

IRIS



at a11 Glances

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CONSORTIUM developments:

New Cooperative Agreement

- ▶ The IRIS 2011-2013 proposal "Facilitating New Discoveries In Seismology and Exploring The Earth: The Next Decade" was successfully reviewed and forms the basis for a new Cooperative Agreement between IRIS and NSF to continue operation of the IRIS core programs. The new agreement runs through September 2013, when a new agreement is anticipated to support the merged operation of the core programs and EarthScope/USArray.

Management Realignment

- ▶ IRIS has integrated the key technical activities of the consortium under three primary elements: Instrumentation Services, Data Services, and Education and Public Outreach. These changes optimize the execution of existing activities, streamline management, and facilitate improved intra- and inter-program interactions.

OBS-IP Management Office

- ▶ NSF selected IRIS to manage the Ocean Bottom Seismic Instrument Pool. IRIS will form an office to manage OBSIP operations and serve as an interface between NSF, the Institutional Instrument Contributors, research principal investigators, the broader OBS research community, and the University-National Oceanographic Laboratory System. An OBSIP Oversight Committee has been formed and a search is underway for a Project Manager.

International Development Seismology



Eighty seven participants representing twenty countries convened for three days in Heredia, Costa Rica to outline priorities and opportunities for seismological capacity development in the Middle America region.

International Development Seismology is an interface between IRIS's NSF-sponsored scientific mission and the Consortium's goal to ensure that scientific progress enables socially important outcomes. While IRIS programs and the scope of IRIS member activities have been international from the earliest days, the Consortium is now committed

developing the partnerships, technical infrastructure, and human capacity required for effective international cooperation, not only as an instrument to accelerate scientific progress through collaboration with technologically equal partners but also as an essential element of U.S. foreign engagement with developing countries. The potential to return greater scientific and societal benefits was widely recognized in responding to the 2004 Sumatra and 2010 Haiti earthquakes. IRIS has built on this potential through training programs, long-term loans of reconditioned instruments, and organizational workshops. These activities promote strategies that simultaneously support fundamental research and contribute to reducing global population vulnerability to seismic hazards through broad education.

IDS committee

Ann MELTZER (Chair)	Leigh University
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Susan BECK	University of Arizona
Karen FISCHER	Brown University
Art LERNER-LAM	Columbia University
Andy NYBLADE	Pennsylvania State University
Eric SANDVOL	University of Missouri-Columbia
Niyazi TÜRKELLI	Bosphorus University, Kandilli-Turkey

Rebuilding for Resilience in Haiti, March 2010, Held in Miami

Individual participants	120
Countries represented	10

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

Individual participants	81
Countries represented	21

Pan American Advanced Studies Institute on New Frontiers in Seismological Research

Individual participants	33
Countries represented	10
Faculty	15

Global Seismographic Network (GSN)



IDA engineer David Chavez adjusts an STS1 seismometer at station JTS (Las Juntas, Costa Rica). The station's pier was rebuilt and a recording building replaced during a major renovation this year.

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
GSN Stations Serving as IMS Auxiliary Stations	33

GSN Stations during 2011

New stations	0
Next Generation System (NGS) upgrades to date.....	100

STANDING committee

Charles J. AMMON (chair)	Penn State University
Caroline BEGHEIN	University of California, Los Angeles
Colleen DALTON	Boston University
Adam DZIEWONSKI	Harvard University
Gavin HAYES	USGS NEIC
Michael HEDLIN	University of California, San Diego
Meredith NETTLES	Columbia University, Lamont
Gerardo SUAREZ	Instituto de Geofísica, UNAM
Mike THORNE	University of Utah
Bill LEITH (ex officio) voting	USGS
Shirley BAHER (obs)	AFTAC
Harley BENZ (obs)	USGS NEIC
Jon BERGER (obs)	Univ. of CA, San Diego
Pete DAVIS (obs)	Univ. of CA, San Diego
John DERR (obs)	USGS, Albuquerque
Lind GEE (obs)	USGS, Albuquerque
Charles McCREERY (Chip) (obs)	Pacific Tsunami Center, NOAA

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 GSN is also a principal global source of data for earthquake locations, earthquake hazard mitigation, earthquake emergency response, and tsunami warning. Installed to provide broad, uniform global coverage of the Earth, 153 GSN stations are now sited from the South Pole to Siberia and from the Amazon basin to islands in the Indian Ocean, in cooperation with over 100 host organizations and seismic networks in 71 countries. The GSN is primarily operated and maintained through the USGS Albuquerque Seismological Laboratory and the University of California at San Diego IRIS/IDA group, and managed by IRIS. Twenty two GSN-Affiliate stations and arrays contribute to the network, including the nine-station USGS Caribbean Network.

Program for Array Seismic Studies of the Continental Lithosphere (PASSCAL)

STANDING committee

Richard ALLEN (Chair)	University of California, Berkeley
Cynthia EBINGER	University of Rochester
Katie KERANEN	University of Oklahoma
Jesse LAWRENCE	Stanford University
Lee LIBERTY	Boise State University
Doug MACAYEAL	University of Chicago
Beatrice MAGNANI	University of Memphis
Seth MORAN	USGS, Cascadia Volcano Observatory
Meghan S. MILLER	University of Southern California
Rick ASTER (obs)	New Mexico Tech
Bruce BEAUDOIN (obs)	PASSCAL NMT
Steve HARDER (obs)	University of Texas, El Paso
Frank VERNON (obs)	Univ of CA, San Diego

Dozens of Texan instruments are readied for deployment.



The Program for Array Seismic Studies of the Continental Lithosphere 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 more than 5000 stations in over 600 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, PASSCAL 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. PASSCAL 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.

Number of Experiments during 2011 (including USArray FA)

New experiments	64
Ongoing experiments	55

Data Logger Inventory

Three-channel data loggers.....	1320
"Texans" (including UTEP).....	2683
Multichannel	14

Sensor Inventory

Broadband	769
Intermediate period	142
Short period.....	270

Polar Instrument Pool

Broadband stations	73
Intermediate period stations	7
Data Acquisition Systems	51
Hydrophones.....	1
Snow streamer channels.....	84
Gimbale 20Hz streamer Geophones.....	62
Summer-only quick deploy boxes	106
Xeos Iridium modems	47

Polar Experiments

Antarctica	10
Arctic.....	13



Bob Greschke (PASSCAL), Yoko Tono (JAMSTEC), Norlandair Pilots, Genchi Toyokuni (NIPR), and Masaki Kanao (NIPR) at ICESG.

Polar Support Services (PSS) supports fieldwork in both Antarctica and Arctic regions and maintains a pool of specialized equipment required to successfully return data from these challenging environments. Experiments using this pool have returned ~93% of their data this season, a vast improvement over previous years. NSF/OPP supports three FTEs to operate and maintain the pool and operate a cold chamber for testing, all housed at the PASSCAL Instrument Center. The development priorities now are instrumentation for cold/wet environments (glaciers), real time communi-

cations and ruggedizing stations for longer-term operations.

PSS also supports the Greenland Ice Sheet Monitoring Network. This international collaboration is establishing permanent observatories with open, real time data to monitor and catalog activity generated by Greenland's glacier systems. Four new stations were installed this season and four others were visited for maintenance. A total of 33 international stations in and around Greenland now contribute open data to the IRIS DMC.

POLAR NETWORKS SCIENCE committee

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 Andy NYBLADE (Vice Chair)
 Doug MACAYEAL
 Meredith NETTLES
 Mike RITZWOLLER
 Mark FAHNESTOCK
 Erik IVINS
 Leigh STEARNS
 Bruce BEAUDOIN (obs)
 Bjorn JOHNS (obs)
 Tim PARKER (obs)

Jet Propulsion Lab
 Pennsylvania State University
 University of Chicago
 Lamont-Doherty (Columbia University)
 University of Colorado
 University of New Hampshire
 Jet Propulsion Lab
 University of Kansas
 NMT/PIC
 UNAVCO
 NMT/PIC - Polar Group

Transportable Array Stations (as of November 8, 2011)

Stations commissioned	1267
Stations operating	477
Stations removed.....	790

Flexible Array Systems

Broadband systems	346
Short period systems.....	141
Single channel systems (Texans)	1699

Magnetotelluric Systems

Backbone operating.....	7
Transportable sites occupied to date	330

Reference Network

Operating.....	114
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Operation and maintenance of USArray includes "rolling" the Transportable Array eastward across the U.S. Field crews construct, install and remove about 18 stations each month, and have moved east of the Mississippi River. The Reference Network provides a fixed "reference frame"; most of these stations are operated and maintained by the USGS, but it includes 20 long-term TA stations which provide more uniform coverage. The Array Operations Facility, located at the PASSCAL Instrument Center, supports high-resolution Flexible Array deployments that address

EarthScope's scientific goals; over the last five years, the NSF has supported 16 major experiments that collectively have occupied thousands of sites. Magnetotelluric observations complement seismic tomography; seven permanent MT observatories span the U.S. and more than 320 temporary sites in the Pacific Northwest and mid-continent have been occupied by USArray's campaign instruments during the past six summers. Siting Outreach facilitates siting of USArray stations and works with numerous state and local organizations to raise awareness of EarthScope and USArray.



Sarah Hedgecock-Hanson (University of North Carolina), Pnina Miller (PASSCAL), Julia MacDougall (Brown University) and Ved Lekic (University of Maryland) perform a huddletest for Flexible Array experiment prior to deployment in Georgia.

USArray

USARRAY ADVISORY committee

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 Roger HANSEN
 Karl KARLSTROM
 Charles LANGSTON
 Maureen LONG
 Guy MASTERS
 David SNYDER
 Donna SHILLINGTON
 Chester WEISS
 Bill LEITH (Ex officio) non voting

Arizona State University
 Cornell University
 University of Alaska, Fairbanks
 University of New Mexico
 University of Memphis
 Yale University
 University of California, San Diego
 Geological Survey of Canada
 Columbia University/LDEO
 Virginia Tech
 US Geological Survey

Data Services (DMS)

Data Archived (as of September, 2011)150.6 terabytes

PASSCAL	42.5
GSN	19.3
EarthScope	23.5
FDSN	11.1
US Regional	46
Other	8.2

Data Shipped in 2011 (projected to end of 2011) ...157.1 terabytes

Customized from Archive	64.1
Real Time Data Distribution	44.8
Web Services.....	38.8
Data Handling Interface	9.4

The Data Management System is one of the largest scientific archives of globally distributed observational data in the world, with data from more than 100 networks operated by US agencies and partners in more than 60 countries. Archiving and management of GSN, PASSCAL, and EarthScope data is the core mission, but collecting other seismological data remains important. This year, 55 new datasets were received from PASSCAL experiments, OBSIP deploy-

ments, FDSN networks, Regional Networks, and EarthScope Flexible Array experiments.

The DMS offers a wide and growing variety of services that Earth scientists rely on worldwide. The distribution of data via web services is being an increasingly well exercised method of interaction with the IRIS DMC. In 2010 - 2011 we sent data to scientists in 135 countries and nearly 12,800 institutions.

STANDING committee

Keith KOPER (Chair)	University of Utah
Harley BENZ	USGS, Denver, Colorado
Mike BRUDZINSKI	University of Miami of Ohio
Matt FOUCH	Carnegie Institution of Washington
Rengin GOK	Lawrence Livermore Natl Labs
Catherine SNELSON	University of Nevada, Las Vegas
Zhingan PENG	Georgia Institute of Technology
Dayanthie WEERARATNE	California State University, Northridge
Bruce BEAUDOIN (obs)	New Mexico Tech
Harold BOLTON (obs)	USGS, Golden, Colorado
Peter DAVIS (obs)	University of California, San Diego



The IRIS DMC is in the process of using virtualized servers running RedHat Enterprise Linux and RedHat Enterprise Virtualization System software.

Education & Public Outreach (EPO)

STANDING committee

Glenn KROEGER (Chair)	Trinity University
Luciana ASTIZ	University of California, San Diego
Bob BUTLER	University of Portland
Maggie BENOIT	College of New Jersey
Kaz FUJITA	Michigan State University
Juan LORENZO	Louisiana State University
Wayne PENNINGTON	Michigan Technological University
Suzan VAN DER LEE	Northwestern University
Christa VON HILLEBRANDT	University of Puerto Rico
David CARLSON (Ex officio) non-voting	UNAVCO liaison
Steve SEMKEN (Ex officio) non-voting	Arizona State University, Earthscope National Office

EPO This Year

Minority Recruitment Lectures for Internship Program	6
IRIS/SSA Distinguished Lectures.....	12
Undergraduate summer research interns	15
Teachable Moment slide sets or information pages	19
Total AS1 seismographs in schools	190
Teachers and college faculty attending IRIS-run workshops	250
Active Earth Monitor Displays, Page Views	3,000,000
IRIS Web site visits, unique monthly visitors	6,400,000
Visitors to museums with IRIS/USGS displays	13,000,000



IRIS summer research interns Ado Mucek and Dwight Williams set up a PASSCAL Geode during the intern orientation at New Mexico Tech.

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 using a computer, to an interactive museum exhibit, a major public lecture, or in-depth exploration of the Earth's interior in a formal classroom.

The past year has seen a considerable increase in the impact of the EPO program through Teachable Moment slide sets 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. A continuing highlight is the summer undergraduate intern program where this year 15 students conducted research at 12 different IRIS member institutions.