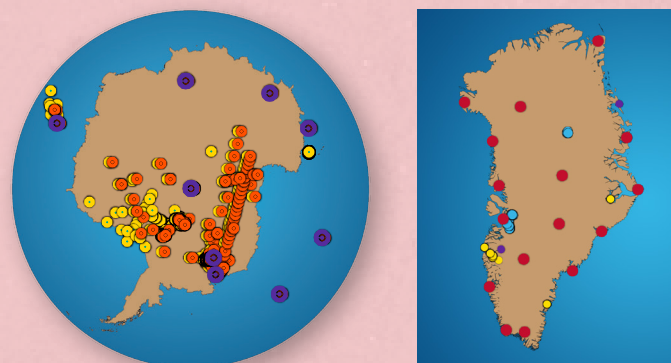


## Polar Support Services

Polar Support Services provides polar-specific engineering support for experiments in Antarctica and the Arctic, maintains and updates a specialized pool of cold-rated equipment and supports field operations in the high-latitude, cold regions of the Earth. This engineering support along with advances in technology has greatly improved data quality and return from these extremely remote and logistically expensive polar regions, optimizing experiment costs and greatly improving the scientific return for seismologist and glaciologist alike. NSF/OPP/AES supports base level engineering efforts through additions to the polar pool equipment, cold-chamber and testing facilities and engineering personnel support. In addition, IRIS also installed and now operates the Greenland Ice Sheet Monitoring Network (GLISN MRI).

### Polar Network Science Committee

Carol RAYMOND (Chair)	UNAVCO - Jet Propulsion Lab
Andy NYBLADE (Vice Chair)	Pennsylvania State Univ. (IRIS)
Jason AMUNSON	Univ. of Alaska, Southeast (IRIS)
Samantha HANSEN	Univ. of Alabama (IRIS)
Erik IVINS	Jet Propulsion Lab (UNAVCO)
Matt LAZZARA	Univ. of Wisconsin, Madison (UNAVCO)
Meredith NETTLES	Lamont-Doherty (Columbia Univ.) (IRIS)
Leigh STERNS	Univ. of Kansas (UNAVCO)
Kent ANDERSON (obs)	GSN (IRIS)
James GRIDLEY (obs)	PASSCAL (IRIS)
Paul CARPENTER (obs)	PSS (IRIS)
Joe PETTIT (obs)	Polar (UNAVCO)
Seth WHITE (obs)	Polar (UNAVCO)



Antarctica: (purple) GSN stations, (yellow) Portable stations, (orange) other stations with data managed by the DMS. Greenland: (red) GLISN stations, (purple) GSN stations, (blue) Portable stations, (yellow) other stations with data managed by the DMS.

### Experiments Supported 2012

Antarctica (2011-2012)	11
Arctic	6
Instrument Inventory	
Broadband Sensors	75
Intermediate Period Sensors	7
Data Acquisition Systems	51
Hydrophones	1
Snow Streamer Channels	84
Gimbaled 20 Hz Streamer Geophones	62
Summer-Only Quick Deploy Boxes	108
Xeos Iridium Modems	74

## Transportable Array

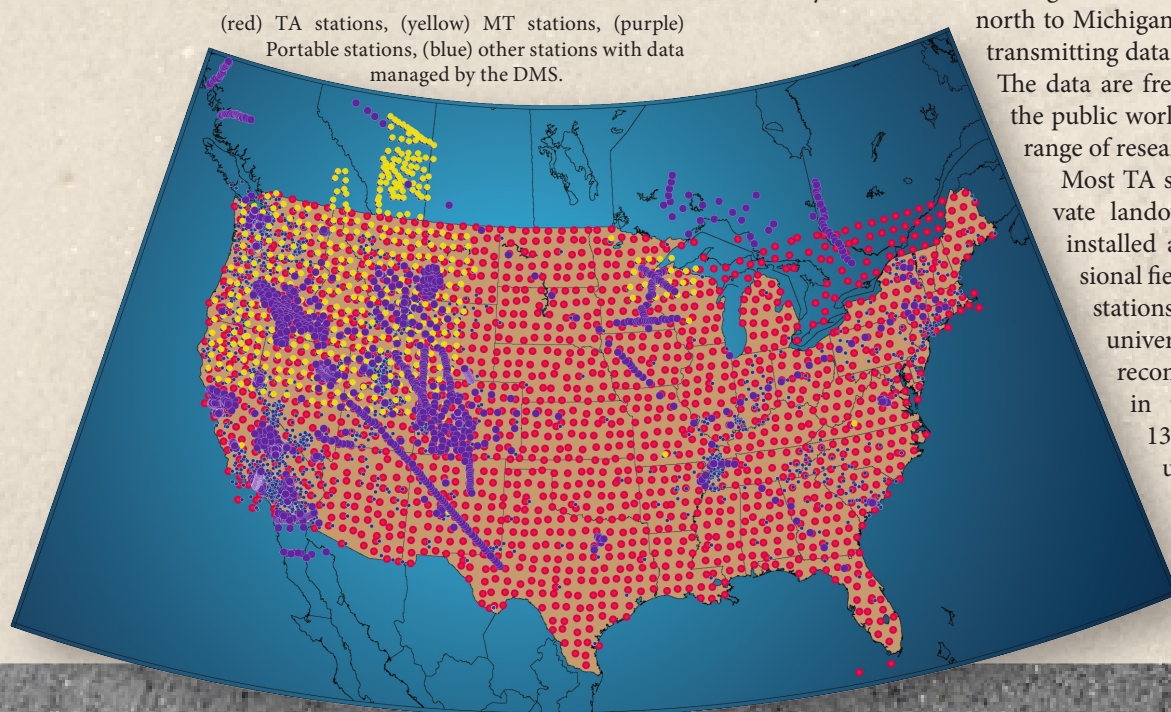
### USArray Advisory Committee

Anne MELTZER (Chair)	Lehigh Univ.
Doug CHRISTENSEN	Univ. of Alaska, Fairbanks
Roger HANSEN	Univ. of Alaska, Fairbanks
Karl KARLSTROM	Univ. of New Mexico
Vadim LEVIN	Rutgers Univ.
Maureen LONG	Yale Univ.
Nick SCHMERR	NASA Goddard Space Flight Center
Donna SHILLINGTON	Columbia Univ./LDEO
David SNYDER	Geological Survey of Canada
Chester WEISS	Virginia Tech
Harley BENZ (ex officio) non-voting	US Geological Survey
Bob WOODWARD	IRIS-USArray Director

### Stations November 19:

Commissioned	1498
Removed	980
Operating	518

The Transportable Array (TA) element of the EarthScope USArray project is a grid of seismic sensors that are "rolling" eastward across the U.S. over a ten-year period. The stations of the TA are located on a grid, with 70 km (~45 mile) spacing between sites. Each sensor resides at a single location for about two years and then is re-located to another site along the leading (eastern) edge of the rolling array. The easternmost edge of the array now extends from Florida



north to Michigan. Every station operates 24x7, transmitting data continuously via the internet. The data are freely available to scientists and the public worldwide and are used in a wide range of research and outreach activities.

Most TA station sites are hosted by private landowners, and are constructed, installed and later removed by professional field crews at the rate of about 18 stations each month. Students from universities performed virtually all reconnaissance for TA station sites in their region. Approximately 135 students from more than 50 universities participated in site reconnaissance efforts.

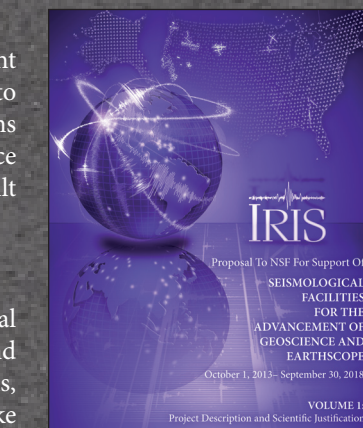
## Consortium Developments

### The Next 25 Years

The IRIS Workshop, June 2012 in Boise, ID, brought together seismologists and other Earth scientists to explore facilitating research in the future, as IRIS programs have since 1984. Plenary session topics including Science Drivers, New Challenges, and New Technology built towards consensus on 21st Century services.

### One in Four

The NSF's proposed budget for FY 2013 included initial funding for a five-year, \$15 million project to extend operation of as many as 200 Transportable Array stations, with the objective of better characterizing earthquake hazard in the eastern United States.



### IRIS Board Directors

Brian STUMP (Chair)	Southern Methodist University
Matt FOUCH (Vice-Chair)	Carnegie Institution of Washington
Susan BILEK	New Mexico Tech
Emily BRODSKY	Univ. of California, Santa Cruz
Paul DAVIS	Univ. of California, Los Angeles
John HOLE	Virginia Tech
Jeroen RITSEMA	Univ. of Michigan
Jeroen TROMP	Princeton University
Doug WIENS	Washington Univ. St. Louis

### Major Proposal

The IRIS Board of Directors led development of a proposal to NSF for operation during 2013 - 2018 of "Seismological Facilities for the Advancement of Geoscience and EarthScope". Based on broad community input, the proposed work includes merged management of the Global Seismographic Network, Transportable Array, Portable Instrumentation, Data Services, Polar Services, Education and Public Outreach, and International Development Seismology.

## International Development Seismology

Through pan-IRIS coordination of programmatic resources, International Development Seismology (IDS) works on developing and engaging international partners who can lead and support the global societal impact of the science of seismology particularly in developing countries or regions. Recent technological advances have greatly enhanced seismologists' ability to address questions requiring large-scale, high-precision observations that were not possible even just a few years ago. Given this reduction in technical constraints, two factors now limit accelerated scientific progress in developing countries: (1) the number of scientists, engineers, and technicians able to participate in seismology projects, and (2) the availability of financial resources to sustain large-scale international projects. IRIS' commitment to facilitate seismological research includes developing partnerships to support the development of international cadres of scientific collaborators, particularly in regions with high seismic risk, or where the use of seismological techniques can lead to the discovery of natural resources with important social and economic impact.

Participants from the "Pan-American Advanced Studies Institute on New Frontiers in Seismological Research" last July (2011). The Institute engaged graduate students, post-doctoral students, and new faculty from across the Americas in an interactive collaborative learning environment.



### IDS Committee

Susan BECK (Chair)	Univ. of Arizona
Sergio BARRIENTOS	Univ. de Chile
Noel BARSTOW	PASSCAL Instrument Center
Anne MELTZER	Lehigh Univ.
Michael PASYANOS	Lawrence Livermore National Laboratory
Wayne PENNINGTON	Michigan Technological Univ.
Jay PULLIAM	Baylor Univ.
Ray RUSSO	Univ. of Florida
Eric SANDVOL	Univ. of Missouri
Niyazi TÜRKELLI	Bosphorus University, Kandilli-Turkey
Harley BENZ	US Geological Survey
Olga CABELLO	IRIS - Director of Int'l Development Seismology

### Advanced Studies Institute on Earthquake Location, Bangkok, Thailand, January 14-17, 2012

Individual participants	18
Countries represented	12

### Geophysical Hazards and Plate Boundary Processes in Central America, Mexico and the Caribbean, October 2010, Costa Rica

Individual participants	81
Countries represented	21

### Pan-American Advanced Studies Institute on New Frontiers in Seismological Research, July 2011, Quito, Ecuador

Individual participants	33
Countries represented	10
Faculty	15

## Magnetotellurics

### Magnetotelluric Systems

Backbone operating	7
Transportable sites occupied	396



A member of the MT field crew installs a campaign instrument this summer in Illinois.

The Magnetotelluric (MT) component of the EarthScope USArray project has been making continuous observations at seven permanent MT observatories that span the U.S. as well as at temporary sites. MT observations exploit the natural variations in the Earth's magnetic field caused by solar activity and lightning, which induce subsurface electrical currents. Observations of these electric currents provide data that complement seismological observations, as they are sensitive to different properties of the Earth.

The temporary MT measurements are made at 70-km intervals (much like the seismic Transportable Array). The instruments are deployed and operated by a combination of professional crews and students. After deployment, the instruments record autonomously for about three weeks at each site to establish a good measurement. Approximately 400 sites in the Pacific Northwest and mid-continent have been surveyed with MT instruments since 2006.

The USArray MT measurements have already provided an unprecedented view of the Earth's structure beneath Yellowstone, the Snake River Plain, and the Pacific Northwest. Data from the current deployments in the midcontinent show structure associated with the continent attempting to rift apart in the distant past.

## Education and Public Outreach

The Education and Public Outreach program is committed to advancing awareness and understanding of seismology and geophysics while inspiring careers in Earth science. The program draws upon the seismological expertise of IRIS Consortium members and combines it with the educational and outreach expertise of EPO staff to create engaging products and activities.

These products and activities are designed to impact 6th grade students to adults in a variety of settings, ranging from self-directed exploration over the Web, to an interactive museum exhibit, a major public lecture, or in-depth exploration of the Earth's interior in a formal classroom.

This summer marks the 15<sup>th</sup> year that a carefully selected group of undergraduates has

spent their summer conducting research under the expert guidance of IRIS consortium members and affiliates throughout the US and the world. This year 15 students conducted research at 12 different institutions, and a total of 126 students and 47 institutions have participated since 1998. Other highlights of the year have included the widely distributed Teachable Moment slide sets that are produced for use in college and school classrooms within a day of major earthquakes, new animations and videos, new content for the Active Earth Monitor, and expanded use of social media. EPO was also active in the USA Science and Engineering Festival in April, which drew 200,000 participants to the Washington, DC convention center during the 3-day event.



Intern Rachel Petit takes her turn using the hammer seismograph during the 2012 intern orientation at New Mexico Tech.

### Standing Committee

Glenn KROEGER (Chair)	Trinity University
Luciana ASTIZ	Univ. of California, San Diego
Maggie BENOIT	College of New Jersey
Elizabeth COCHRAN	USGS
Anna COURTIER	James Madison Univ.
Kaz FUJITA	Michigan State Univ.
Juan LORENZO	Louisiana State Univ.
Suzan VAN DER LEE	Northwestern Univ.
David VOORHEES	Waubesaunee Community College
Donna CHARLEVOIX (ex officio)	UNAVCO
Steve SEMKEN (ex officio)	Arizona State Univ. (EarthScope)
John TABER	IRIS-Program Manager

### EPO this Year

Minority Recruitment Lectures for Internship Program	7
IRIS/SSA Distinguished Lectures	9
Undergraduate summer research interns	15
Teachable Moment slide sets or information pages	13
Teachers and college faculty attending IRIS-run workshops	175
Active Earth Monitor Display accounts	150
IRIS Web site visits, unique monthly visitors	5,500,000
Visitors to museums with IRIS/USGS displays	13,000,000

## Portable Seismology

IRIS facilitates portable array seismology worldwide for diverse scientific and educational communities with end-to-end experiment support services, state-of-the-art portable seismic instrumentation, and advanced field and database management tools. Over its history, PASSCAL has supported deployment of over 900 experiments to image plate boundaries, cratons, orogenic systems, rifts, faults, and magmatic systems. By integrating planning, logistical, instrumentation and engineering services and supporting the efforts with full-time professional staff, IRIS has enabled seismologists to mount large-scale experiments throughout the U.S. and around the globe.

The access to professionally supported state-of-the-art equipment and archived, standardized, open data has revolutionized the way that geophysical research is conducted. IRIS influences international academic seismology by providing instrumentation to spur or augment collaborations and by pioneering standards and facilities that have been adopted by organizations worldwide.



Student deploying a portable seismic recording system in Wyoming.

### Standing Committee

Seth MORAN (Chair)	USGS, Cascadia Volcano Observatory
Cynthia EBINGER	Univ. of Rochester
Ted CLARKE	Exxon-Mobil
Katie KERANEN	Univ. of Oklahoma
Jesse LAWRENCE	Stanford Univ.
Lee LIBERTY	Boise State Univ.
Meghan S. MILLER	Univ. of Southern California
Shad O'NEEL	USGS, Alaska Science Center
Michael WEST	Univ. of Alaska, Fairbanks
Andy NYBLADE (ex officio)	Penn State Univ.
Rick ASTER (obs)	New Mexico Tech
Bruce BEAUDOIN (obs)	PASSCAL/New Mexico Tech
Steve HARDER (obs)	Univ. of Texas, El Paso
James GRIDLEY	IRIS Program Manager

### Experiments During 2012

<b>Number of Experiments (including USArray Flexible Array)</b>	
New experiments.....	64
Ongoing experiments.....	55

### Data Logger Inventory

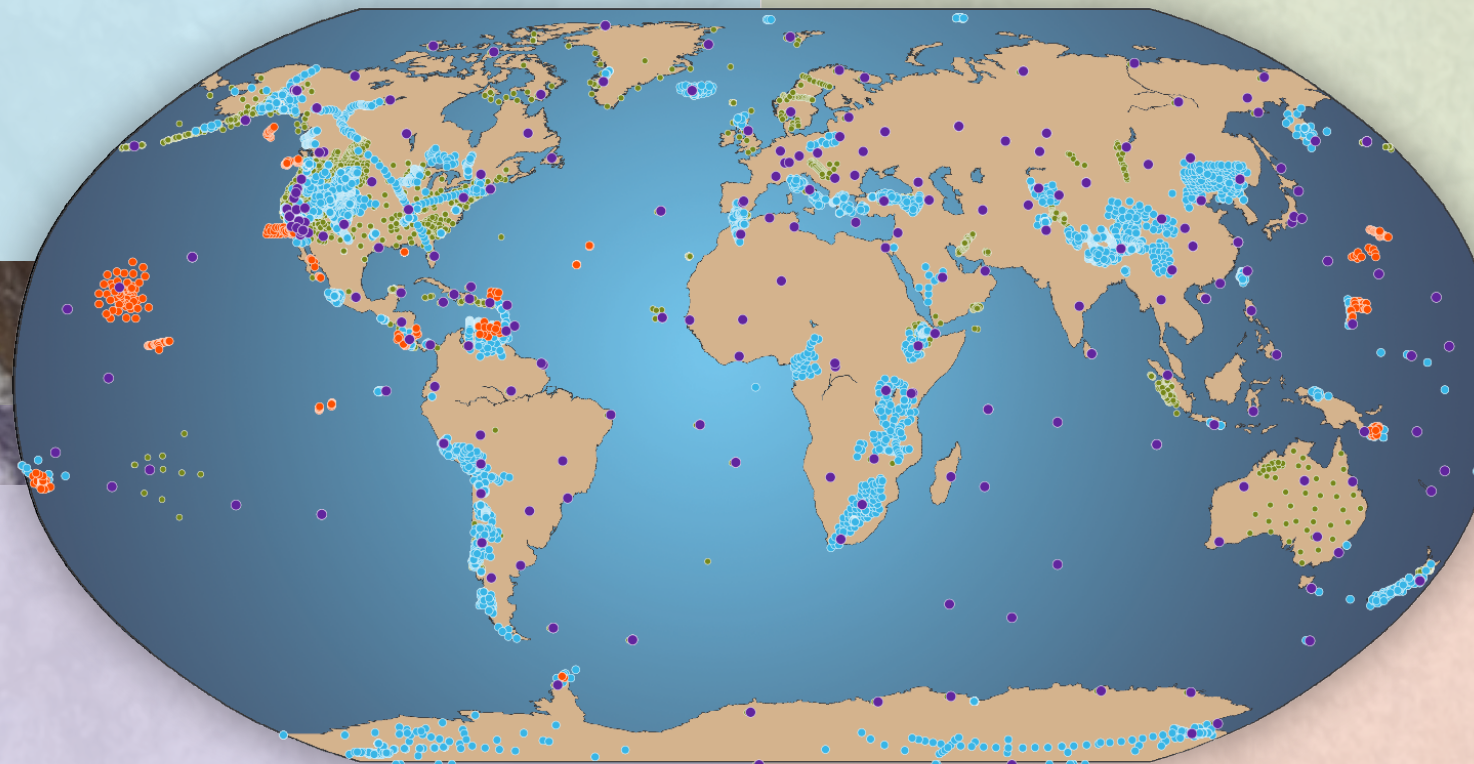
Three-channel data loggers.....	1292
"Texans" (including Univ. of Texas, El Paso).....	2600
Multichannel.....	16

### Sensor Inventory

Broadband.....	981
Intermediate period.....	122
Short period.....	311

### ● PASSCAL & Flexible Array Stations (6620)

### ● Contributed Stations (6600 +)



### ● GSN (153) & FDSN (157) Stations

#### GSN Stations with:

Broadband primary seismometers .....	153
Secondary broadband/HF seismometers .....	125
Strong-motion sensors .....	129
Borehole sensors.....	50
Microbarographs .....	75
Real-time communication .....	149
Next Generation data acquisition systems .....	110
Serving as IMS Auxiliary Stations .....	33

### ● OBSIP Stations (541)

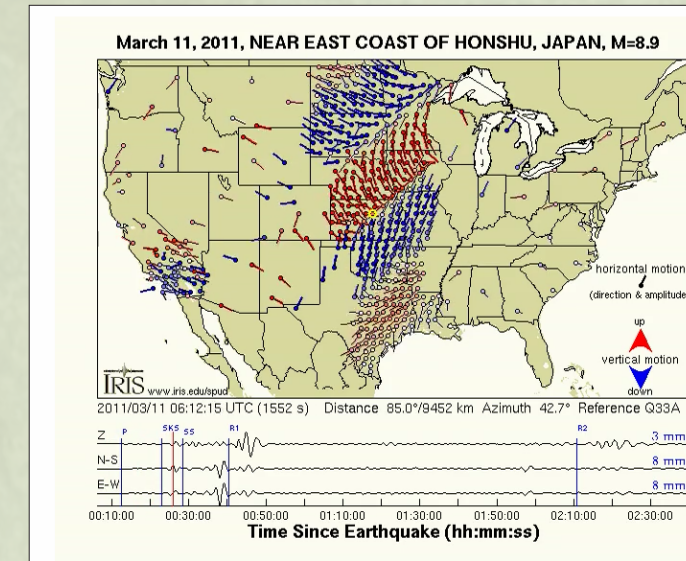
#### Experiments Supported 2012

Worldwide.....	14
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#### Instrument Inventory

Short Period .....	91
Long Period.....	159

## Data Services



The wide range of data products created by the DMS include visualizations of wave propagation across the Transportable Array. Rayleigh waves from the deadly Tohoku-Oki earthquake of March 2011 propagated along a great circle path and then across the Transportable Array from north to south.

The Data Management System is one of the largest scientific archives of globally distributed observational data in the world, with data from more than 150 networks operated by US agencies and partner organizations worldwide. Archiving and management of GSN, PASSCAL, EarthScope, FDSN, Regional Network, and OBSIP data is the core mission. IRIS offers a wide and growing variety of services that Earth scientists rely on worldwide. The distribution of data via web services is increasingly important. During 2011 – 2012 we sent data to scientists in roughly 150 countries.

### Standing Committee

Rick ASTER (Chair)	New Mexico Tech
Mike BRUDZINSKI	Miami Univ. of Ohio
Rengin GOK	Lawrence Livermore National Lab
Keith KOPER	Univ. of Utah
Dan MCNAMARA	USGS, Denver, Colorado
Vera SCHULTE-PELKUM	Univ. of Colorado
Zhigang PENG	Georgia Tech
Dayanthie WEERARATNE	California State Univ., Northridge
Francis WU	State Univ. of New York at Binghamton
Bruce BEAUDOIN (obs)	PASSCAL/NMT
Harold BOLTON (obs)	USGS, Denver, Colorado
Peter DAVIS (obs)	Univ. of California, San Diego
Chad TRABANT	IRIS-DMC
Tim AHERN	IRIS-DMS Program Manager

## Global Seismographic Network

The Global Seismographic Network is a permanent telemetered network of state-of-the-art seismological and geophysical sensors. A forefront source of free and open data for seismological research and Earth science education, the network is also a principal global source of data for earthquake locations, earthquake hazard mitigation, earthquake emergency response, and tsunami warning. Current work is underway to update this 153-station, 25-year-old network to the next generation of acquisition, sensor and infrastructure systems, as well as the implementation of a revamped data quality assurance system to improve data quality and data return. Updated stations have shown remarkably improved quality and optimized operations. The GSN is primarily operated and maintained through the US Geological Survey Albuquerque Seismological Laboratory and the University of California at San Diego IRIS/IDA group, and managed by IRIS. Twenty-two affiliate stations and arrays contribute to the network, including the nine-station USGS Caribbean Network.

### Standing Committee

Charles J. AMMON (chair)	Penn State University
Caroline BEGHEIN	Univ. of California, Los Angeles
Paul EARLE	USGS, NEIC
Michael HEDLIN	Univ. of California, San Diego
Meredith NETTLES	Lamont-Doherty (Columbia Univ.) (IRIS)
Andy NEWMAN	Georgia Tech
Mark PANNING	Univ. of Florida
Gerardo SUAREZ	Instituto de Geofisica, UNAM
Mike THORNE	Univ. of Utah
Bill LEITH (ex officio) voting	USGS, National Center
Shirley BAHER (obs)	AFTAC
Harley BENZ (obs)	USGS, NEIC
Jon BERGER (obs)	Univ. of California, San Diego
Peter DAVIS (obs)	Univ. of California, San Diego
David WILSON (obs)	USGS, Albuquerque
Lind GEE (obs)	USGS, Albuquerque
Charles McCREERY (Chip) (obs)	Pacific Tsunami Warning Center, NOAA
Kent ANDERSON	IRIS-Program Manager



Field engineers from ASL arrive at CASY (Casey Station, Antarctica) to perform an upgrade the GSN station. Travel is via an updated DC-3 on skis called a Basler.

## OBSIP Management Office



Ocean bottom seismometers awaiting deployment in the Marianas Trench.

The Ocean Bottom Seismograph Instrument Pool provides ocean bottom seismometers to support research and further our understanding of marine geology, seismology and geodynamics. Instrumentation includes both broadband systems for long-term deployment of passive experiments, and short period systems that are used for active seismic refraction studies in coordination with vessels towing airgun arrays. IRIS works closely with the University National Oceanographic Laboratory System in scheduling cruises to support experiments. Principal investigators at research universities can request the use of instruments as part of the NSF standard proposal process. Other private and public organizations and industry can also use the instruments upon request, depending upon availability. The program is funded by the National Science Foundation and is comprised of a Management Office and three Institutional Instrument Contributors – Lamont Doherty Earth Observatory, Scripps Institution of Oceanography, and Woods Hole Oceanographic Institution – each of whom contributes both instruments and technical support.

### OBSIP Oversight Committee

Don FORSYTH	Brown Univ.
Harm VAN AVONDONK	Univ. of Texas
Monica KOHLER	California Technical Institute of Technology
David OKAYA	Univ. of Southern California
Anne TREHU	Oregon State Univ.
Doug WIENS	Washington Univ. in St. Louis
William WILCOCK	Univ. of Washington
Brent EVERS	IRIS - Program Manager