Bradley	A-147-M
Dobrica, Elena	G-058-M
Doran, Peter	C-516-M
Dore, John	C-534-M
Dugger, Katie	B-031-M
Dujmovic, Hrvoje	A-333-S
Duling, Dennis	T-524-M
Dunbar, Nelia	G-065-M
DuVernois, Michael	A-333-S
Dziak, Robert	G-437-E
Eberhardt, Benjamin	A-333-S
Edgar, Sofia	Y-610-E
Edwards, Thomas	A-106-M/S
Elliott, John	A-343-M/S
Elrod, Megan	B-031-M
Eppes, Martha	G-055-M
Etheridge, David	I-160-M
Filip, Forbes	O-283-M/S
Fink, Zachary	Y-601-M
Fissel, Laura	A-147-M
Fitzsimmons, Sean	A-142-M
Flexas, Mar	O-124-N
Foga, Steven	T-434-M
Foged, Nikolaj	C-516-M
Foster, Allen	A-379-S
Fox, Adam	X-591-E
Fox, Larry	A-145-M
Fraser, Donna	C-013-L/P
Fraser, William	C-013-L/P
Frazier, Amanda	B-207-M
Frazier, Curtis	A-145-M
Friedlaender, Ari	B-206-L
Friedlander, Cherisa	O-257-M/S

Participant	Science Event Number
Friedman, Elizabeth	A-107-S
Frisch, Josef	A-149-S
Fudge, Tyler	I-175-M/S
Funk, Raymond	T-927-M
Gadson, Thomas	A-115-M
Gagnon, Alan	C-534-M
Galitzki, Nicholas	A-147-M
Galloway, Aaron	B-236-L
Gambrel, Anne	A-379-S
Garcia, Christopher	G-412-L
Gardner, Alan	G-437-E
Gardner, Christopher	C-534-M
Gast, Rebecca	B-303-L
Geraghty, Ian	A-123-M
Gernant, Cameron	G-412-L
Gerrard, Andrew	A-111-M/P/S
Gerrard, Andrew	A-112-M/S
Gibson, Dar	T-524-M
Giertz, Simone	Y-601-M
Goebel, Michael	B-232-L
Goebel, Michael	X-591-E
Goldbogen, Jeremy	B-206-L
Gooseff, Michael	C-504-M
Gordon, Samuel	A-147-M
Graham, Alastair	C-447-N
Greeley, Adam	X-594-M/S
Gregg, Gerald	A-145-M
Griffin, Natasha	C-507-M
Grombacher, Denys	C-516-M
Gu, Shuai	C-045-L/P
Guns, Sam	A-379-S
Gustafson, Chloe	I-353-M
Hadley, Scott	A-145-M

Participant	Science Event Number
Hall, Brenda	I-196-M
Hall, Michelle	A-333-S
Hamby, Frances	Y-610-E
Hamilton, Andrew	A-145-M
Harris, Carolynn	C-505-M
Harris, Heather	B-030-M
Harwood, David	C-534-M
Hays, Jack	A-145-M
Heatwole, Scott	A-115-M
Hedin, Matthew	C-507-M
Heindel, Ruth	C-506-M
Heine, John	T-913-M
Heiser, Sabrina	B-236-L
Helmericks, Jay	T-396-M
Henderson, Randall	A-145-M
Hennig, Andrew	O-131-N
Herried, Bradley	T-434-M
Hobbs, Tiegan	B-041-M
Hoch, Garrett	T-942-S
Hoch, Garrett	T-943-M
Hocking, Wayne	A-382-P
Hogan Pires de Matos, Kelly	C-447-N
Hogg, Derek	A-145-M
Holm, Henry	B-032-L
Holschuh, Nicholas	I-175-M/S
Hosticka, Bouvard	T-998-P
Huang, Nicholas	A-379-S
Hughes, Kaeli	A-340-S
Hungate, Bruce	B-086-P
Hynek, Brian	G-058-M
Iken, Katrin	B-236-L
Iles, David	B-243-M
Jeffer, Gilbert	A-111-M/P/S

Participant	Science Event Number
Jeffer, Gilbert	A-112-M/S
Jeffrey, Wade	B-303-L
Jensen, Lars	C-516-M
Johnson, Arlo	A-145-M
Johnson, Jay	D-552-M
Johnston, David	B-206-L
Jones, David	G-090-P/S
Jones, Joseph	A-145-M
Jørgensen, Jan	C-516-M
Kaip, Galen	C-446-M
Kaiser, Benjamin	O-257-M/S
Kaiser, Henry	B-195-M
Kalin, Jonas	T-524-M
Kalra, Isha	C-508-M
Kambarn, William	T-927-M
Kanatous, Shane	B-232-L
Kane, Timothy	G-437-E
Karam, Salar	C-445-N
Karkare, Kirit	A-149-S
Karner, James	G-058-M
Karplus, Marianne	C-446-M
Kasic, Kathryn	C-534-M
Kelleher, Cole	T-434-M
Key, Kerry	I-353-M
Khandelwal, Rishabh	A-107-S
Kienle, Sarah	B-232-L
Kim, Junhan	A-379-S
Kirkham, James	C-447-N
Kislat, Fabian	A-115-M
Klein, Andrew	B-236-L
Klug, Bryant	A-369-M/S
Koppers, Antonius	G-116-N
Korman, Milo	A-379-S

Participant	Science Event Number
Kovac, John	A-149-S
Kovacs, Attila	A-149-S
Krause, Douglas	X-591-E
Kravchenko, Ilya	A-107-S
Krawczynski, Henric	A-115-M
Kromer, Edward	G-090-P/S
Krula, Edwin	T-524-M
Kubik, Donna	A-379-S
Kuhl, Tanner	I-160-M
Kulesa, Craig	A-364-M/S
Kvasager, Tyrel	G-078-M
Kyle, Philip	G-066-M
Labrousse, Sara	B-243-M
Lamp, Jennifer	G-055-M
Landolt, Scott	O-456-M
Larsen, Greg	C-024-L/P
Larter, Robert	C-447-N
LaRue, Michelle	B-243-M
Lawrence, Jade	C-506-M
Lawrence, Justin	B-041-M
Lescroel, Amelie	B-031-M
Leventer, Amy	C-534-M
Lever, James	O-399-S
Li, Wei	C-534-M
Li, Zimu	A-130-M
Lilien, David	I-193-M/S
Lingutla, Narendra Naidu	T-299-M/S
Link, William	B-009-M
Little, Owen	D-552-M
Liwanag, Heather	B-030-M
Long, John	G-071-M
Lourie, Nathan	A-147-M
Loveland, Frank	Y-610-E

Participant	Science Event Number
Lowe, Alex	B-236-L
Lowe, Ian	A-147-M
Lowitz, Amy	A-379-S
Lulak, Martin	C-505-M
Lyu, Lu	A-333-S
Macdonald, Kaitlin	B-009-M
Mallot, Ann Kathrin	A-333-S
Malmquist, Samuel	C-020-L/P
Maloof, Adam	G-071-M
Manahan, Naomi	C-045-L/P
Manigo, Leroy	A-145-M
Marino, John	A-284-M
Marrone, Daniel	A-379-S
Marsh, Justin	A-145-M
Masters, Otto	A-145-M
Mattas, Laura	I-196-M
Mauskopf, Phillip	A-147-M
Mazur, Aleksandra	C-445-N
McCarthy, Forrest	G-071-M
McClure, James	C-511-M
McComas, Jeremy	G-065-M
McDaniel, Scott	A-145-M
McDonald, Randall	A-145-M
McIntosh, William	G-065-M
McKnight, Diane	C-509-M
McMillen, Kelly	B-086-P
Meister, Konrad	B-195-M
Meister, Matthew	B-041-M
Melville, Robert	A-111-M/P/S
Melville, Robert	A-112-M/S
Michaud, Alexander	C-534-M
Miege, Clement	I-344-E
Mikolajczyk, David	O-283-M/S

Participant	Science Event Number
Mikucki, Jill	C-516-M
Miles, Maraina	I-196-M
Millan, Robyn	A-145-M
Miller, Julie	I-344-E
Miller, Scott	A-145-M
Minzoni, Rebecca	C-447-N
Mironov, Anatoly	T-524-M
Mitchell, Andrew	G-071-M
Modest, Michelle	C-024-L/P
Montgomery, Joshua	A-379-S
Moore, Zbigniew	A-145-M
Mullen, Andrew	B-041-M
Mullin, Matthew	A-145-M
Munger, Lisa	B-195-M
Munro, David	O-214-L
Myers, Krista	C-511-M
Myers, Madeline	C-511-M
Nadolski, Andrew	A-379-S
Nardelli, Schuyler	C-019-L/P
Naslund, Andrew	B-207-M
Nati, Federico	A-147-M
Natoli, Tyler	A-379-S
Nayak, Michael	A-368-S
Neff, Peter	I-160-M
Newberger, Timothy	O-214-L
Nichols, Ross	C-024-L/P
Niebuhr, Spencer	T-295-M
Nikolaus, Kevin	T-299-M/S
Nitsche, Frank-Oliver	C-447-N
Novak, Giles	A-147-M
Nylen, Thomas	T-295-M
Oberla, Eric	A-340-S
Obrien, Joseph	T-927-M

Participant	Science Event Number
Oelerich, Ria	O-124-N
Okajima, Takashi	A-115-M
Padin, Stephen	A-379-S
Palladino, Steven	A-149-S
Pallin, Logan	C-024-L/P
Palo, Scott	A-284-M
Pan, Yue	A-107-S
Parmelee, David	G-066-M
Patterson, Molly	C-534-M
Pauldine, Andrew	G-078-M
Pautet, Pierre-Dominique	A-119-M/P/S
Pearson, Linnea	B-030-M
Penn, Michael	O-283-M/S
Pennycook, Jean	B-031-M
Penzkover, Kathryn	C-508-M
Pernic, David	A-379-S
Persichilli, Christopher	A-127-M/S
Petch, Shane	B-009-M
Peterson, Zachary	A-115-M
Petrenko, Vasilii	I-160-M
Pettit, Joseph	T-295-M
Phelps, Jacob	G-078-M
Pike, Alyssa	C-507-M
Place, Sean	B-199-M
Polish, Nathaniel	B-031-M
Pollmann, Anna	A-333-S
Pomraning, Dale	T-396-M
Porazinska, Dorota	B-320-M
Pouncy, Andrew	G-078-M
Power, Sarah	C-507-M
Powers, Thomas	C-507-M
Priscu, John	C-534-M
Purcell, Alicia	B-086-P

Participant	Science Event Number
Queste, Bastien	C-445-N
Rahlin, Alexandra	A-379-S
Ramey, Charles	B-041-M
Rauch, Brian	A-142-M
Reiss, Christian	B-006-L
Reynaga, Andrew	X-591-E
Richard, Jacob	A-145-M
Richard, Mitchell	A-145-M
Richards, Raymond	G-078-M
Rigaud, Christopher	T-913-M
Riverman, Kiya	C-444-M
Roberts, Darren	C-013-L/P
Roberts, Graham	T-524-M
Roberts, Megan	C-013-L/P
Roberts, Mike	C-446-M
Robinson, Corey	G-071-M
Robinson, David	C-505-M
Roche, Lauren	G-437-E
Rogers, Timothy	C-516-M
Rolandsson, Rolf	C-445-N
Romualdez, Javier	A-147-M
Rose, Mel	A-379-S
Rosenheim, Brad	C-534-M
Ross, Ronald	B-031-M
Rotella, Jay	B-009-M
Roth, Aurora	T-299-M/S
Rougeux, Brian	G-058-M
Ruan, Xiaozhou	O-124-N
Ruff, Johanna	C-045-L/P
Rundell, Susan	B-234-P
Rush, Elizabeth	W-481-N
Sacks, Joshua	C-020-L/P
Sakai, Kenichi	A-142-M

Participant	Science Event Number
Saks, Caitlin	Y-601-M
Salas, Leonardo	B-243-M
Salvatore, Mark	B-235-M
Salzano, Michelle	A-111-M/P/S
Sanders, Robert	B-303-L
Sandoval, Samuel	G-090-P/S
Sandstrom, Perry	A-333-S
Sasaki, Makoto	A-142-M
Scambos, Theodore	I-344-E
Scarano, Caitlin	W-482-M
Schaefer, Anne	C-013-L/P
Schaufel, Merlin	A-333-S
Schmidt, Anne	B-031-M
Schmidt, Britney	B-041-M
Schofield, Samantha	C-019-L/P
Scholar, Paul	G-058-M
Schram, Julie	B-236-L
Schrange, Kharis	B-032-L
Schubert, Ryan	O-124-N
Schulze, Lena	O-124-N
Schutt, John	G-058-M
Schwab, Bennet	A-284-M
Schwarz, Robert	A-149-S
Scott, David	O-124-N
Seefeldt, Mark	O-456-M
Seifert, Meghan	C-533-M
Senden, Tim	G-071-M
Seunarine, Surujhdeo	A-118-S
Sheehan, Peter	C-445-N
Shemet, Sabrina	O-257-M/S
Shepard, Alec	A-333-S
Sheridan, Patrick	O-257-M/S
Sherwell, Shasten	C-508-M

Participant	Science Event Number
Shubin, Neil	G-071-M
Siegfried, Matthew	C-533-M
Simburger, Garry	A-115-M
Simburger, Garry	A-142-M
Simmering, Arianna	B-303-L
Simms, Alexander	G-412-L
Simons, Elizabeth	O-124-N
Sinclair, Adrian	A-147-M
Singley, Joel	C-504-M
Sinkola, Nikolas	T-927-M
Sirovic, Ana	B-229-E
Skidmore, Mark	C-534-M
Slesinger, Emily	C-019-L/P
Smith, Andrew	I-160-M
Smith, Richard	I-160-M
Sobrin, Joshua	A-379-S
Solon, Adam	B-320-M
Sommers, Pacifica	B-320-M
Soule, Dax	G-437-E
Speer, Kevin	O-124-N
Spoth, Meghan	C-443-N
St Germaine, Michael	A-149-S
Stafford, Kathleen	B-229-E
Stanish, Lee	B-235-M
Stedt, Filip	C-445-N
Steig, Eric	I-175-M/S
Steinberg, Deborah	C-020-L/P
Steinke, Kirsten	B-459-L/P
Stelling, Jonathan	G-094-P
Stelly, Robert	A-145-M
Stephen, Judith	A-379-S
Stevens, Christopher	I-193-M/S
Stillinger, Andrew	A-111-M/P/S

Participant	Science Event Number
Stillinger, Andrew	A-112-M/S
Stone, Michael	C-511-M
Stone, Robert	G-078-M
Stoner, Katelyn	B-031-M
Stroud, Rhonda	O-399-S
Stuchlik, David	A-115-M
Sullivan, David	A-145-M
Swanger, Kate	G-055-M
Sweeney, Colm	O-214-L
Takahashi, Hiromitsu	A-115-M
Tarrant, Ann	B-258-L
Taylor, James	B-206-L
Taylor, Michael	A-119-M/P/S
Tercero, Anthony	B-199-M
Thamatrakoln, Kimberlee	C-019-L/P
Theilen, Brittany	G-412-L
Thibodeau, Patricia	C-020-L/P
Thomas, Gregory	M-ATS-S
Thompson, Andrew	O-124-N
Thornton, David	I-160-M
Todgham, Anne	B-207-M
Tranter, Martyn	C-534-M
Traylor, Shawnee	C-045-L/P
Treibergs, Lija	C-506-M
Trinh, Rebecca	C-045-L/P
Trumble, Stephen	B-232-L
Tulaczyk, Slawomir	C-516-M
Turner, Alasdair	G-066-M
Turner, Weston	B-195-M
Valkonen, Elina	O-283-M/S
van Gestel, Natasja	B-086-P
Van Mooy, Benjamin	B-032-L
Van Winkle, Daniel	A-149-S

Participant	Science Event Number
Varsani, Arvind	B-031-M
Vecchiarelli, Anthony	D-552-M
Venturelli, Ryan	C-534-M
Vick-Majors, Trista	C-534-M
Villalobos, Victor	B-009-M
Villasana, Cesar	A-145-M
Vimercati, Lara	B-320-M
Voisinet, Melissa	B-030-M
Waahlin, Anna	C-445-N
Waite, Nicole	C-019-L/P
Walden, Stephanie	X-591-E
Waldman, Ariel	W-220-M
Wallin, Bruce	I-344-E
Wallstrom, Erica	Y-610-E
Walter, Jacob	C-446-M
Walther, Tessa	I-196-M
Ward, Bridget	B-030-M
Waters, April	W-219-P
Weber, Corey	A-145-M
Weitzner, Emma	B-030-M
Welch, Kathleen	C-506-M
Welhouse, Lee	O-283-M/S
Welzenbach, Linda	C-447-N
Wendell, Edward	T-927-M
West, Leigh	C-020-L/P
Wheeler, Christopher	M-SFA-M
Whippo, Ross	B-236-L
Whoriskey, Sophie	B-030-M
Wilcock, William	G-437-E
Williams, Danny	A-145-M
Williams, Keith	T-295-M
Williams, Paul	A-147-M
Willis, Macgregor	B-211-M

Participant	Science Event Number
Winans, John	C-534-M
Winkelman, Andrew	T-396-M
Wolter, Sonja	O-214-L
Woodward, Robert	T-299-M/S
Wooten, Curtis	A-145-M
Xu, Zhonghua	A-106-M/S
Yates, Florence	C-013-L/P
Young, Edward	A-149-S
Young, Jodi	B-234-P
Young, Matthew	A-379-S
Yu, Cyndia	A-149-S
Yu, Zicheng	G-094-P
Zahn, Marie	C-019-L/P
Zaino, Anne	T-295-M
Zeit, Grace	A-118-S
Zheng, Yixi	C-445-N
Zierke, Simon	A-127-M/S
Zillig, Kenneth	B-207-M
Zimmerer, Matthew	G-065-M
Zook, Robert	C-534-M