

UNAVCO Report

Support of UNAVCO Community and Facility Activities

**UNAVCO Facility Interim Report, December 2007
For period of performance September – November 2007**

NSF Cooperative Agreement EAR-031760

Also includes the quarterly progress report for
UNAVCO Facility Support to NASA

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UNAVCO Facility December 2007 Interim Report

Period: September–November 2007

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1.0 Quarterly Summary

The UNAVCO Facility through this Cooperative Agreement provides engineering, equipment, data, and information technology support to NSF-EAR, NSF-OPP, and NASA-funded efforts. Larger projects supported over the last quarter include continued installation of new permanent stations in the Caribbean for hurricane and tectonic research, wrap-up of the deployment of very ambitious network of 23 new stations in Greenland and preparation for 17 new stations in Antarctica for the International Polar Year (our featured project this quarter), and installation of a new NASA-GGN station in Madagascar. Support was provided to the EarthScope PBO, Nucleus, and GeoEarthScope projects, and to the NASA Global GPS Network (GGN). Numerous other projects were supported with engineering and equipment and are documented in this report. The equipment pool continues to be nearly fully subscribed.

UNAVCO Terrestrial Laser Scanning (TLS) continued this quarter at UNAVCO with purchase of a new TLS with funds from an OPP MRI proposal and development of Facility capabilities with the EAR-IF “INTERFACE” project and OPP core-funded resources. Activities also included outreach at the Geological Society of America annual meeting in Denver and UNAVCO staff training. Other highlighted Education and Outreach activities for the summer included recruitment of 2008 RESESS protégés, participation at SACNAS including sponsoring a field trip for SACNAS participants interested in geoscience, working closely with several faculty researchers to design and implement programs that address broader impacts of their science, and performing short course and development workshop evaluations.

The GPS data management, archiving, and distribution level grew at a record rate with nearly twice the volume of data added in 2007 as in 2006. Ongoing software development and hardware improvements in the archive continue to stream-line data management, implement new mass storage systems, and proved enhanced user experiences. In addition, the Data Group manages UNAVCO’s InSAR archives for GeoEarthScope and WInSAR. The new 2008-2010 WInSAR proposal has been approved providing additional data purchasing and staff resources.

This quarterly report presents in more detail the highlights and performance metrics for the period September–November 2007 including core support as well as summaries of major projects managed by the Facility. As noted previously, the format of this report provides enhanced quantitative performance metrics following the Facility Work Breakdown Structure (WBS). The Facility uses a WBS that provides a multi-level framework that organizes and defines the work to be accomplished for core and project tasks. Additional resource use and service tracking has been implemented into the UNAVCO’s project time system and is currently being tested. Following sponsor feedback, we have also added a new table containing the current Facility permanent station operations and maintenance list. Overall, the enhanced information gathering will have greater utility over time as addition quarterly statistics are acquired and trends develop.

The *UNAVCO Community* continues to grow and currently has 111 members (68 Member Institutions and 43 Associate Member Institutions) from around the globe. In October, 2007, as part of a community Strategic Planning kickoff, the UNAVCO Board, Facility Standing Committee and Education Standing Committees met in a joint session in Boulder. A process and plans for strategic planning were formulated.

1.1 Quarterly Featured Project

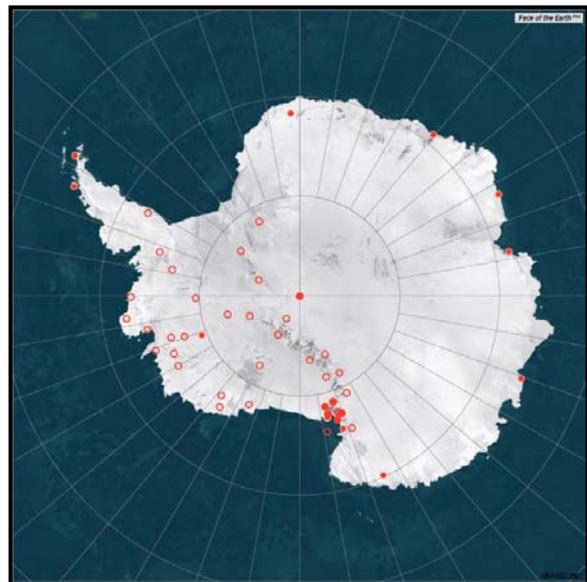
Project: Polar Earth Observation Network (POLENET) GPS Stations

UNAVCO Facility Engineer: Bjorn Johns

Principal Investigator: Dr. Michael Bevis and Dr. Terry Wilson

Funding Source: NSF

UNAVCO is a partner in the International Polar Year POLENET project (Figures 1 and 2), and is managing hardware design, procurement, and GPS data management for the project. Support is also provided for the field installations and the POLENET education and outreach effort. Twenty-three continuous GPS stations were installed in Greenland during August 2007 (Figures 3 and 4), with active participation of collaborators from Denmark, Luxemburg, and the USA for Greenland activities. One of the project's goals is to determine the vertical velocity field associated with glacial isostatic adjustment (GIA) which will provide GRACE, and other remote sensing missions, with an accurate 'GIA correction', thereby suppressing the largest source of uncertainty in estimates of ice mass changes in Greenland. Recent innovations to the Polar remote CGPS station design, and close coordination with the Polar power and communications MRI project, allowed for rapid single day station deployments. Data from these sites are transmitted via the Iridium satellite system to the UNAVCO Archive (Figure 5). Installation of another approximately 17 stations is planned to complete the network around the entire Greenland circumference.



Figures 1 and 2. During the International Polar Year approximately 80 new geodetic GPS stations are planned in Antarctica and Greenland, primarily by the Polar Earth Observation Network (POLENET) (M. Bevis and T. Wilson, PIs). POLENET will use bedrock geodesy to constrain past and present day changes in Antarctica and Greenland ice mass.



Figure 3. UNAVCO engineer Marianne Okal at the Northwest Greenland GPS station DKSG at Docker Smith Gletscher.



Figure 4. Ohio State University graduate student Abel Brown at the Southeast Greenland GPS station TIMM on Timmiarmiut Island.

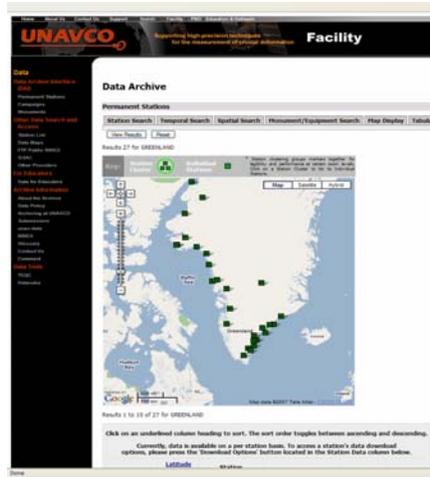


Figure 5. UNAVCO provides POLENET data management and on-line data access

Antarctica field activities are in progress (Figure 6), and four new stations have been installed as of the end of December 2007. A total of 17 new station installations are scheduled for the field season, covering extremely remote (even by Antarctic standards) locations in the Transantarctic Mountains, Ellesworth Mountains, and Marie Byrd Land.



Figure 6. The most recent POLENET installation in the extremely remote and inaccessible Marie Byrd Land. The 1-m mast GPS monument used for most POLENET remote stations was designed at the Ohio State University for rapid installation in exposed bedrock.

Facility Engineering and Equipment

The UNAVCO Facility provides state-of-the-art GPS equipment and engineering services to PI projects. This includes project management, planning, installation, operations and maintenance of continuous, permanent GPS station networks around the globe. Engineers and technicians also undertake technology development, testing, and systems integration to support new project demands. Presented below are highlights of activities during the quarter as well as associated WBS tasks and performance metrics. Included are core support for NSF/EAR, NASA, and OPP programs and project management of PBO Nucleus and GeoEarthScope.

NSF/EAR Program Support

Facility EAR program support is categorized by task and related metrics in Table 1 below and is discussed in the following section.

Table 1. Engineering Performance Metrics – NSF Core

WBS	Task	Performance Metrics	Numbers
1.1.1.2	Permanent Station Operations	# Stations monitored (on O & M list)	396
		# Station troubleshooting events	35
1.1.1.3	PI Project services	# Projects	21
1.1.1.4.1	Engineering Technical Support	# Tech support requests	82
1.1.1.4.2	Development and Testing	# D & T projects completed	1
1.1.1.4.3	Pool Equipment Maintenance (warehousing, repair, outfitting, tracking, reporting)	# Receivers in pool	277
		# Community/project receivers	2285
		# Receivers delivered to projects	10
1.1.1.4.4	PI Equipment Repairs	# Receivers repaired	30
1.1.1.4.5	PI Training Classes, Workshops, Meetings	# Classes held or participated in	3

Permanent Station operations. After continuously operating GPS stations are installed as part of UNAVCO Principle Investigator (PI) projects, they are managed in an Operations and Maintenance (O&M) phase. The UNAVCO Facility, working closely with PIs and their collaborators, provides O&M support at three broad levels of support:

High – UNAVCO Facility provides centralized O&M support that may include retrieving the data, monitoring station data flow, and proactively responding to problems with data flow or station hardware. Problems are fixed remotely working with collaborators if necessary. If a maintenance trips or materials required for O&M are funded by the PI’s project.

Medium – PIs or collaborators download the data from the stations, monitor station data flow, and handle most problems themselves. UNAVCO provides engineering and medium-level technical support on a request basis. Any UNAVCO Engineering maintenance trips and materials required for O&M are covered by the PI’s project.

Low – UNAVCO only provides archiving support and a low-level of technical support. UNAVCO does not monitor or download data from the stations.

The facility currently provides operations and management (O&M) support to 396 continuously operating stations. During this quarter there were 35 troubleshooting incidents handled for

stations monitored for EAR PIs. This included resolving communication and equipment issues, shipping replacement equipment and working with PIs and local contacts to resolve problems.

Presented on the following page (Table 2) is a list of current networks on the UNAVCO O&M list as well as PIs, number of stations, general level of effort and responsibility as well as funding source and current funding source. This list will be updated and included in UNAVCO Facility interim and annual reports.

Table 2. Current UNAVCO Facility Operations and Maintenance List.

Network Name or Location	Principal Investigator	No. Active Stations	Level of Effort	Funding source
Bhutan	Roger Bilham, CU	2	high	NSF-EAR: IF
Calabria	Michael Steckler, LDEO	9	high	NSF-EAR: CD
Caribbean Hurricane Prediction & Geodetic Network	John Braun, UCAR	8	high	NSF-ATM/EAR: IF
Costa Rica - Nicoya	Tim Dixon, U. Miami	9	high	NSF-EAR: Tectonics
Galapagos GPS Network	Dennis Geist, U. Idaho	4	high	NSF-EAR-PET&GEOCHEM
Galapagos L1 GPS Network	Dennis Geist, U. Idaho	4	high	NSF-EAR-PET&GEOCHEM
Guerrero Coast	Kristine Larson, CU	4	high	NSF-EAR: Geophysics
Las Vegas	Geoff Blewitt, UNR	2	high	NSF-EAR: Hydrology
Mediterranean	Rob Reilinger, MIT	7	high	NSF-EAR: Tectonics
Mid America/New Madrid	Bob Smalley, U. Memphis	11	high	NSF-EAR: IF
Northwest Mexico	Rick Bennett, U. of AZ	2	high	NSF-EAR: Tectonics
Peatland Minnesota GPS Network	Paul Glaser, U. of Minn.	10	high	NSF Geoscience Directorate, Carbon & Water in the Earth System Program, interdisciplinary EAR, ATM and OCE
Rio Grande Rift GPS Network	Anne Shehan, CU	25	high	NSF-EAR: Earthscope
UNAVCO GPS Test Network	Various UNAVCO	2	high	NSF-EAR: IF/NASA
Afar GPS Network	Eric Calais, Perdue	13	med	NSF-EAR: Geophysics
Andaman Islands GPS Network	Bilham, CU	3	med	NSF-EAR: Geophysics
Bangladesh	Michael Steckler, LDEO	11	med	NSF-EAR: Tectonics
Central Asia	Tom Herring, MIT	6	med	NSF-EAR: CD
Denali Fault GPS Network	Jeff Freymueller, UAF	3	med	NSF-EAR: F/Geophysics
El Salvador	Chuck DeMets, UW-Madison	3	med	NSF-EAR: Geophysics
GULFNET GPS Network	Roy Dokka, LSU	17	med	NSF-EAR: IF (increase to 25 sites - 2007/8)
IAGT GPS Network	Matt Star, IAGT	1	med	Community NASA
Jalisco, Mexico	Chuck DeMets, UW-Madison	10	med	NSF-EAR: Geophysics
Kilauea, Hawaii	Paul Segall, Stanford	11	med	NSF-EAR: Geophysics
Mauna Loa	Ben Brooks, University of Hawaii	12	med	NSF-EAR: Geophysics
Oaxaca, Mexico	Chuck DeMets, UW-Madison	8	med	NSF-EAR: Geophysics
Southeast Alaska GPS Network	Jeff Freymueller, UAF	6	med	NSF-EAR: Geophysics
Southern Basin and Range GPS Network	Brian Wernicke, Caltech	27	med	NSF-EAR: CD/IF Expired; NSF-EAR:

				Geophysics Proposal Pending
Akutan Volcano	Tom Murray, USGS	4	low	Community USGS
BARGEN Expansion	Brian Wernicke, Caltech	3	low	Community Caltech PO in place for communications
Cotopaxi L1 GPS Network	Pete LaFemina, Penn State	2	low	Community Penn State
DIVE GPS Network	Meghan Miller, CWU	1	low	Community NASA
DIVE L1 GPS Network	Meghan Miller, CWU	2	low	Community NASA
EBRY GPS Network	Bob Smith, U. Utah	4	low	Community USGS
GPS Soil Moisture	Kristine Larson, CU	4	low	Community - NSF IF Proposal Pending
Greenland	Kristine Larson, CU	2	low	NSF-EAR: Geophysics Expired
Hawaii GPS Network	Asta Miklius, HVO, Paul Segall, Stanford	24	low	USGS
Hayward Fault L1 GPS Network	Barbara Romanowitz, UCB	4	low	Community NASA
Idaho National Laboratory GPS Network	Suzette Payne, INEL	5	low	Community INEL
Mt. Spurr GPS Network	Jeff Freymueller, UAF	3	low	Community UAF
Mt. Washington, NH	Steve Nerem, CU	1	low	Community NASA
Okmok Volcano	Jeff Freymueller, UAF	3	low	Community USGS
Sage, New Zealand	Peter Molnar, CU	13	low	NSF-EAR: Tectonics
Santorini, Greece	Andrew Newman, Georgia Tech	2	low	Community - NSF Geophysics Proposal Pending
Slide Mountain Tie GPS Network	Geoff Blewitt, UNR	1	low	Community NSF-EAR: Geophysics Proposal Pend
Socorro	Andrew Newman, Georgia Tech	3	low	Community Georgia Tech
SuomiNet-A GPS Network	Various ATM PIs	33	low	NSF-ATM Proposal Pending
SuomiNet-C GPS Network	Various ATM PIs	3	low	NSF-ATM Proposal Pending
SuomiNet-G (Geodetic) GPS Network	Various EAR/ATM PIs	32	low	NSF-ATM Proposal Pending
Yucca Mountain GPS Network	Brian Wernicke, Caltech	17	low	DOE/NSF-EAR: Geophysics Proposal Pending
TOTAL 396				

PI Project Services. In the last quarter 21 PI projects were supported by the UNAVCO facility, ranging from project design and budgets for proposals to full field deployments for new networks, network upgrades and campaign surveys. The GPS Soil Moisture Project is an example of a project that received a full compliment of UNAVCO facility support. UNAVCO staff was involved in project planning, network design, monument design, equipment preparation and installation of the equipment. Additionally two UNAVCO engineers established a permanent GPS site with a geodetic quality short-drilled brace monument on the island of San Andres, Colombia. The installation was jointly funded by NSF-EAR and NSF-ATM as part of the Caribbean Hurricane Prediction and the Costa Rica projects. A summary listing of PI project supported during the last quarter is included in Table 3.

Table 3. UNAVCO Supported Individual PI Projects

Project Name or Location	PI	Support Involved
ANDIVOLC 2009-2013	Joachim Gottsmann	Station data retrieval & management, Equipment purchase, Station installation, Field support, Proposal planning, budgeting & letter of support
ANDIVOLC 2009-2013	Steve McNutt	Pool equipment loan, Equipment purchase, Data archive, Technical planning & consultation, Station installation, Training
Campaign GPS instrument pool at SIO/UCSD	Duncan Agnew	Pool equipment loan
Central Baja 2007	Timothy Dixon	Pool equipment loan
CLPX-II Alaska 07	Hans-Peter Marshall	Pool equipment loan
Death Valley LiDAR September 2007	David Phillips	Technical support, Station data retrieval & management, Data archive
GGN-ABPO	David A. Stowers	Pool equipment loan, Technical support, Equipment purchase, Data archive, Station installation, Field support, Data communications planning, Equipment configuration/ integration, Equipment testing
GPS Soil Moisture 2007 - Installation	Kristine Larson	Station data retrieval & management, Data archive
GPS Soil Moisture 2007 - Installation	Kristine Larson	Technical support, Data archive
Guyot Glacier 2008	Chris Larsen	Pool equipment loan
Mutnovsky Scientific Drilling Project 2009	Andrew Newman	Technical support, Equipment purchase, Technical planning & consultation, Station installation, Field support, Data communications planning, Proposal planning, budgeting & letter of support
MWD CGPS Installation 2007	Cecilia Whitaker	Technical support, Equipment purchase, Data archive, Technical planning & consultation, Station installation, Field support, Equipment configuration/ integration
Natron-Magadi 2008	Eric Calais	Pool equipment loan, Station installation, Field support, Proposal planning, budgeting & letter of support
North Anatolian Fault LIDAR 2008-10	James Dolan	Proposal planning, budgeting & letter of support
Northern Pakistan 2008-2011	Rebecca Bendick	Pool equipment loan, Data archive
PIE LTER 2008	Charles S. Hopkinson	Pool equipment loan
Sierra Negra volcano CGPS network 2007	Dennis Geist	Equipment purchase, Equipment configuration/ integration
Southern CA Multihazards Rapid Response GPS	Adrian Borsa	Pool equipment loan
Telica volcano, Nicaragua 2008	Peter LaFemina	Pool equipment loan, Proposal planning, budgeting & letter of support
Tempe Permanent Station 2007	Rick Bennett	Technical support, Equipment purchase, Technical planning & consultation, Equipment configuration/ integration, Proposal planning, budgeting & letter of support
Yucca Mountain 2008-09	Brian Wernicke	Proposal planning, budgeting & letter of support

Engineering Technical Support. During the last quarter the UNAVCO facility responded to 82 requests for support via our support mail alias (support@unavco.org), and by direct requests to staff via email and phone calls.

Development and Testing. The UNAVCO facility developed and tested the NetRS BINEX streaming capacity over a TDMA radio modem network using the WIGATE download and management software. This type of GPS data streaming setup is currently in use on Sierra Negra Island in the Galapagos. This network utilizes receivers that are no longer in production and cannot be repaired. This test confirmed that a NetRS could be used should additional sites be installed or old ones replaced.

Facility GPS Receiver Pool. The UNAVCO facility pool consists of 381 receivers of various types. The last quarter saw a continued high level of utilization of the UNAVCO receiver pool (Figures 7-11).

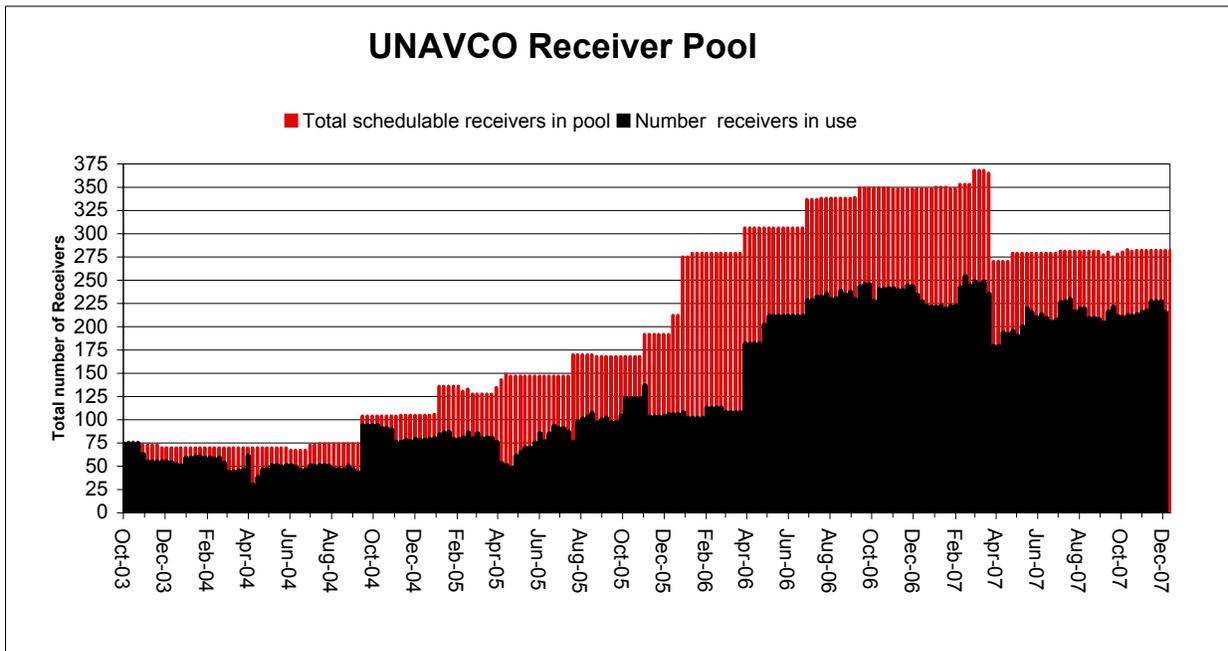


Figure 7. Total receiver utilization. Note: As of March 2007 OPP receivers will not be included in the total.

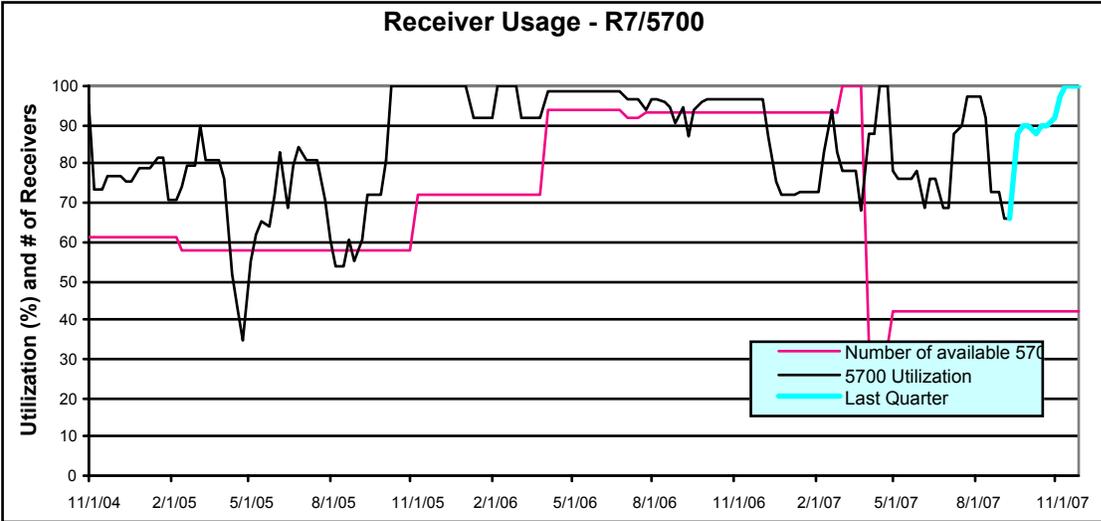


Figure 8. Trimble R7/5700 receiver usage over the last 3 years. Shown are the percentage utilization and the total number in the receiver pool.

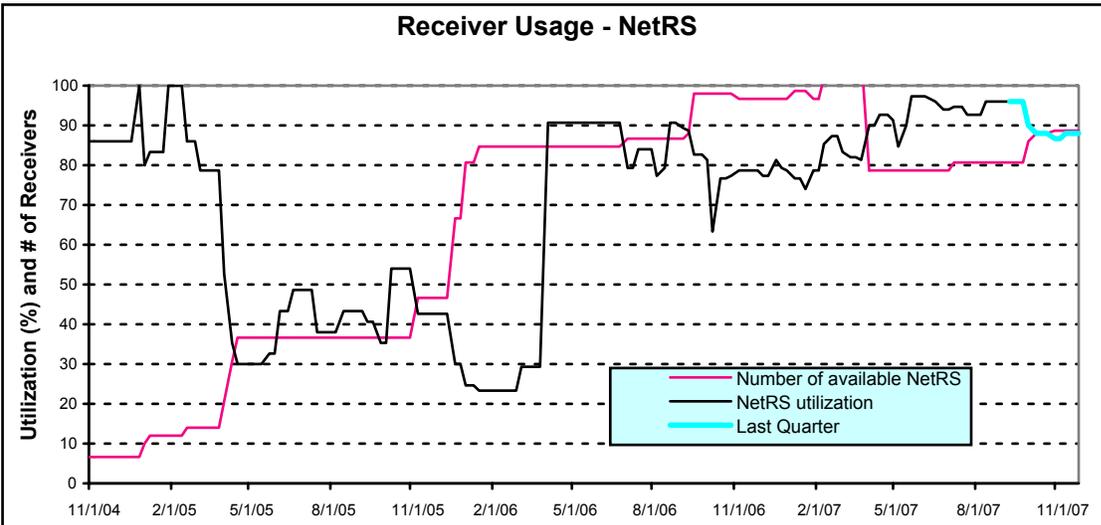


Figure 9. Trimble NetRS receiver usage over the past 3 years. This receiver package is intended for use in semi-permanent installations and campaigns. Shown are the percentage utilization and the total number in the receiver pool.

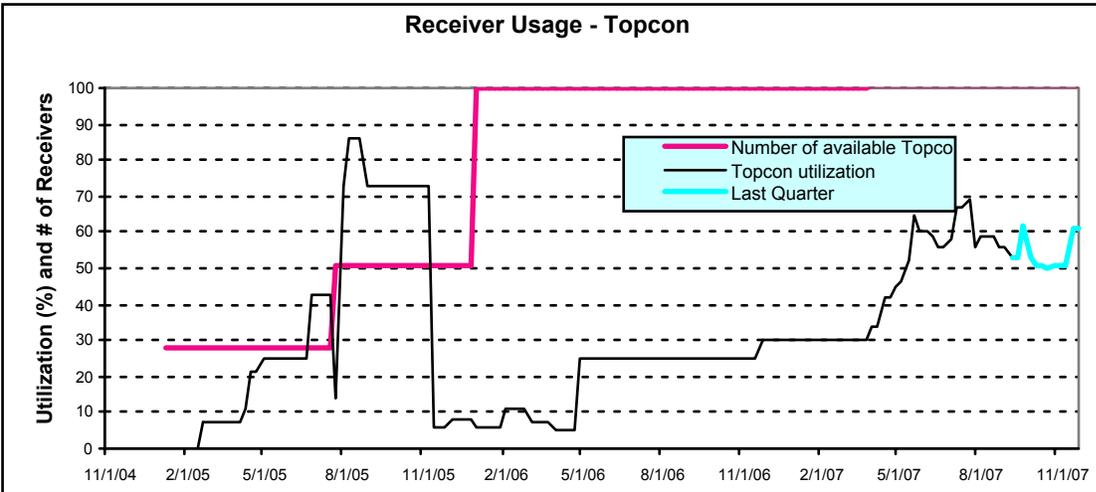


Figure 10. Earthscope/PBO Topcon receiver usage over the past 2 years. Shown are the percentage utilization and the total number in the receiver pool. Use of this pool is restricted to Earthscope or closely associated projects and subject to NSF approval.

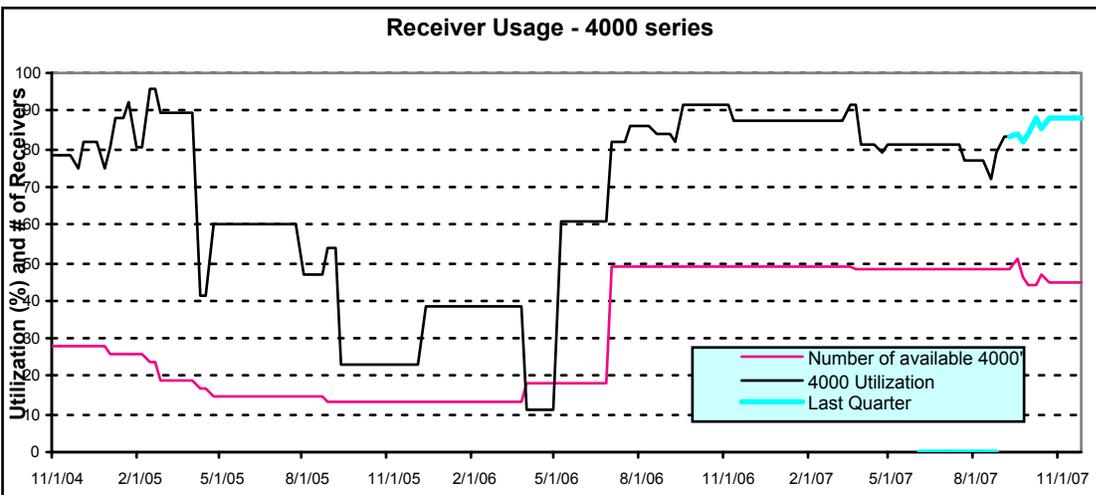


Figure 11. Trimble 4000 series receiver usage over the past 2 1/2 years. Shown are the percentage utilization and the total number in the receiver pool.

PI Equipment Repairs. During the last quarter the UNAVCO processed 30 receiver repairs. The repairs ranged from processing RMA with the manufacture to board level repairs in-house. In addition to the receiver repairs the facility repair depot handled 5 metrological instrument and 10 choking antenna repairs.

NASA/SENH Program Support

UNAVCO with JPL provides support for the NASA GPS infrastructure through a network of 76 permanent GPS stations called the Global GPS Network (GGN) which represents approximately 20% of the stations that make up the IGS permanent station global network. Data from these

stations are used to produce highly accurate products that are essential for Earth science research, multidisciplinary applications, and education.

The UNAVCO Facility responded to approximately 350 (through November 31st) individual troubleshooting and maintenance issues during the fourth fiscal quarter (Q4-2007), including GPS equipment, computer, and communications upgrades at several GGN stations.

As part of the ongoing computer equipment upgrade of the GGN network, a new batch of Linux computers (15) have been purchased for routine network upgrades and new installations. These are (2U) rackmount computers that will be running the Fedora Core 4 OS (FC4). Also, nine mini-pc units have been purchased for use at low power installations (solar, and unstable AC power station with large UPS backup, etc.). These units will run FC4 like the standard rackmount computers. Computer configurations have been finalized with JPL and deployments have started.

A new NASA-GGN station was installed outside Antananarivo in Madagascar. This station is a new collaboration with the seismic IDA Group at UCSD-Scripps and the Institute Observatory of Geophysics of Antananarivo (IOGA) at the University of Antananarivo. UNAVCO/NASA and IDA will share site support costs and Internet connection. The site is equipped with a large UPS for backup of a sometime intermittent power, and is running a mini-pc, an Ashtech UZ-12 receiver and chokering antenna. A UNAVCO field trip was done in November for the installation and also created strong bonds with our new collaborators at the University of Antananarivo. Data is flowing into the JPL archive, and an application will be filed with the IGS-CB for IGS station status.

A second new NASA-GGN installation is being planned for Port Stanley, Falkland Islands. We are receiving support in the station planning from the C&W group on the Island and have been granted equipment space and help for an installation close to town. The final Internet contract and connection details (firewall, IP, etc.) are still pending, but we are hopeful a files engineering trip can be made early in the new year for this installation.

UNAVCO will also be shipping new GGN station equipment (Linux computer, and an Ashtech UZ-12 receiver) to the Palmer Station on the Antarctic Peninsula this fall. This new receiver will either be an addition (and upgrade) or replace the existing receiver on-site. Permissions and agreements were worked out between NSF-OPP/NASA-JPL/UNAVCO and only local bandwidth and configuration issues remain. The long term plan is to add this receiver/station to the IGS network. This is another example of a longstanding multi-agency interaction extending the NSF-OPP/NASA-JPL collaboration on this logistically challenging and sparsely GPS populated continent.

NASA-GGN GPS station equipment for a full new installation in Kenya is packaged and ready at UNAVCO and will be shipped in January 2008 per request from the local collaborator. Local collaborators at the Regional Center for Mapping of Resources for Development will install the equipment and connection the new station to the Internet. This will be a valuable contributor to the GGN network as well as the AFREF initiative.

UNAVCO is also continuing conversations with European collaborators on the possibility of installing more stations in Africa. A Cape Verde site is the most promising so far. After several email iterations, UNAVCO has also managed to establish contact with the Director of the Observatory of Tamanrasset in Algeria. The contact information has been forwarded to JPL so the official US State Department science agreement with Algeria can be amended to include this NASA-GPS collaboration. The goal is to install a NASA-GGN station at the Observatory. Tamanrasset is in southern Algeria and would greatly enhance the GPS coverage for northern Africa and also be a valuable contributor to the AFREF Project.

In support of the ongoing work to upgrade the computers and receivers in the GGN network, 15 new rackmount Linux computers and nine new mini-pc's were purchased (see above for details). Six Ashtech UZ-12 receivers were acquired by the GGN in a receiver trade with the Facility. Up to nine Ashtech UZ-12 receivers have been back to the manufacturer for firmware and hardware upgrades, and more will be upgraded once they are returned to the Facility from remote stations after upgrades. During this quarter the following stations were upgraded with new UZ-12 receivers/firmware: Shanghai, P.R.C. (SHAO), Easter Island (ISPA), McMurdo, Ross Island Antarctica (MCM4), and Brewster, WA (BREW). Upgrade receivers were also shipped to Bogotá, Colombia (BOGT), Mahe, Seychelles (SEY1), and Santiago, Chile (SANT) and will be installed during the month of December. New computers were upgraded at BREW, and new units have been shipped and are awaiting installation at BOGT, Usuda, Japan (USUD), The US Naval Observatory, Washington, DC (USN3), Arequipa, Peru (AREQ), and SANT.

In addition, several stations have received extensive upgrades in the form of new antennas, antenna cables, lightning protection, and Internet connections. The Internet connection at the SEY1 station was upgraded to an ADSL line and at the BOGT station work is underway to improve the receiver housing, power and the environment around the antenna. This station has also received all new GPS and computer equipment in accordance with the NASA-INGEOMINAS MOU that has been renewed. The old equipment will have to be shipped back to the US in accordance with Colombian customs regulations. VSAT problems continue to plague the Mbarara, Uganda (MBAR) station, but UNAVCO provided new batteries and a replacement solar panel have solved any power problems for the GPS equipment.

The new NASA equipment test station at Marshall Field outside Boulder for investigation of receiver and antenna performance, equipment mixing and new GPS observables issues is operational. One NetRs receiver has been operating since the first quarter of this year, and the wireless Internet link back to the UNAVCO Facility is operational. A Hughes VSAT link has also been added, allowing for more options for communication and data offloads. The VSAT is running off a self-contained solar system. Initial station surveying and testing plans for the new antenna marks have been worked out with our JPL PEM, and three new iCGRS Ashtech receivers were recently added to the test site for an initial survey of the new marks in the tri-pillar monument.

The 10 new Ashtech iCGRS (Internet receiver) systems have been delivered to UNAVCO. These receivers will be used for new installations and GGN network upgrades. Three receiver/antenna pairs are operational at the Marshall test site (see above) and some in the Facility testing lab. The

GGN-project also purchased (additionally) a total of 11 new Trimble NetRs receivers available for installations and trades for Facility Ashtech CGRS receivers.

UNAVCO in collaboration with the JPL-PEM, prepared earlier this year a Statement of Work (SOW) for the performance period through March 31st 2008, in order to ensure the current funds are being spent by the end of the grant period. Current financial burn rates and operational spending will meet the goal of having the current grant spent out by the end of March 2008. The SOW is being monitored monthly and updates are being provided to the JPL-PEM. In addition the GGN Group at UNAVCO has implemented bi-weekly telephone conferences with the JPL-PEM to ensure the timely execution of the goals in the SOW.

Table 4. Engineering Performance Metrics – NASA CORE

WBS	Task	Performance Metrics	Numbers
Engineering and Equipment Services			
1.2.1.2	Permanent Station Operations	# stations monitored (on O&M list)	76
1.2.1.2		# station troubleshoot events	350
		# new stations installed	1
1.2.1.3	Permanent Station Maintenance	# field trips or upgrades	8
1.2.1.4.1	Development and Testing	# D&T projects completed	1
1.2.1.4.2	Equipment Repairs	# receivers repaired	9
Data and Data Product Services			
1.2.2.2	Archiving and data management	# permanent stations handled	66
1.2.2.4	Community Software	#TEQC downloads, #TEQC web information requests	Same as NSF 1.1.2.1.4 above

NSF Office of Polar Programs Support

Another record Antarctic season is underway, and three UNAVCO staff deployed to McMurdo Station to manage the core UNAVCO operations supporting ~20 PI projects throughout the field season, prepare and stage equipment, and support the installation of 17 remote POLENET stations. The International Polar Year POLENET project (T. Wilson PI) is dominating activities. This project is part of the US contribution to the international Polar Earth Observing Network, or

POLENET consortium, an IPY-endorsed effort by more than 20 nations to improve geophysical observations of Earth's polar regions, largely using autonomous platforms. Data are downloaded by UNAVCO using an operational Iridium hub, and made available via the permanent station archive. Two other projects are also deploying UNAVCO Iridium systems on Pine Island Glacier (R. Bindshadler PI) and on Whillans Ice Stream (S. Tulaczyk PI). The field systems required for these projects dovetail with the Polar MRI technology development project deliverables. As a result, the MRI project goal of providing field system kits that are robust and easy to install under adverse conditions systems is nearly complete with engineering designs well documented in production drawings that are available to the community at www.unavco.org/polartechnology. The focus of the MRI power and communication systems development effort has now shifted to

developing systems can operate in the extreme cold of the Polar Plateau, and in January 2008 a cold hardened prototype will be installed as part of the POLENET network, and a cold-technology testbed will be installed at South Pole Station. Other Antarctic PI project highlights include delivering 18 pool receivers for a large GPS array to study the flow dynamics taking place at Thwaites Glacier (S. Anandakrishan), and 10 receivers for the investigation of grounding line forensics along the base of the Kamb and Whillans Ice Streams, as well as ice dynamics at Siple Dome (G. Catania PI). The Greenland Meltwater project, using GPS to detect ice sheet velocity changes resulting from the melting surface (T. Neumann PI) was completed, while unattended continuous data collection continues for the Greenland Supraglacial Lakes project (S. Das PI) that is studying the effect of glacial lake draining on the ice sheet. Planning is also underway for the 2008 Arctic field season, including another big POLENET effort in Greenland (M. Bevis PI) and developing and deploying 60 L1 receivers systems on Helheim and Kangerdlugssuaq glaciers (M. Nettles PI). Other highlights include attendance and presentation at the Northwest Glaciology and Fall AGU meetings. Performance Metrics are given in Table 5, and Tables 6 and 7 provide information on permanent station operation and maintenance (O&M) as well as long term receiver loans.

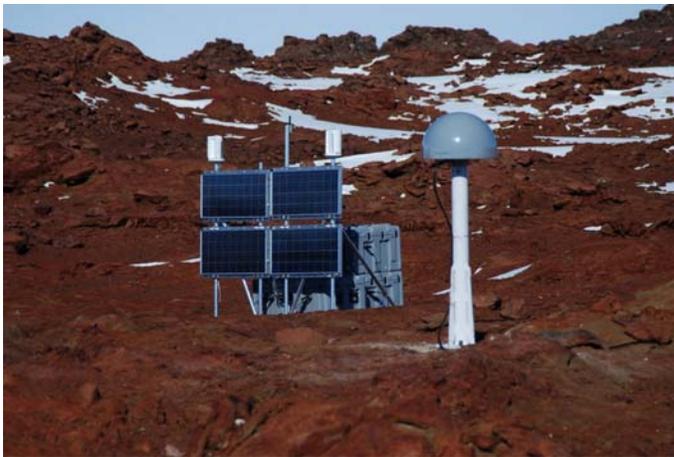


Figure 12. POLENET GPS station BURI at Butcher Ridge in the Transantarctic Mountains features wind and solar power, Iridium communications for year-round autonomous operation. This station was installed by UNAVCO for Land Information New Zealand (G. Blick PI), and is part of the New Zealand contribution to the international POLENET project. A goal of the POLENET project is using bedrock geodesy to constrain past and present day changes in Antarctica's ice mass.



Figure 13. UNAVCO recently acquired a ground based LiDAR unit and is developing the support capability for NSF-OPP PI applications.

A ground based LiDAR terrestrial laser scanner (Figure 13) was acquired with funds from the MRI project *Acquisition of a Terrestrial Laser Scanning System for Polar Research*. UNAVCO is currently building the capability to provide facility support to this technology for high-precision, high-resolution imaging and change detection. This new community resource was promoted at the fall AGU meeting, and a pilot project in the McMurdo Dry Valleys is planned for January 2008. The instrument is now available by request to support PI projects.

Table 5. Engineering Performance Metrics – OPP

Engineering Performance Metrics			
1.1.1.1	Permanent Station Ops	# stations monitored (on O&M list)	49
1.1.1.2		# station installation and maintenance events	11
1.1.1.3	PI Project Services	# projects	28
1.1.1.4.1	Engineering Technical Support (email and phone support)	# tech support requests	not tracked
1.1.1.4.2	Development and Testing	#D&T projects completed	(Power & Comms MRI, TLS MRI)
1.1.1.4.3	Pool Equipment	#receivers in pool	164
		#receivers on long term deployment	73
		#receivers delivered to projects	89
1.1.1.4.4	PI Equipment Repairs (RMAs)	# receivers repaired	included in EAR numbers
1.1.1.4.5	PI Training Classes, Workshops, Meetings	# classes/meetings held or participated in	2

Table 6. Current networks on the UNAVCO Polar permanent O&M list

Network Name or Location	Principal Investigator	Number of Active Stations	Level of Effort	Funding source
Polar Programs O&M				
Antarctica Erebus	Philip Kyle, New Mexico Tech	6	high	NSF-OPP
Antarctica L1	Philip Kyle, New Mexico Tech	2	medium	NSF-OPP
Antarctica Infrastructure	UNAVCO	6	high	NSF-OPP/NASA-GGN
Antarctica POLENET	Terry Wilson, OSU	9	high	NSF-OPP
Barrow Alaska Infrastructure [ATQK]	UNAVCO	1	high	NSF-OPP
Greenland	OSU, ULux, DNSC, UNAVCO	25	high	NSF-OPP
TOTAL 49				

Table 7 . Receivers on long term deployment not covered in permanent station O&M list.

Location	Receivers	PI
Alaska - Barrow	1 RTK base, 2 RTK rovers	BASC/UNAVCO
Alaska - Toolik	1 RTK rover	TFS/UNAVCO
Antarctica – Mount Erebus	1	Philip Kyle
Antarctica – Pine Island Glacier	2	Robert Bindshadler
Antarctica – South Pole	1 spare	UNAVCO
Antarctica – Whillans Ice Stream	10	Slawek Tulaczyk
Greenland – Supraglacial Lakes project	5	Sarah Das
Greenland - Summit	1 RTK rover	UNAVCO
Total 24		

PBO Nucleus Project Support

PBO Nucleus project support under NSF-EarthScope award #0453975. Core NSF facility support contributes to data archiving activities for the 14 Nucleus stations that have not yet been upgraded, all other aspects of the project are self-supported.

Nucleus station upgrades are now 93% complete. 9 upgrades were completed during this quarter, bringing the total number to date of 195 of the 209 stations, 8 months ahead of schedule. (two previously upgraded stations were later decommissioned and are no longer counted toward the total). Permitting activities are now over 80% completed and metadata transfer to the PBO Operational Database is also proceeding apace. We are working closely with PBO staff on all levels to ensure a successful and timely transition of responsibility for these stations to the PBO O&M staff at the end of September 2008.

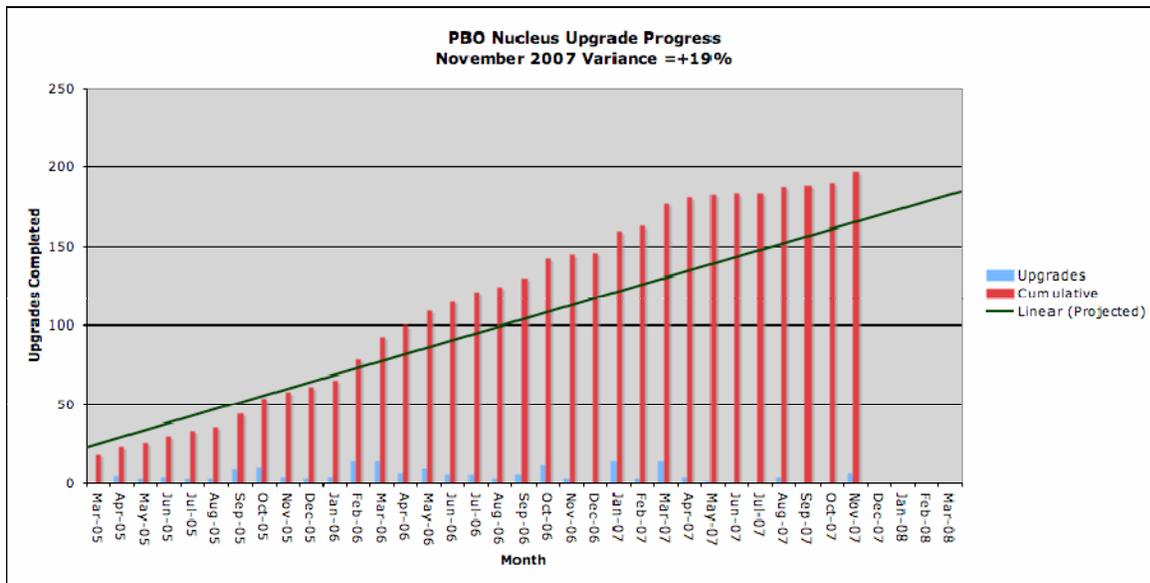


Figure 14. PBO Nucleus Upgrade Progress

Earned Value Management metrics reflecting detailed progress on all aspects of the project as of this quarter are shown in the table below.

Table 8. New Earned Value Management Metrics

Category	EV Weight	Actual	Quarterly Change	Plan	Variance
Procurement	5%	209	0	158	+32%
Landowner Contact	10%	186	26	191	-3%
Permit Submitted	10%	127	21	145	-12%
Permit Accepted	20%	100	11	129	-22%
Metadata to POD	5%	60	8	69	-13%
Station Upgrades	50%	195	+9-2 = 7	165	+19%
Total Earned Value	100%	163	12	153	+6%

PBO Nucleus project staff lent significant support this quarter to core facility projects, with Project Manager F. Blume having spent two weeks in Madagascar for the installation of a new NASA-GGN station, and Project Engineer Eleanor Boyce working on an NSF-Geophysics/Atmn-funded installation in Colombia, as well as miscellaneous contributions to core facility and PBO-MREFC work.

EarthScope/PBO Project Support

The EarthScope-funded pool of 100 Topcon GB-1000 systems was used to support three continuing projects this quarter: Hawaii Earthquake Emergency Response (B. Brooks and J Foster, U. of HI. PI's), STEEP 2007 (T. Pavlis and J. Freymueller PI's), and the Rio Grande Rift (A. Sheehan, S. Nerem, U of CO, A. Lowry, U.S.U., and M. Roy, U of NM PI's), of which the latter was the only EarthScope-funded venture. In addition to these, 1 other non-EarthScope PI projects were supported as well as the continuing use of this equipment pool to support PBO siting and reconnaissance activities. Non-EarthScope projects are supported with this equipment subject to the Program Manager's approval whenever the UNAVCO Facility's equipment pool is over-subscribed.

The 25-station Rio Grande Rift project continues to run smoothly in operations mode, with UNAVCO's role one of training and advising the PI's staff and archiving data as they are collected. Several station service visits were made by UNM and CU staff, and one by UNAVCO staff. The network is performing well, with only 1 of the stations having minor data loss due to hardware failure during this quarter. Data from 23 of the stations over the first year of the project are now available to the public from the UNAVCO archive.

The Facility's Equipment Group continues to provide vital resources to the EarthScope campaign support effort, coordinating the staged RMA process for the entire pool of 100 Topcon receivers, and maintaining and shipping the system cases. The group will be involved in the redesign and improvements to these systems in the coming quarter. The remainder of these activities were supported the NSF Plate Boundary Observatory MREFC award.

Performance Metrics.

Nucleus: 209 Permanent stations monitored, 9 upgraded, 15 remote troubleshooting events, 20 troubleshooting events that included site visits (excluding upgrade visits).

EarthScope Project Support: 4 Projects supported, 100 Receivers in Pool

GeoEarthScope Support

GeoEarthScope is a component of NSF's EarthScope Facility project that includes the acquisition of aerial and satellite imagery and geochronology. UNAVCO, led by the various GeoEarthScope working groups, continued to implement activities this quarter according to the revised budget finalized last quarter.

LiDAR imagery. The LiDAR working group provided revised recommendations for future acquisitions, with one half of the remaining budget planned for targets in southern and eastern California including the Garlock fault and Owens Valley, one quarter of the budget for the Intermountain Seismic Belt including Yellowstone and the Wasatch fault system, and one quarter of the budget for the Pacific Northwest and Alaska combined. In order to identify data providers for these future projects, UNAVCO released an Announcement of Opportunity and Request for Information on November 16. Responses are due in December and the working group will make recommendations based on these responses and any follow-up RFP's. Following this RFI release, the GeoES project manager communicated with numerous potential data providers in person and by phone. Meanwhile, data processing for the Northern California (NoCal) and Death Valley LiDAR projects continued throughout this quarter. Additional imagery was acquired in Death Valley by the National Center for Airborne Laser Mapping (NCALM) in September in order to address data quality issues with the initial dataset collected last year. Data processing for the NoCal project was delayed by technical difficulties with the GPS trajectory processing at Ohio State University (OSU) but final trajectories were being produced at the end of this quarter. The GeoES project manager visited OSU on November 1-3 to observe the NoCal processing efforts and to learn more about the causes of delay. Once the GPS trajectories are produced, final data products will be produced by NCALM using their standard procedures and Arizona State University (ASU) using the GEON LiDAR Workflow model. Preliminary NoCal images were presented by D. Phillips at the Southern California Earthquake Center (SCEC) meeting in September. The SCEC meeting was also a very useful venue for discussing the future LiDAR projects with the community. Several working group telecons took place this quarter.

Several LiDAR related outreach activities also took place this quarter. GeoEarthScope LiDAR was the featured article in the Fall 2007 EarthScope OnSite newsletter. The article was prepared by members of the LiDAR working group and included preliminary NoCal imagery provided by NCALM. An airborne LiDAR training course was also hosted at UNAVCO on October 27 as part of the Geological Society of America (GSA) annual meeting. GSA Short Course #507 was entitled "Processing and Analysis of GeoEarthScope and Other Community LiDAR Topography Datasets". Instructors were R. Arrowsmith and C. Crosby from ASU, and D. Phillips from UNAVCO. There were twenty-two participants. Feedback was very positive and there is clear community interest for additional courses in the future.

LiDAR data acquired for the GeoEarthScope Northern California project was used to create these shaded relief map images of the San Andreas fault in the Santa Cruz Mountains just south of San Francisco. Figure 15 is an unfiltered "full feature" digital elevation model (DEM) showing all surfaces imaged including vegetation and Figure 16 is a filtered "bare Earth" DEM

that reveals surfaces imaged beneath the vegetation. [Images prepared by the National Center for Airborne Laser Mapping (NCALM)].

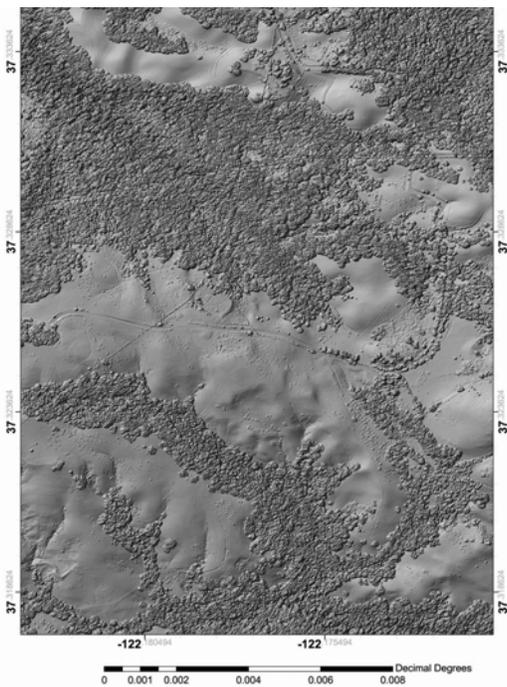


Figure 15. Unfiltered digital elevation model (DEM)

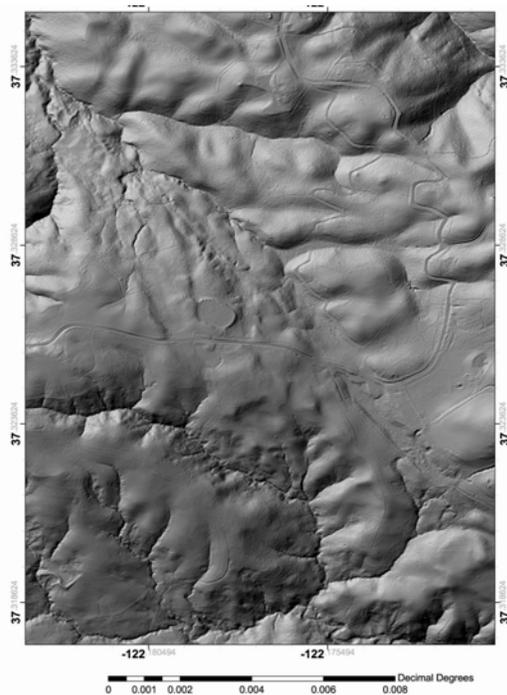


Figure 16. Filtered "bare Earth" DEM)

InSAR imagery. Great progress was made this quarter in plans and efforts to acquire imagery from the European Space Agency (ESA). C. Meertens and F. Boler visited ESA officials in Frascati, Italy, in September to discuss InSAR activities at UNAVCO including GeoEarthScope and WInSAR. This meeting resulted in several agreements between UNAVCO and ESA that effectively ended a period of delays and policy changes at ESA that had been impeding imagery acquisition efforts by UNAVCO. As a result, regular procedures for planning, ordering, receiving and redistributing data from ESA were implanted this quarter with success and ESA satellites (ENVISAT and ERS-2) are now acquiring data for GeoEarthScope on a routine basis. Moreover, better defined plans are now in place for ordering large volumes of archive data from ESA. D. Phillips met with ESA officials during a follow-up visit to Frascati in November during the ESA FRINGE workshop. R. Guritz was responsible for numerous noteworthy accomplishments in acquiring data for GeoEarthScope from NASA holdings at the Alaska Satellite Facility (ASF). Through a previously authorized NASA proposal, several terabytes of data were delivered to UNAVCO from ASF this quarter including imagery from the ERS and RADARSAT satellites. R. Guritz also visited UNAVCO on October 12-22 for meetings and collaborative work with UNAVCO staff supporting SAR data (F. Boler, S. Weir, S. Gross and D. Phillips). Infrastructure development at UNAVCO to support SAR data for GeoES continued and was led by F. Boler, S. Weir and S. Gross. Several InSAR working group telecons took place this quarter. In order to better plan GeoES activities and community requirements, UNAVCO issued a user survey to the community on November 21 and responses were continuing to be received at the end of the quarter.

Geochronology activities subsided this quarter following the distribution of funds to twelve laboratory facilities last quarter. Highlights this quarter included final award processing and the gathering of information from labs to establish sample submission guidelines for PI's.

The GeoES project manager also assisted with terrestrial laser scanning (TLS) activities this quarter, including the funded Polar Programs MRI at UNAVCO and the INTERFACE project.

GeoES metrics are designed and tracked by UNAVCO PBO and reported monthly to NSF as part of the EarthScope Cost Schedule Status Report (CSSR). However, the baseline for GeoES has not been revised according to the revised plan. As a result, current GeoES performance metrics do not correlate to actual GeoES activity. This was discussed by NSF and UNAVCO during the EarthScope management review meeting in November. Provided here are figures presented during that management review, showing GeoES metrics as reported in the EarthScope CSSR, spending commitments to date, and funds allocated vs. committed to date.

1.3.7 GeoEarthScope

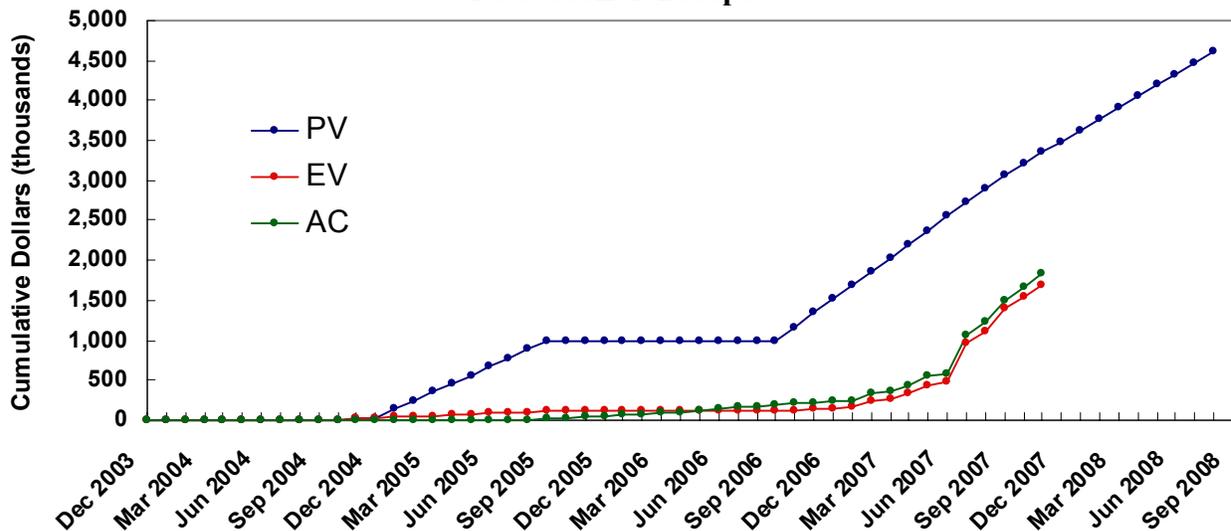


Figure 17. GeoEarthScope data reported in EarthScope Cost Schedule Status Report (CSSR), October 2007.

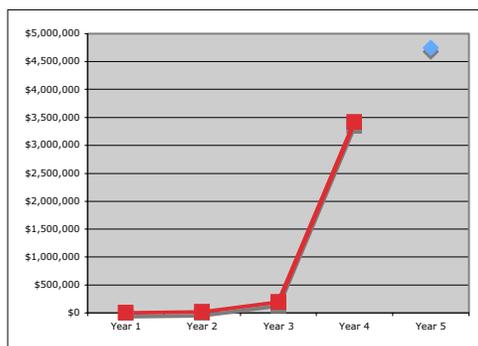


Figure 18. Graph showing GeoES spending commitment to date.

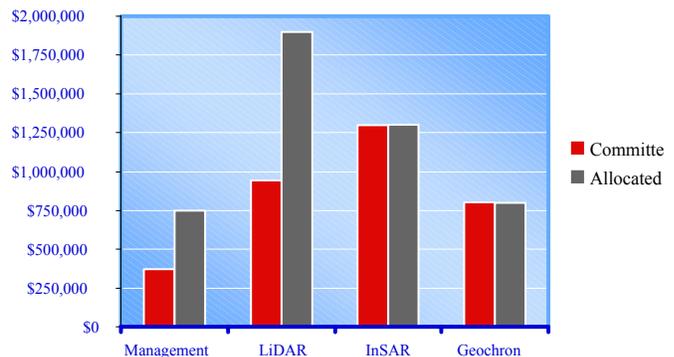


Figure 19. Graph showing GeoES funds allocated vs. committed to date.

1.2 Data Highlights

Archiving and Data Management

The UNAVCO Data Archive mission is to provide a secure long-term Archive for data, data products, and metadata from high-precision GNSS studies and other crustal deformation measurements. UNAVCO makes data from the Archive available to the scientific community and to the public and provides additional tools that add value to the data and data products in the Archive.

WBS Metrics. The table below shows WBS Metrics reporting in the area of Data and Data Products. The metrics are very similar to the prior quarter.

Table 9. Archive Performance Metrics

WBS Report – Facility Data Group – Sep-Nov 2007		
WBS Element	Metric	Quantity
1.1.2.1.2	Campaign files archived	3,573
1.1.2.1.2	Permanent station files archived	156,927
1.1.2.1.3	Campaign files accessed	6,913
1.1.2.1.3	Permanent station files accessed	2,751,796
1.1.2.1.4 and 1.2.2.4	Community software – TEQC downloads	4,845
1.2.2.2	Permanent stations handled	66

Holdings. Archive holdings in the online repository, including the primary copy of all GPS files, related files, and products, total 4.2 Tb in compressed form (9.3 Tb when uncompressed to their usable form). Holdings in the ftp pickup area, where the RINEX copy of all GPS-related files and products are available for pickup, total 4.8 Tb. During the quarter, a category of ftp holdings that offered a different RINEX compression option were eliminated for older data so that disk space could be preserved.

The bar graphs show annual and cumulative archive data volume growth through time for the primary copy of GPS files.

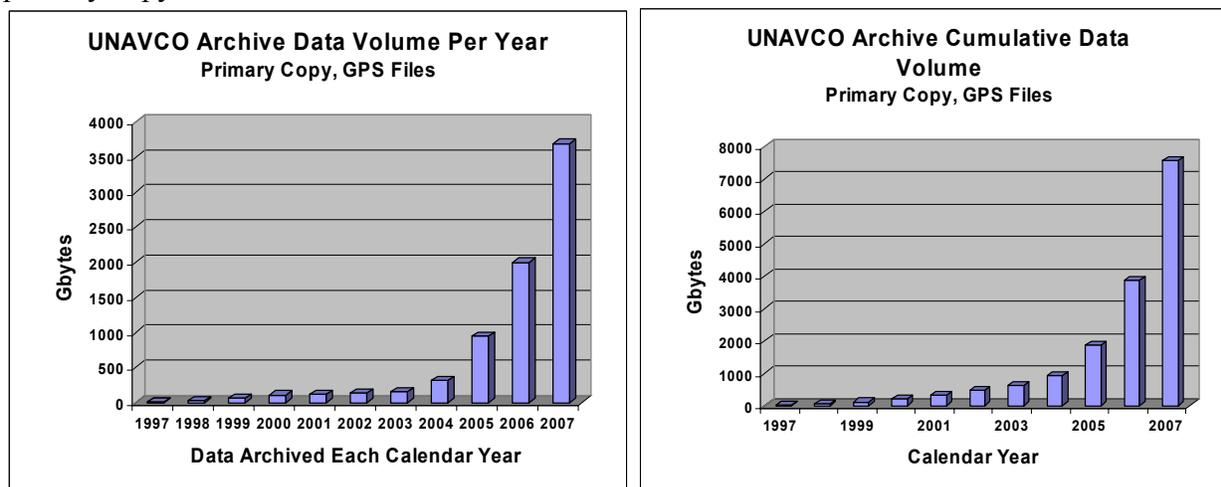


Figure 20. Archive data volume by fiscal year and (right) cumulatively plotted.

Permanent Stations. Currently, 1545 active global permanent stations are being archived at UNAVCO. An additional sixteen sites from a variety of global networks (not including PBO) were added this quarter for automated archiving.

Campaigns. Archiving was completed for twelve campaigns this quarter (Central San Andreas 2007, Chhota Shigri Glacier 2006, Ethiopia Continuous 2007, Greenland Supraglacial Lakes 2006, Kennicott Glacier 2006, Wabash 2007, Washington 1995, Washington 1996, Washington 1998, Washington 1999, Washington 1997, Washington 2000)

Plate Boundary Observatory Data Support. Seventy-six new PBO sites were added this quarter. High-rate data from over 500 PBO stations collected in association with the August 15, 2007 Peru earthquake contributed to the 916 Gb (uncompressed) of high-rate data archived during the quarter.

GGN-SENH Data Support. During a planned power outage at JPL in November, UNAVCO successfully performed the backup role for data flow, RINEXing and delivery to CDDIS and JPL for 29 GGN stations. This quarter's support also included improving the reporting of problems via automated e-mail. A few sites requiring special handling to resolve problems.

Data Pickup. A monthly average of 917,265 data files were picked up from the Archive ftp server. Additionally, a monthly average of 213,377 QC files, sitelogs, GSAC holdings files, product files, campaign log images, and other GPS-related files were picked up from the Archive ftp server.

IT Infrastructure and Software. Database schema improvements were implemented to improve query speed for data search and access through archive web pages. The UNAVCO server room HVAC upgrades were initiated this quarter.

Total Storage. The total storage (compressed) for the primary archived copy and the public copy of all GPS data in the archive is 8.9 Terabytes. (During November, close to 2 Tb of storage was recovered due to cleanup of a second copy of older data that is no longer required to be available for primary access.)

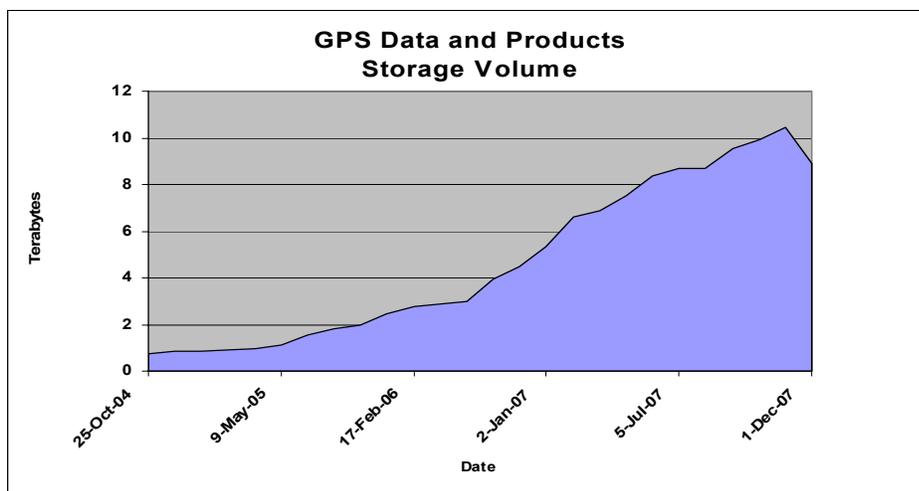


Figure 21. GPS data and products storage volume

1.3 Education and Outreach Activities

UNAVCO's Education and Outreach Program has moved towards the accomplishment of its goals this quarter through disseminating knowledge and scientific discovery of modern geodetic science and the use of UNAVCO's tools to access data in the education community; in broadening participation in geoscience; in building a sustainable community of educators and researchers working together toward geoscience education; and in collaborating with other organizations in mutual goals.

1. Designing the materials for a UNAVCO presence at professional meetings and staffing a booth in the exhibit hall are significant parts of our outreach to the broader geoscience community. During this quarter, we added content on new initiatives in UNAVCO, namely Interface TLS, WinSAR, and more Polar content. There was a 'buzz' around the UNAVCO booth during the 2007 GSA meeting (Figure 22) as new community members who are and who will be using the TLS came by to view equipment, to hear about digital scanning, and to ask about the use of equipment in their research. A new information sheet was produced to accompany this equipment in the booth. A new booth was also designed during this quarter for production prior to December AGU. This is a large design project for content and visual impact that uses significant personnel and monetary resources and will not be repeated for 5-8 years.



Figure 22. Education Specialist Celia Schiffman reviewing material prior to staffing the UNAVCO booth at the 2007 GSA Annual Meeting in Denver.

2. RESESS (Research Experience in Solid Earth Science for Students)
The major activities of RESESS during the third quarter were recruiting students for 2008, participation at the SACNAS (Society for the Advancement of Chicanos and Native Americans in Science) and NABGG (National Association of Black Geologists and Geophysicists) conferences, publication and distribution of the summer 2007 interns'

research, and starting the planning process for renewal of the RESESS program in 2009-2013.

Four RESESS interns presented at national meetings during this period:
National Association of Black Geologists and Geophysicists, Sept, Phoenix:
Thompson, Lennox, Displacement Modeling of Volcanic Magma Chambers

Society for the Advancement of Chicanos and Native Americans in Science:
Fornash, Katherine, Trends in plant-insect interactions in the Cenozoic

Feliciano, Emanuelle A., Historical Seismicity of the Northeastern Region of Russia: A Perspective on the M7.6 Earthquake on Koryakia, Russia

Patlan, Ezer, Development of a Power and Communications System for Remote Autonomous GPS and Seismic Stations in Antarctica

S. Eriksson worked with other women interested in diversity to plan and present a workshop at SACNAS entitled “Being a Minority in a Majority Setting”. This workshop was attended by 37 people who gave very high ratings on the workshop and recommended it be presented again at subsequent SACNAS meetings (evaluations submitted to SACNAS administration).



Figure 23. (left) UNAVCO Education and Outreach Director, Susan Eriksson, was one of the organizers and presenters for “Being a minority in a majority setting” at the 2007 national SACNAS conference. Presenters were Dr. Audeliz Matias (left), Dr. Lina Patino, Dr. Jacqueline Bolman, and Dr. Susan Eriksson (right). (right photo) RESESS intern Ezer Patlan presented his research on the Polar MRI equipment design at SACNAS.

Two other major activities at the SACNAS Conference was the shared booth space with EarthScope and IRIS and the third year of sponsoring a field trip for SACNAS participants interested in geoscience. Due to the exceptional response to these field trips over the past two years, we hired two large buses and included more organizations in sponsorship, planning, and implementation. Although over 50 people attended most of the day, more coordination is needed. The SANCAS registration processes need to be modified in order to make this field trip more structured. We will continue to participate with other geoscience organizations and SACNAS administration to improve this experience for a greater number of students and teachers.

3. Disseminating Scientific knowledge

UNAVCO has hired a new ‘content specialist’ to help target geodetic scientific material for various target audiences. During this quarter we rewrote introductory lectures for our workshops to better serve both college and secondary faculty participants.

Table 10 shows workshops provided September–November 2007 and Table 11 lists projected professional development workshops for January–June 2008.

Table 10. Professional development workshops provided September – November 2007

Event	Type	Secondary-Ed Faculty	University Faculty	Scientists/Community Members	Other education professionals
* GSA Short Course	4-hr Short Course	7	6	1	1
NSTA Area Conference Denver, CO	1 hour workshop	17			
CAST (Conference for the Advancement of Science Teaching) Austin, TX	4 hr short course	5			
Total reached		29	6	1	1

* A poster was presented at the Geological Society of America, Denver to disseminate lessons-learned from curricular and workshop development:
Olds, Shelley and Eriksson, Susan; Bringing GPS data and data-rich activities into college and secondary Earth science classrooms

Table 11. Professional development workshops planned for January - June 2008

Event	Type	Secondary-Ed Faculty	University Faculty	Scientists/Community Members	Other education professionals
NAGT	1-hr		15	2	15
GSA – Rocky Mtn/ Cordilleran	4-hr Short Course	5	30	2	2
UNAVCO Workshop	4-hr	5	5	20	20
NSTA-Boston	4-hr Short Course	30		3	
RESESS	3 month internship		7	14	7
Master Teacher & Faculty In-Residence		1	1		
Total projected		41	58	41	44

4. Building a sustainable community of scientists and educators takes on many forms of activities. UNAVCO E&O works closely with several faculty researchers to design and

implement programs that address broader impacts of their science. Eriksson provided letters of support to three researchers this quarter for research proposals. E&O assisted with planning of three newly funded projects and one group project which commenced during this quarter.

Mien Liu is heading a group of UNAVCO community scientists for a geophysical study of China. This is a five year project with high expectations for the educational component. Eriksson worked with Liu on designing this component and is working with him and his collaborators, as well as IRIS E&O for the years 2008-2012.

G. Wang of U. Puerto Rico, Mayaguez has received funding for a GPS network and we continue to plan for components for undergraduate research associated with the UNAVCO community through RESESS and his newly funded REU and for planning components for secondary teachers and undergraduate curriculum.

K. Ellins of the University of Texas at Austin is planning her 5 year project to increase geoscience knowledge among middle school and secondary teachers in Texas to prepare for a capstone course beginning in 2009. UNAVCO will present workshops in her project during 2008-2011.

POLENET in the UNAVCO community spans Greenland to Antarctica and is associated with the UNAVCO/IRIS project to work with our community to integrate new technology to serve the POLENET science. During this quarter, we have initiated collaboration with the science community led by Terry Wilson for educational and outreach POLENET programs, initiated inclusion of Polar science in our teacher and faculty workshops, and started work on POLENET content on museum exhibits.

5. Aside from collaborating with various people in SACNAS, NABGG, teachers, faculty, and researchers in the UNAVCO community described above, we have more formal collaborations with EarthScope. Eriksson participated in the two day EarthScope E&O Standing Committee meeting in early October, reported on UNAVCO work on PBO/EarthScope activities, and plans for the next year of collaboration with IRIS, the ENO, and the EEOSC. Two new people have been hired at UNAVCO for this work. The EarthScope Content Specialist (ECS) for UNAVCO is contributing to the accomplishment of the goals outlined in the EarthScope Education and Outreach (E&O) Implementation Plan, focusing on the Plate Boundary Observatory (PBO). The ECS began work October 1, 2007, so this report only covers October and November.

The ECS has compiled the first draft of an asset map for both UNAVCO and EarthScope, which is an inventory of all printed and multimedia educational materials that has been generated by the E&O team, past workshops, and other accomplishments. A first review of all the materials on the old EarthScope E&O website has also been completed (including ~600 links), and suggestions as to where the material should go, if it should be kept or not, and new categories are included with the review. Work has begun on a collaborative one-pager between IRIS and UNAVCO on Cascadia ETS and on developing content for an Active Earth museum display and will focus on background

material about GPS and Cascadia Episodic Tremor and Slip (ETS) and. A highlights-piece for the recent Conference for the Advancement of Science Teaching in Austin, Texas was written for the EarthScope webpage. A metric of success is the completion of the asset map and initial website review were completed on schedule.

PBO siting outreach has continued with the hiring of a dedicated person to make presentations at specific PBO sites and regions who have requested activities to engage students and the communities in this project. Significant activities include an inventory of which sites are priorities for outreach activities, building relationships with the engineering staffs in the various regions, mailing UNAVCO educational and outreach materials to specific schools and people, and starting to schedule work for 2008.

6. Evaluation

As part of the E&O program funded through the PBO Nucleus project, we have distributed a web-based questionnaire to our former workshop and short course participants. This questionnaire focuses on the courses taught and the usefulness of the UNAVCO E&O materials in their teaching which will help us prepare our future professional development workshops, modify curricular materials, and provide a measure of how well the E&O is doing in its mission.

The questionnaire was distributed to approximately 115 former participants in late November (Figure 24). After one week of the survey being available, thirteen responses have been submitted, with ten volunteering to be interviewed by our independent evaluator. Our goal is to have twenty-five respondents volunteering to be interviewed.

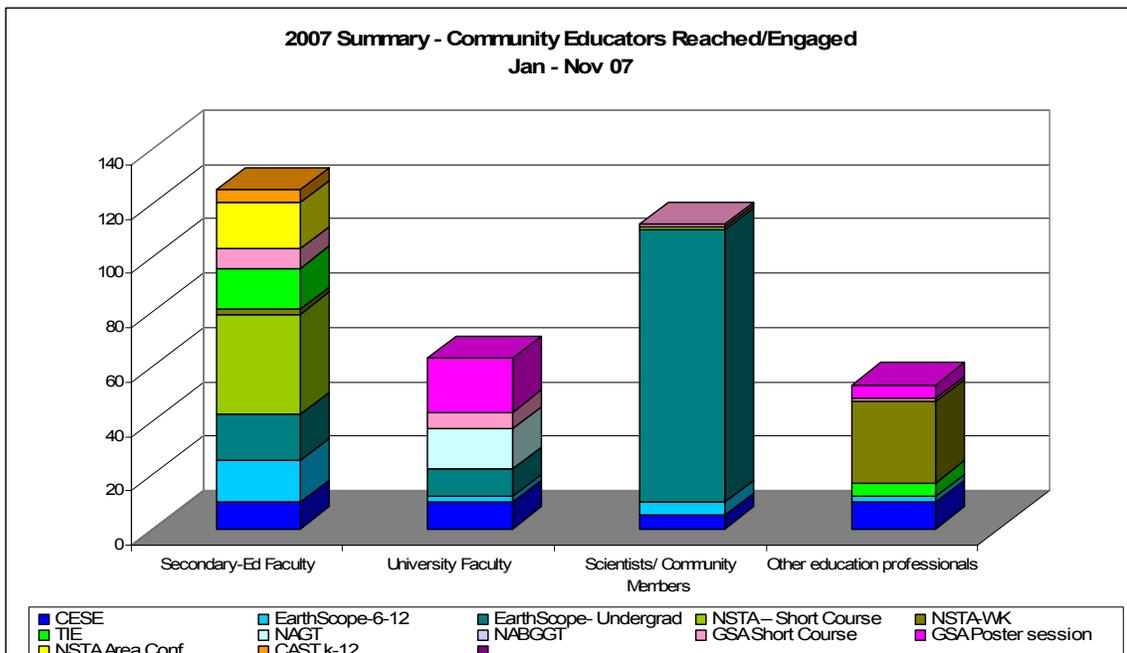


Figure 24. Types of courses and educators receiving evaluation questionnaire

Web Metrics. Figure 25 reflects the number of individual E& O web pages viewed Apr 2005 -Nov 2007. Figure 26 reflects total times all E&O pages were viewed Apr 2005- Nov 2007. Note the spike of activity in Oct 2007 was when the GSA Short Course was presented.

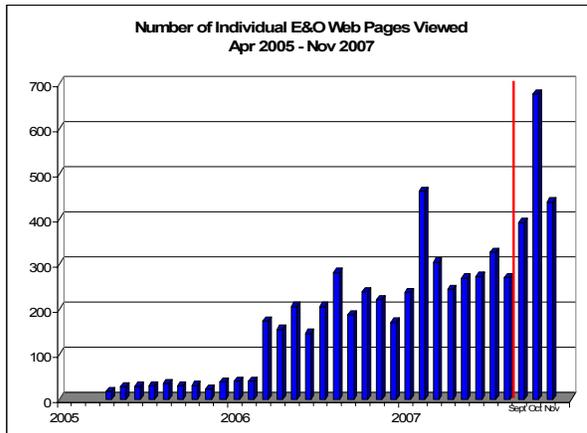


Figure 25. Individual web pages viewed

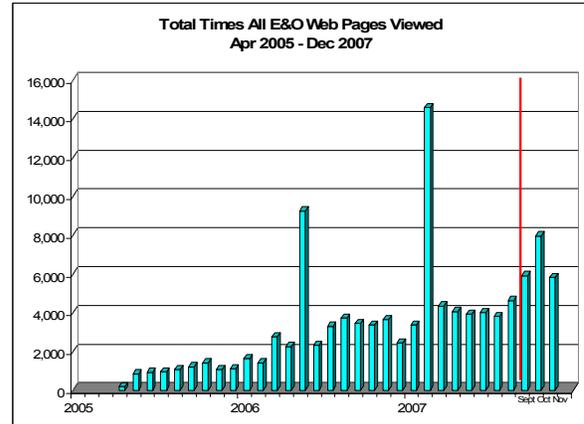


Figure 26. Total times pages were viewed

8. Other work

As part of our response to the NSF panel's comments in the cooperative agreement, we are initiating a more formal program to work with the media. Eriksson visited with personnel at the Joint Oceanographic Institutes and AGU. Material from these meetings is being integrated into a plan for UNAVCO.

The E&O Director:

- visited NSF in early October to meet with J. Karsten regarding priorities for the 2008 OEDG program;
- completed a report on the March, 2007 workshop led by UNAVCO to bring heads of E&O programs in large projects, facilities, and centers together;
- worked with four new staff members on orientation and planning work for the E&O program;
- hosted the E&O Standing committee with a high proportion of new members. A synthesis of E&O work was presented as an orientation to this committee;
- a finalized strategic plan for E&O was presented to the UNAVCO Board of Directors which was approved in early December.

Acknowledgement: Significant contributions to this report were made by Steve Fisher, Jim Normandeau, Bjorn Johns, Freddy Blume, David Philips, Fran Boler, Susan Eriksson, Angie Krantz and Chuck Meertens.