

# UNAVCO Facility Interim Report, April - June 2005

## EAR-0321760: Support of UNAVCO Community and Facility Activities

### 1.0 Quarterly Summary

The 2005 UNAVCO Annual Meeting, held this quarter, is a prime example of the community aspects of the *Support of UNAVCO Community and Facility Activities* Cooperative Agreement. This year, UNAVCO and IRIS held a joint annual meeting in early June in Stevenson, Washington. UNAVCO community participation continues to grow with about half of the 300 participants attending the meeting having UNAVCO ties. UNAVCO support for the meeting was provided through this Cooperative Agreement. Joint science sessions included geodetic and seismic presentations on the Sumatra Earthquake, Polar Geoscience, Explosive Volcanism, and Next Generation Imaging. In addition to the science talks and numerous posters, there were a number of science and technology Special Interest Group (SIG) forums. UNAVCO staff either led or played a significant role in seven SIGs listed below. The SIGs provided an excellent opportunity for the Facility to have open discussions with the community on technical support issues and to address new developments such as collaborations with IRIS on collocated GPS and seismic instrumentation (Figure 1).

#### Special Interest Group Topics with significant UNAVCO participation:

- Fran Boler (UNAVCO) and Tim Ahern (IRIS)  
Data Facilities: Access to UNAVCO and IRIS Data
- Chuck Meertens (UNAVCO) and Jim Fowler (IRIS)  
Field Experiments: State of the Art Seismic and GPS Instrumentation and Opportunities for Collaborative Experiments
- Freddie Blume (UNAVCO)  
PBO Nucleus
- Terry Wilson (Ohio State)  
Polar Sciences Issues and the International Polar Year (IPY)
- Mike Jackson (UNAVCO/PBO)  
PBO Component of EarthScope: A Construction and Data Management Update
- Susan Eriksson (UNAVCO) and John Taber (IRIS)  
Need Help with Broader Impacts? How to Fund and Host an Intern
- David Phillips (UNAVCO)  
Digital Photography Workshop: Improving Our Community's Image



**Figure 1.** Over 300 persons attended the joint UNAVCO/IRIS annual meeting in Stevenson, WA, June, 2005. In addition to focus science sessions, there were a number of Special Interest Group (SIG) workshops to discuss technological and scientific developments (for example the collocated seismic/GPS Field Experiments SIG, left photo). The SIGs provided an important opportunity for the UNAVCO and IRIS Facilities to get feedback from their communities. The field trip to Mt. Hood (right photo) provided an informative meeting break as participants learned about the geologic and seismic history of this important Cascades volcano.

### *Facility Activities*

The Facility continues to provide a wide range of support for NASA and NSF projects including network, field and technical engineering, equipment, data management, and archiving support. As discussed in more detail below, the Facility supports a number of university individual PI projects, the NASA GGN, EarthScope PBO and PBO Nucleus, and Arctic and Antarctic projects from the NSF Office of Polar Programs. The featured project this quarter is the Mauna Loa GPS network project (Brooks, U. of Hawaii PI). The network is operational and first results were discussed at the UNAVCO/IRIS annual meeting. UNAVCO also provided campaign engineering and equipment support for a 17-receiver deployment associated with the San Andreas Fault LIDAR mapping project (Bevis, OSU PI), one of the largest campaigns recently undertaken. The UNAVCO archive continues to expand with almost 30% of the total holdings acquired in just the first three quarters of this year. Facility engineers are supporting permanent station reconnaissance, installation and maintenance for permanent stations around the world and are working with the polar community to develop new technologies, including systems for deployment in extreme weather environments. In addition, UNAVCO Facility staff are participating in Education and Outreach activities including development of on-line geophysical mapping tools, participation in organizing the DLESE annual meeting, and supporting the first UNAVCO student intern for the summer.

Presented below are our featured Quarterly Highlight on the Mauna Loa project, a series of Facility highlights for the quarter, and detailed monthly reports for April, May and June, 2005.

### **1.1 Quarterly Featured Project**

Project: Mauna Loa Continuous GPS Network

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Principal Investigator : Benjamin Brooks (University of Hawaii)

Co-PI's: Asta Miklius (USGS), Don Thomas (UH), Peter Mougini-Mark (UH)

Funding Source: NSF EAR Geophysics and Instrumentation and Facilities

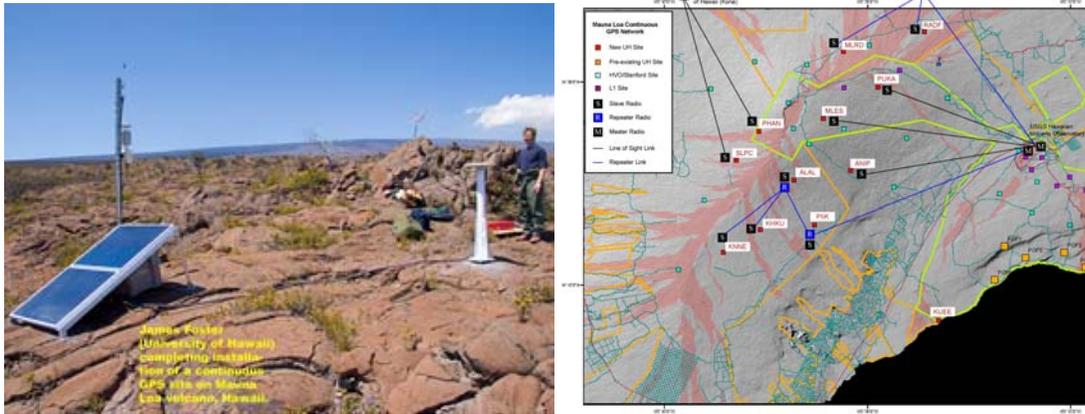
UNAVCO Engineer: David Phillips

Dates: March 2005

Location: Big Island of Hawaii

The University of Hawaii, the USGS Hawaiian Volcano Observatory and the UNAVCO Facility installed eleven new continuous GPS sites on Mauna Loa volcano, Hawaii, in March 2005 (Figure 2). Each GPS site consists of a Trimble NetRS receiver, a Trimble Zephyr geodetic antenna mounted to a Tech2000 or UH monument, and an Intuicom ethernet bridge radio. These sites will improve monitoring capabilities and will allow much more accurate models to be developed of the magmatic and structural processes at work within Hawaiian volcanoes. Mauna Loa, the most massive volcano on Earth, last erupted in 1984 and has recently shown signs of increased activity.

This new network increases the total number of continuous dual-frequency GPS sites on Mauna Loa to 24, the preexisting sites being installed by HVO and Stanford University. Additionally, 18 continuous dual-frequency sites operated by HVO, UH and Stanford are currently installed on Kilauea volcano. There are also 2 L1 CGPS sites on Mauna Loa and 10 L1 CGPS sites on Kilauea installed by HVO and UNAVCO. Data from all these sites are archived at the UNAVCO Facility. This project was funded by the National Science Foundation.



**Figure 2.** (left) One of the GPS stations installed on Mauna Loa and the network design and telemetry paths of the wireless IP system (right). Simplified monument designs allowed for rapid installation and the GPS and communications networking utilized technologies implemented and tested by UNAVCO for PBO. Synergism with PBO is not only helping drive the cost of GPS receivers down, but as the Mauna Loa experiment demonstrated, PBO/UNAVCO developments contribute to effective GPS network implementation.

## 1.2 Facility Highlights

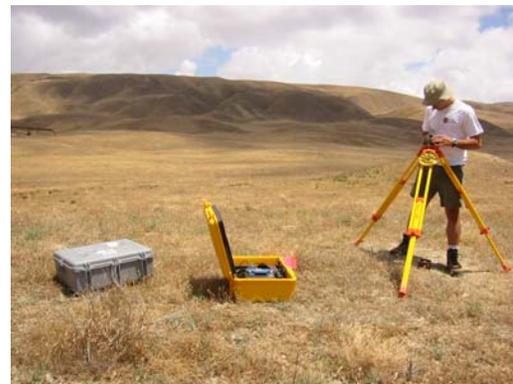
### NSF/EAR Program Support

#### *University PI Project Support*

Thirteen different projects funded by NSF/EAR programs were provided engineering and equipment support during the quarter (Table 1). The project mix included six permanent networks involving installation, operation and ongoing maintenance; four campaign or mixed mode projects involving episodic deployment of personnel and equipment; and one long term receiver test. Proposal planning and budget development support was provided for nine new projects proposed under NSF programs.

#### *NSF Network Operations and Management*

Approximately 95 troubleshooting incidents were handled involving stations monitored for NSF EAR funded PIs. This included resolving communication and equipment issues, shipping replacement equipment and working with local contacts to resolve problems. Automated GPS download software programs were updated for the new Trimble receiver types. New Ashtech downloading software was written and implemented. Trimble and Topcon receiver firmware was tested. A range of cold response tests of batteries and receivers were conducted for use in extreme environments.



**Figure 3.** Seventeen receivers from the UNAVCO pool were deployed by a large field team along the southern San Andreas Fault to provide ground control for an NSF EAR airborne LIDAR mapping project (OSU and USGS).

<b>Project Name</b>	<b>PI</b>	<b>Mode</b>	<b>Support Provided</b>
Mauna Loa	Brooks	Permanent Network	Install 12 NetRS GPS stations on Mauna Loa volcano, Hawaii.
BARGEN	Wernicke	Permanent Network	Extensive operations support to regional scale network. Planned and ordered equipment for 18 station network expansion.
Bhutan	Billham	Mixed Mode	Remote technical support and troubleshooting.
San Andreas Fault Swath Mapping	Bevis/Hudnut	Mixed Mode	Equipment and field support
Eastern Mediterranean	Reilinger	Mixed Mode	Equipment integration and remote technical support for multiple stations.
Pico del Aguila anticline 2005	Anastasio	Campaign/RTK	Equipment and field support.
Philippines Volcanoes	Hamburger	Permanent Network	Remote technical support and troubleshooting.
Pseudorange Bias Testing	Larson	Testing	Purchased environmental test chamber and began assembling laboratory equipment.
RETREAT/Italy and Croatia	Bennett	Mixed Mode	Equipment and field support.
SuomiNet	Multiple	Permanent Network	Support for a new station installation and an existing station. Over 30 of the Suominet stations are providing geodetic-quality data and some are being converted to PBO.
Costa Rica/Nicaragua 2005	Bilek	Mixed Mode	Equipment integration and remote technical support for multiple stations.
University of Missouri Equipment purchase 2005	Gomez	Permanent Network	Equipment integration and remote technical support for multiple stations
Greece CGPS Installations	Reilinger	Permanent Network	Equipment integration and remote technical support for multiple stations

**Table 1. NSF EAR Funded Projects Supported During Quarter**

*PBO Nucleus Project Support*

Work on upgrades continued during the quarter, with seven more existing stations now meeting PBO standards (Figure 4). Plans for further upgrades in California, Wyoming and Nevada in the near future are in place. Excellent data flow was maintained for all stations through coordinated troubleshooting when necessary - several onsite repairs were made by regional network operators as well as UNAVCO employees. Project personnel also took the lead in diagnosing and solving technical issues that arose with the PBO-standard CDMA communications hardware, and are helping to coordinate testing of the latest Trimble NetRS firmware release with PBO.



**Figure 4.** Over the course of the next few years over 200 regional GPS stations in the western United States and Alaska will be upgraded (network of stations at left). Where monuments and choke ring antennas meet PBO standards, such as the photo at the right, only the receiver and communications will be replaced.

#### *Plate Boundary Observatory Project Support*

Continued firmware version and accessory software testing was conducted by the engineering group for both NetRS and GB-1000 receivers to evaluate new functionality implemented by vendors for the PBO project. Campaign engineering support for EarthScope science projects was planned within the engineering group and staffing assignments were made. Campaign accessory equipment and packaging was procured. Planning for the PBO permanent stations at collocated US Array stations continued with a USGS/ASL system now being built. UNAVCO engineering and technical staff members are providing reconnaissance for several regional locations and support for a number of stations, including Alaska's Akutan Volcano installation.

#### *NSF OPP Project Support*

Arctic field support is in progress for 15 separate PI projects through the summer in Alaska, Greenland, and Russia. The 2005-06 Antarctic season planning is also underway for 25 projects using 80 GPS receivers, and discussions are in progress for UNAVCO to provide operations and maintenance support for USGS Antarctic permanent stations. An upgrade of the Palmer Station RTK system is also slated for later this summer. Support for Polar permanent stations continues to expand, with a prototype test site using Iridium communications recently established at the UCAR Marshall Facility south of Boulder and Niwot Ridge (Figure 5). At the June UNAVCO/IRIS Annual Meeting a session was dedicated to Polar Geosciences, and UNAVCO is currently engaged with the community to develop a remote Antarctic Observatories infrastructure proposal for the International Polar Year.



**Figure 5.** (left) Permanent station testing for polar projects at the UCAR Marshall Facility south of Boulder, CO, and at the U. of Colorado Niwot Ridge Facility at the continental divide west of Boulder (right).

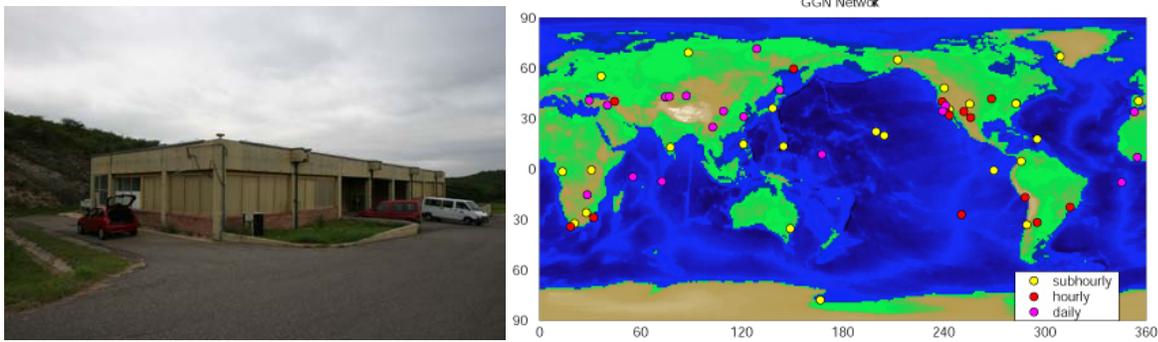
### **NASA/SENH Program Support**

Approximately 375 individual trouble and maintenance issues were addressed by the UNAVCO Facility during this quarter, including equipment, computer, and communications upgrades at several Global GPS Network (GGN) stations (Figure 6). Seven new GPS receivers were tested, configured, and deployed to replace faulty or suspect Ashtech CGRS receivers. Four new Linux computers were deployed to upgrade GGN stations, and one station was decommissioned and the equipment returned to UNAVCO. New equipment was sent to Diyarbakir, Turkey for the re-establishment of this station. VSAT communication equipment was upgraded and finetuned for two remote stations (Easter Island and Gabon). Plans are in the works for a wireless Internet upgrade in Seychelles, which will greatly enhance the communications from this station. Also, plans are being laid for a proposed Internet upgrade at Solar Village, Saudi Arabia.

Upgrade plans were finalized for Guadalupe station (in collaboration with SCIGN). Two GGN Ashtech CGRS receivers are on loan to Smithsonian/Harvard in support of the Accurate Realization of GPS Vertical Global Reference Frame project (NAG5-13748).

Warranty repairs of receivers exhibiting poor tracking performance are ongoing and being performed by the manufacturer in a timely manner. So far eight GGN (12 total Facility) receivers have been repaired, and faulty receivers are being sent in for repair as they are being swapped out or fail. It should be mentioned that there is significant effort and cost associated with retrieving and replacing receivers at installed locations around the world.

The FY2005 NASA statement of work (FY05-SOW) was finalized in conjunction with the relevant JPL staff members. New tasks will include planning for enhancements to IGS reference frame stations to improve the stability of time series observations at core locations, performance and functional evaluation of GPS receivers that could be adopted within the GGN in the future, establishment of operating agreements at new station locations and increased business operations support to the IGS Central Bureau. Also, a new equipment test station is being planned in Boulder for investigation of receiver and antenna performance, equipment mixing, and new GPS observables issues. New L2C capable receivers have been purchased to support testing of this new observable at existing GGN stations.

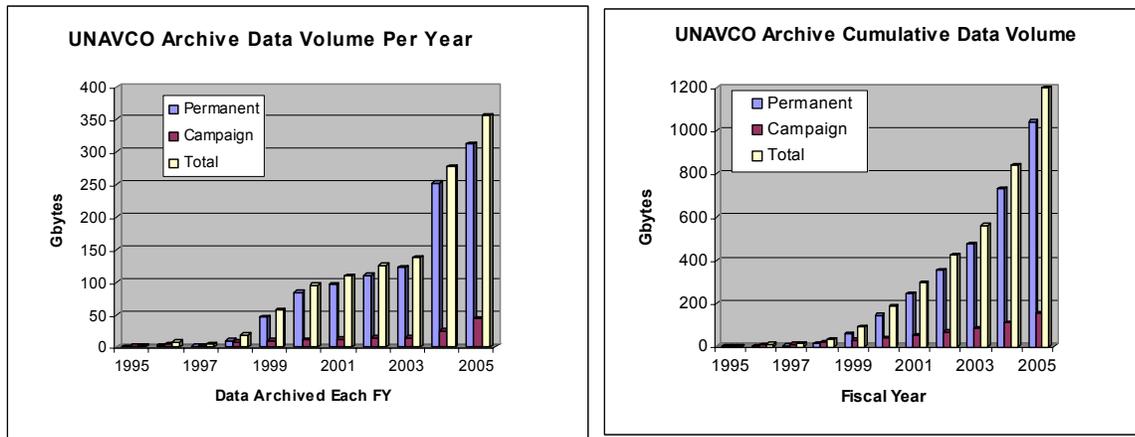


**Figure 6.** (left) A UNAVCO engineer performed an equipment upgrade at Cordoba, Argentina, on one of the NASA/JPL GGN stations (right) supported under this cooperative agreement.

## UNAVCO Archiving and Data Management

*Permanent Stations.* Currently, 624 active global permanent stations are being archived at UNAVCO. Twenty-eight new PBO sites were added this quarter. An additional seven sites from a variety of global networks were added this quarter for automated daily archiving.

*Campaigns.* Archiving of ten campaigns was completed this quarter. The ten campaigns are: American Samoa 2004, Arenal 2003, Denali 2004, Denali Earthquake 2002 High Rate, Eastern Mediterranean Armenia 2002, Eastern Mediterranean Azerbaijan 2002, Irian Jaya 2004, Morocco 2004, Parkfield Earthquake 2004 High Rate, San Simeon Earthquake 2003 High Rate.



**Figure 7.** UNAVCO Archive holdings continue to grow at a very rapid pace. The volume of data archived to date in FY2005 already accounts for approximately 30 percent of the total Archive volume. Shown are the data volume (left) and cumulative data volume (right).

*Plate Boundary Observatory Data Support.* Archiving of PBO data continues. During this quarter, several stations were configured to deliver high rate (5 samples/sec) data, and 23 station-days of high rate data were archived. Archiving of the high rate data at this stage requires some manual handling. In order to facilitate future high rate archiving, henceforth all sites will initially be set up for both 15 sec/sample and 5 sample/sec data archiving. This doubles the effort up front, but will allow more rapid archiving and availability of high rate data in case of an event in the future.

The UNAVCO Facility Archive is constructing the PBO Secondary Archive hosted at the IRIS Data Management Center in Seattle, Washington. During this quarter, the Facility System Administrator visited IRIS and worked out specifications for the computer system that will host the Facility's archiving software, database, and ftp server. The data management software to be used for archiving is a modification of the software used in Boulder. After some design and development this quarter, the initial version of this software is ready for installation. The archiving computer system has been delivered to IRIS. When they have completed physical installation, UNAVCO's data management and archiving software installation will commence.

*Nucleus Data Support.* Data from all 209 sites of the Nucleus network are now being archived and made available through the UNAVCO Archive. The UNAVCO Archive already has complete holdings for 57 sites of the Nucleus network. Historical data for the other 152 sites is being gathered in support of the PBO and Nucleus data analysis effort. Historical data going back to January 1, 2004 is now in hand for all sites, and older data will continue to be gathered until the complete historical collection is available through the UNAVCO Archive ftp site.

## **General Support and Infrastructure Development**

### *Facility Equipment Support*

The Facility Equipment Group prepared and shipped materials for eighteen NSF project requests and six NASA/GGN requests this quarter. As part of an on-going property management upgrade, a new red "Property of UNAVCO" tag is being attached to important equipment that is not considered Government Property, but will be tracked as such by the UNAVCO property management system. An internal property management audit is underway. Preparations are underway for establishing a new equipment repair lab at the Boulder Facility.

### *PBO/Warehouse Activities*

Preparations are being made for the PBO fourth quarter shipment to each of the regions. The Facility prepares quarterly shipments of assembled enclosures, solar panel mount kits, and communications kits and ships them to each of the regional offices and coordinates direct shipments of materials such as monument steel and grout to the regions. This year over 200 GPS systems will be shipped and installed by PBO. This will grow to 250 next year. The UNAVCO Boulder warehouse is working with the regions to assist in maintaining accurate data in the Inventory database. This activity includes quarterly physical counts at each region and tracking of GPS installations and equipment as they occur.

PBO Year 3 materials forecasts are being developed with regional staff. With this information, the Equipment Group's "Materials and Supplies" budget, quantities, and time-phasing for PBO can be developed. A Forecasting module has been developed in the Inventory Database. This will assist with the forecasting activity described above. In addition to remote assistance, staff deployed to Washington's Olympic Peninsula for a week to assist with the first borehole strainmeter installation to learn about the equipment used. Staff also deployed to Alaska for a month to assist with PBO's Akutan Volcano GPS installations.



**Figure 8.** Richmond, CA, PBO Warehouse – one of 5 regional PBO offices. The UNAVCO Facility Equipment Group handles shipment of PBO equipment to the regional PBO offices and tracks the location of UNAVCO equipment worldwide.

### *Health and Safety*

The UNAVCO Facility Safety and Project Coordinator visited the Northern California PBO Office to examine their health and safety processes and a visit to the Southern California PBO Office has been scheduled. UNAVCO has scheduled its annual Boulder Facility Health and Safety Audit with its consultant. Bear awareness and Firearms safety classes were conducted for PBO in the Anchorage office.

### *Building Facility Activity*

Construction on the new Facility offices and renovation of the Facility seminar room was completed this quarter. The first class, the UNAVCO Strain and Stress workshop, will be underway in mid-July and will be attended by over a dozen professors and students from around the country. Activation of the new Boulder Facility Card access system and upcoming alarm system will increase building security.

## 2.0 UNAVCO Facility April-June 2005 Monthly Reports

### 2.1 April 2005

#### Facility Data Group (Fran Boler)

##### NSF/EAR Data Support

- Routine archiving of permanent stations proceeded with 85 Gb archived.
- Two new permanent stations were added for ongoing data management and archiving (CORs: PUB2 and ). Currently, data from 618 sites are actively managed and archived.
- Archiving was completed for five campaigns (Denali 2004, Morocco 2004, Eastern Mediterranean Armenia 2002, Eastern Mediterranean Azerbaijan 2002, Arenal 2003) this month. Data for four new campaigns was received.
- 222,871 files (99 Gb) of data were picked up from the ftp area during the previous month.
- Data requests for 15 campaigns were filled totaling 4.2 Gb.
- New automated reports were developed and put in production for UNAVCO engineers to track sites which are in need of repair.
- New functionality was added to the permanent station maintenance form for recovering from errors in metadata entry.
- Improvements to the code that allows harvesting of metadata from IGS-style logs directly into the permanent station database was completed.
- The Archive Oracle database schema is under revision to address efficiency improvements for permanent station data archiving.

##### NSF/EAR NUCLEUS Data Support

- SCIGN: Routine archiving of 22 additional SCIGN Nucleus sites began this month, including three sites that were repaired this month. Four sites are currently not operational. Historical data has been archived for 45 sites going back to January 1, 2004; this task continues for the remaining SCIGN sites. All operational SCIGN Nucleus sites are being archived.
- PANGA: 22 sites are currently archived. Historical data has been archived for 19 of 22 sites going back to January 1, 2004.
- BARD: Ten sites are currently archived. For all of these, historical data going back to January 1, 2003 have been archived.
- All data are available for the other 57 sites that are part of the AKDA, BARGEN and EBRY western networks making up the Nucleus project.
- NetRS conversions for 5 Nucleus sites required new data handling procedures to be put in place.
- A discussion of procedures for handling data from non-NetRS NUCLEUS sites was held with PBO data management staff.

### **NSF/EAR Plate Boundary Observatory Data Support**

- Thirteen sites (P015, P028, P217, P262, P267, P268, P401, P430, P476, P498, P501, P506, P600) were added to the Archive metadata databases and archiving of raw data with RINEXing was initiated. There are now a total of 116 sites with archived data.
- Six sites were set up for archiving of high-rate data. Eventually only two sites actually delivered high-rate data.
- The application of new firmware to a number of active receivers required manual handling for files archived for the day of change in each case.
- A list of UNAVCO Archive contact persons for various responsibility areas outlined in the subaward statement of work was submitted to the Data Products Manager.
- The Facility Data Group Manager participated in the Data Products Working Group conference call on April 4, 2005.
- The Facility Data Group software development team worked on requirements for software for interim phase PBO data mirroring to the Secondary PBO Archive.
- Accounting charge numbers were set up by the PBO Cost-Schedule Coordinator after discussions with the the Facility Data Group Manager.
- Plans were made for the UNAVCO Facility System Administrator to visit IRIS during May to finalize plans for the computer system that will be ordered for the Secondary PBO Archive housed at IRIS.

### **NSF WInSAR Archive Support**

- The UNAVCO WInSAR system was tested and data upload from Stanford node was requested.

### **Infrastructure**

- A firewall issue that was causing intermittent timeouts for certain operations on our ftp data server was investigated and corrected.
- The last remaining upgrade to the jules mapserver opteron cluster was completed.
- Software migration and testing is underway for new hardware to be implemented for data management.

### **Software Development**

- As part of ongoing improvements to TEQC RINEX translation capabilities, revisions were made to the signal-to-noise flags definitions.
- Leica system 1200 MDB data formats were added to the TEQC translation capabilities.
- An old issue with translation of Ashtech B-files from LM-XII2 receivers was recognized and addressed.

### **Database Services to Headquarters, Facility, and PBO**

- A test SQL environment and database connection was create for tracking the NetRS firmware upgrade for PBO.
- Improvements were made to the inventory system, adding a delete transfer function and a breakout kit function. Schema changes were made for inventory forecasting.

## **Education and Outreach**

- Staff attended the DLESE Data Services workshop and began working on Earth Exploration Toolkit chapter on measuring crustal deformation for 9<sup>th</sup>-graders.

## **Engineering Group (Steve Fisher)**

### **General**

- Trimble NetRS firmware version 1.1-2 was delivered and acceptance testing continued with long term OS stability testing currently being conducted.
- Circulated community note about NetRS issues, expanding on information circulated by Trimble to include notification of diode hardware problem.
- Upgrading six pool Ashtech uZ receivers with new firmware and capacitor.
- Continued testing of troubleshooting of GB-1000 firmware version 2.5 including hardware failure that occurred during upgrade process on one unit. Extensive communication with Topcon personnel on these issues. Finalized BINEX and other specifications with Topcon for upcoming GB-1000 firmware release. Confirmed with Topcon that failure of external card logging and communications in GB-1000 is due to controller formatting function and developed a temporary workaround while Topcon develops a permanent fix.
- Continued testing of Iridium SATCOM system – still investigating RFI issues and mitigation.
- PC104 long term system testing continues in communication laboratory.
- Continued various cold response tests of batteries for use in extreme environments.
- Continued evaluating backend functionality of project planning database. Will coordinate implementing improvements with S. Jeffries over next few months.
- Filled project engineer position in engineering support section. Primary duty is to help with Nucleus project implementation and PBO campaign coordination.
- Hosted visit by Leica Geosystems VP of Engineering Solutions and Director of Federal Affairs. Leica unveiled new UNAVCO pricing. Support issues were discussed.

### **NSF-EAR University PI Project Support**

- Mauna Loa 2005 (B. Brooks): Completed the installation of 12 station permanent network consisting of Trimble NetRS receivers, power systems and IP communications.
- RETREAT Part I (R. Bennett): Preparation of 8 NetRS campaign systems for deployment to Italy to be installed for 3 months of continuous operation.
- San Andreas Fault Swath Mapping (M. Bevis ): Preparation of 17 R-7 systems with Choke Ring antennas for a very high-resolution topographic survey of the San Andreas fault (SAF)
- Saudi Arabia (R. Reilinger): Shipped the PI two 5700 systems and ancillary equipment for permanent station installations.
- University of Missouri Equipment purchase 2005 (F. Gomez): Assisted with specifying the ancillary equipment required to allow existing GPS equipment to be used for Campaign and permanent deployments.

- Sumatra (J. Galetzka): Supporting equipment purchase and configuration for installation of 20 permanent network stations.
- Toolik GPS data automation (A. Balsler): Created custom download and conversion scripts to manage data generated by the Toolik Field Station NetRS base station.
- Pico del Aguila Anticline (D. Anastasio): Equipment has been sent to Barcelona. The project looks to determine high-resolution, long-term deformation rates utilizing Milankovitch rhythms in growth strata.
- Highbourne Cay (P Reid): Provided assistance with specifying an RTK system for permanent installation on Highbourne Cay.
- San Juan Mountains 2005 (J. Neff): This project is focused on understanding interactions between substrate geochemistry and the composition and dynamics of terrestrial ecosystems. The project is based in the San Juan Mountains near Silverton, CO.
- Active Tectonics of the Monument Hill Fault System (D. Anastasio): Active Tectonics Along the Eastern Margin of the Red Rock Graben, Red Rock 7.5' Quadrangle, Montana
- Proposal planning and budgeting: Provided proposal planning and budgeting support to two new projects being proposed under EAR programs.
- Calibration Experiment for Pseudorange: continued support for PI's staff.
- Acceleration Calibration Experiment (P. Elosegui): Continued technical and equipment support to project assess the GPS capability for detecting short-term transient motions.
- Yucca Mountain Network Expansion (B. Wernicke): Continued testing and assembly of equipment at UNAVCO. PI staff is working on permitting and building monuments. Currently expect late summer instrumentation installation.
- Proposal planning and budgeting: Provided proposal planning and budgeting support to two new projects being proposed under EAR programs.
- Guadalupe VSAT service terminated. Site visit to Guadalupe Island for upgrade w/ SCIGN in progress. NetRS receiver was ordered for SCIGN, trip being planned.
- Network O&M: Approximately 25 troubleshooting incidents were responded to on the 271+ stations monitored for EAR PIs.
  - Saudi Arabia (R. Reilinger): HALY,SOLA,NAMA
  - Mid America (R. Smalley):- PTGV
  - Mediterranean GPS Network (R. Reilinger): TETN, IFRN, new computer for Diyarbakir
  - Las Vegas (G. Blewitt): UNR1
  - SBAR (B. Wernicke): RYAN, CRAT, GABB, RELA, REPO, ROGE, ECHO, RAIL, DYER
  - NBAR(B. Wernicke): MINE, NEWS, UPSA,SLID, BAMO,LEWI, COON, ELKO, TOIY, TUNG, SPIC, EGAN
  - Bhutan (R. Billham): TIMP, RBIT
  - Yellowstone (B. Smith): LKWY

- Guerrero Coast (K. Larson): CPDP,COYU
- Mount Washington (): MTWO
- Philippines (M. Hanburger): TAAL
- Northwest Mexico (R. Bennett): USMX

### **NSF-EAR Plate Boundary Observatory Project Support**

#### *PBO Permanent GPS Network*

- Provided engineering group staff member for Southern California region station reconnaissance for two week field trip, plus reporting time.
- US Seismic Array: Continued assembly and testing of equipment and consulting on site selection and installation with IRIS staff.

#### *Earthscope Campaign Projects Support*

- Completed design and order of custom 32 watt solar modules for campaign system with CT Solar.
- Finalized design and received shipment of custom foam inserts for Campaign System Boxes.
- Developed (with Rick Bennett and Dan Johnson) NSF Supplement request to fund Cascadia ETS Campaign in summer/fall 2005.
- Approved requests, configured equipment, and trained and instructed PBO regional staff for use of TopCon systems for reconnaissance - 3 to NCAL and 1 to RM regions.
- Developed tentative plan with Rick Bennett for campaign in Joshua Tree N.P in late May/early June.
- Approved plan to use 8 TopCon systems for Doug Schmidt's Oregon Coast campaign in late June/early July.
- Assisted Mike Bevis and students with instruction, troubleshooting, and data QC of GB-1000 system.
- Tentative plan to purchase and configure 4 GB-1000's for RTK surveys in PBO regions.
- Met with Colorado Geological Survey Director Vince Matthews to discuss potential PBO role in supporting CGS earthquake hazard research.
- Earthscope Campaign System Summary: 28 Total, 20 in-house, 3 at PBO NCAL (Coyle), 2 on MSH (Lisowski), 1 PBO RM (Lyman), 1 OSU (Bevis), 1 MIT (McClusky). Total requested this month: 12

### **NSF EAR PBO Nucleus Project Support**

- Extensive hardware and software troubleshooting of stations in all networks in all states of the Nucleus network.
- Devised detailed plan with PBO and Facility Data Management to transition archiving of Nucleus data from the Facility to PBO in the next few months, including PBO downloading of upgraded stations, notification of problems, naming of stations to PBO specifications, and integration of all data into analysis stream.
- Finalized Statement of Work and initiated sub-award for UCSD Glendale strain meter.
- Drafted Statement of Work for Caltech/BARGEN sub-award am close to finalizing document with Nathan Niemi.

- Discussions and conference calls with Berkeley and USGS personnel regarding technical and permit issues of BARD station upgrades.
- Planning and coordination of BARD upgrade at Hat Creek Radio observatory.
- Coordinated upgrade of AKDA station CLGO.
- Worked with SuomiNet and NOAA on data flow issues relating to upgrades and PBO data transition of common Nucleus/SuomiNet stations.
- Coordinated upgrade of EBRY station LKWY using shared USGS VSAT telemetry.
- Visited SCIGN office in Pasadena to train field personnel in upgrade procedures, and identify priorities and clusters for future upgrades.
- Upgraded SCIGN stations BKAP, NDAP, and LDSW, visited three others to determine equipment needs for imminent upgrades.
- Recon for PBO station P61 in Mojave National Preserve and on-site repair and firmware upgrade of P588.
- Planned and configured equipment for imminent upgrades of BARGEN, BARD, SCIGN, and AKDA stations in early May.
- Fielded and coordinated request for high-rate data at Nucleus and PBO stations in conjunction with NOAA airborne mapping survey.
- Coordinated and approved Tucson Basin Subsidence project using surplus Nucleus receivers from upgraded SCIGN stations (Rick Bennett PI).
- Investigated telemetry options for BARGEN stations not included in PBO B&R communication master plan.
- Investigated permit details of all BARGEN and many BARD stations to plan future PBO transition.
- Nucleus Network Summary: Upgrades to Date: 24, Upgrades this month: 5

#### *EarthScope Campaign Support*

- Continued testing of troubleshooting of GB-1000 firmware version 2.5 including hardware failure that occurred during upgrade process on one unit. Extensive communication with TopCon personnel on these issues.
- Completed design and order of custom 32 watt solar modules for campaign system with CT Solar.  
Finalized BINEX and other specifications with TopCon for upcoming GB-1000 firmware release.
- Confirmed with TopCon that failure of external card logging and communications in GB-1000 is due to controller formatting function and developed a temporary workaround while TopCon develops a permanent fix.
- Finalized design and received shipment of custom foam inserts for Campaign System Boxes.
- Developed (with Rick Bennett and Dan Johnson) NSF Supplement request to fund Cascadia ETS Campaign in summer/fall 2005.
- Approved requests, configured equipment, and trained and instructed PBO regional staff for use of TopCon systems for reconnaissance - 3 to NCAL and 1 to RM regions.
- Developed tentative plan with Rick Bennett for campaign in Joshua Tree N.P in late May/early June.

- Approved plan to use 8 TopCon systems for Doug Schmidt's Oregon Coast campaign in late June/early July.
- Assisted Mike Bevis and students with instruction, troubleshooting, and data QC of GB-1000 system.
- Tentative plan to purchase and configure 4 GB-1000's for RTK surveys in PBO regions.
- Met with Colorado Geological Survey Director Vince Matthews to discuss potential PBO role in supporting CGS earthquake hazard research.

### **Campaign System Summary**

- 28 Total, 20 in-house,
- 3 at PBO NCAL (Coyle)
- 2 on MSH (Lisowski)
- 1 PBO RM (Lyman)
- 1 OSU (Bevis)
- 1 MIT (McClusky)

Total requested this month: 12

### **NSF OPP Support**

#### *Antarctic*

- Submitted Support Information Package for Raytheon logistics support for 2005/06 field season.
- Equipment from field season returned and checked in.
- Palmer Station RTK/DGPS capability upgrade planning in progress.
- Retirement plan announced for oldest receivers in USAP pool.

#### *Arctic*

- Held GPS and RTK training course at the University of Alaska, Fairbanks (A. Balsler).
- Field engineer visit to upgrade RTK/DGPS base station to a NetRS at Toolik Field Station, Alaska (A. Balsler)
- Planning support for Barrow Biocomplexity project (C. Tweedie) and DGPS system support (G. Sheehan).
- Working with Science Coordination Office in planning a potential RTK/DGPS system installation at Summit Station, Greenland (J. Burkhardt).
- Remotely assisted RTK/DGPS system users at Barrow.

#### *General Support and Infrastructure Development*

- Attended and presented at Polar Technology Conference Research workshop hosted by Stanford at NASA Ames Research Center.
- Continued cold chamber (-50C) testing of GPS system batteries for engineering evaluation of remote Polar GPS systems.
- Continued Iridium system field validation at the Niwot Ridge test site.
- Tested and determined likely cause of failure with Iridium/NetRS system deployed in Antarctica in February.

- Planning with community for IRIS/UNAVCO meeting Polar Geosciences session and related activities.

#### *Equipment loan*

- USAP Patagonia glaciology project in progress (B. Hallet).
- Iceland Breidamerkurjokull project in progress (S. Tulaczyk).

#### **NASA Program Support**

- Ashtech MicroZ capacitor "recall" repairs and tests at UNAVCO ongoing. Ashtech CQ00 firmware tests and re-installations.
- Plan and diagram for GGN reference frame station at Marshall test site.
- Minor coordination on GGN/L2C tracking experiment.
- Approximately 155 individual NASA trouble or maintenance issues were handled during this month.
- Site highlights:
  - AREQ New connection on temporary IP. Backlogged data pulled, no real-time stream. Still awaiting resolution of new contract with NASA-HQ and University.
  - BOGT Some Internet problems with local provider. Ashtech equipment needs to return as five year temporary importation agreement is up this July.
  - CHPI Site private (no data publishing). New Ashtech receiver shipment ready and awaiting "green light" from Brazil.
  - CRO1 Cable upgrade confirmed. Still waiting on locals to install new cable in permanent conduit. Existing radome in-place. Old Ashtech Z-XII to return.
  - EISL Some more data copied over. Will stop using site, and have asked that equipment be returned.
  - GODE New rack mount delivered to site. Installation awaiting security screening at Goddard.
  - GUAM Established annual payment schedule. Internet paid through December, 2005.
  - HRAO MET-Pack installed. Pressure reading changed to mbar. New log submitted with correct hi-diff to GPS antenna. IGSSTATION email. Antenna connection (?) just went down ... currently no data.
  - IISC Power outages at receiver site. Network upgraded at IISC, computer IP natted through firewall, but no real-time stream after change. Locals are checking on this.
  - ISPA After a reasonable link throughput in most of April, the link deteriorated to be unusable after April 20th. Emailed IDA (same problem) and Mauricio.
  - MSKU VSAT link down after April 11th. Mauricio is shipping spare parts.
  - NLIB Site operations restored with new TR ACT receiver. Still using same antenna cable and ACT connected to H-Maser.
  - PIE1 Local data outages could be due to GPS jamming test at White Sand Missile Range, NM.
  - PIMO "New" desktop computer installed. Still problems with dropped packages.
  - RABT Computer clock synchronized to UNAVCO timeserver.
  - SANT New log submitted with updated Freq. Standard info.
  - SEY1 New wireless 24/7 Internet application in the works. Will replace current dial-up connection. New Ashtech uZ receiver shipped. Sorted out payment of phone bills to Scripps.

- SUTH Computer IP will probably change with network upgrade locally. Forwarded passwords and RTNT port info to Ludwig. No word yet on upgrade ...
- USUD Connection to receiver down April 17th. Repeated emails and fax has not yielded any response from locals.
- YKRO Internet connection problems again. And receiver needs replacement. No working TR at UNAVCO. Site private.
- ZAMB Network OK, but receiver needs replacement. Ludwig is pondering Ashtech purchase. Site data is private.

## Equipment Group (Chuck Kurnik)

### Facility Equipment Support

- Three NSF projects were shipped in April
- The Equipment Group continues to implement the new red “Property of UNAVCO” tag on important equipment that is not considered Government Property. Kurnik is auditing the process.

### Boulder Warehouse

- Last shipment of ~120 enclosures received.
- Started using deployment module in Inv DB
- Beginning development on Forecasting module

### Regional Warehouses

- Each region was contacted last week to discuss deployments. These will be put into the Inventory Database to better track quantities at regional offices.

### QC Issues

- One CDMA deployed to field – not in DynDNS service
- Radio kits overnighted to Chinle, AZ (RM install) incomplete Ordering
- Regional needs for SS pipe (DDBM) have been analyzed and ordered for each region if necessary.
- Supplier for NetRS “twist lock” connector has been located. Spare power cables can now be purchased for about half the cost Trimble charges.

### Akutan

- Boulder will ship supplies no later than 9 May
- John Symank will build and kit equipment at the AK office from 18-27 May
- Six redesigned Volcano huts will be completed by 13 May, and two more the following week
- Mencin will work with Symank to ensure that proper comms and spares are shipped to AK

## 2.2 May 2005

### Facility Data Group (Fran Boler)

#### NSF/EAR Data Support

- Routine archiving of permanent stations proceeded with 53 Gb archived.
- Nine new permanent stations were added for ongoing data management and archiving (Mauna Loa: ALAL, ANIP, KHKU, KNNE, MLES, MLRO, PIIK, PUKA, RADF). Currently, data from 627 sites are actively managed and archived.
- Archiving was completed for two campaigns totaling 45 Gb this month (Denali Earthquake 2002 High-Rate, Parkfield Earthquake 2004 High-Rate). The data for these two projects was from high-rate (1 sample/sec) permanent stations operating during the Denali and Parkfield earthquakes.
- 249,088 files (50.3 Gb) of data were picked up from the ftp area during the previous month.
- Data requests for 16 campaigns were filled totaling 3.1 Gb.
- New functionality was added to the permanent station maintenance form for recovering from errors in metadata entry.
- A system for simplifying image loading into the database was implemented for documentation of permanent stations.

#### NSF/EAR NUCLEUS Data Support

- SCIGN: Routine archiving of 120 SCIGN Nucleus sites continues, including three sites that were repaired this month. Four sites are currently not operational. Historical data were archived this month for 16 sites (total 61) going back to January 1, 2004; this task continues for 63 other SCIGN Nucleus sites.
- NetRS conversions for nine Nucleus sites (BAMO, COON, ECHO, ELKO, LEWI, MINE, SLID, CHAB, ATW2) required new data handling procedures to be put in place.
- Archiving of high-rate data for one site (NEAH) for multiple days was completed.

#### NSF/EAR Plate Boundary Observatory Data Support

- Eleven sites (AC38, P119, P210, P213, P240, P264, P270, P423, P454, P477, P504) were added to the UF Archive metadata databases, and archiving of raw data with RINEXing was initiated.
- Scripts for summarizing FTP stats for PBO data pickup with web reports were completed.
- The Facility Data Group software development team implemented code for interim phase PBO data mirroring to the Secondary PBO Archive.
- Facility Staff worked with DMIT staff to configure LDM delivery to the UNAVCO Archive for PBO data, and for future delivery of PBO data to Analysis Centers.
- The Facility System Administrator worked with the IRIS System Administrator to select hardware for the Secondary PBO Archive data management computer system.
- Archiving of high-rate data for one site (P401) for multiple days was completed.

#### NSF WInSAR Archive Support

- All existing WInSAR data was uploaded from Stanford the UNAVCO WInSAR node

## **Information Technology Infrastructure**

- Data management operations were migrated to a new, faster server.

## **Software Development**

- Leica engineers visited to discuss system 1200 TEQC support and BINEX
- An evaluation of the BINEX generation by the TopCon GB-1000 was initiated.

## **Database Services to Headquarters, Facility, and PBO**

- A test SQL environment and database connection was created for tracking the NetRS firmware upgrade for PBO.
- Forecasting tools and deployments reporting tools were developed for the inventory system.
- Web-based editing for the Community information was developed.
- A Solomon test environment was created.
- The report generator for the equipment database was modified for dynamic report generation with e-mailed reports.

## **Education and Outreach**

- Work on Earth Exploration Toolkit chapter on measuring crustal deformation for 9<sup>th</sup>-graders proceeded.
- Preparations for the EarthScope teacher workshop were initiated.
- Preparations for the DLESE Annual Meeting workshop were initiated.
- Staff visited Space Science Institute to learn about their Education and Outreach program during their Open House in Boulder.

## **Engineering Group (Steve Fisher)**

### **General**

- Opened and competed project manager position to support university PIs. Hired Jim Normandeau.
- Hosted technical/courtesy visit by Leica Geosystems reference station project managers.
- Helped prepare materials for BOD meeting and for several SIG or poster sessions at annual meeting.

### **NSF-EAR University PI Project Support**

- RETREAT Part I (R. Bennett): Continued preparation of 8 NetRS campaign systems for deployment to Italy to be installed for 3 months of continuous operation. Planning field visit for deployment support.
- San Andreas Fault Swath Mapping (M. Bevis ): Completed control and ground truth surveys in southern California using 17 R-7 systems with Choke Ring antennas in support of high-resolution airborne LIDAR topographic survey of the San Andreas fault (SAF)
- Pico del Aguila Anticline 2005 (D. Anastasio): Provided field support in Spain to coordinate the GPS surveys and also to train the science group in Kinematic and Fast Static survey methods. This project is to determine high-resolution, long-term deformation rates utilizing Milankovitch rhythms in growth strata.

- Provided proposal planning and budgeting support to seven new projects being proposed under EAR programs
- Prepared funding supplements for two ongoing projects in Mexico (C. Demets) that UNAVCO is supporting.
- Calibration Experiment for Pseudorange (K. Larson): continued support for PI's staff.
- Acceleration Calibration Experiment (P. Elosegui): Continued technical and equipment support to project assess the GPS capability for detecting short-term transient motions.
- Yucca Mountain Network Expansion (B. Wernicke): Continued testing and assembly of equipment at UNAVCO. PI staff continues working on permitting and building monuments. Still expect late summer instrumentation installation.
- Guadalupe (SCIGN): Preparing for site visit to Guadalupe Island for upgrade w/ SCIGN staff. NetRS receiver was ordered for SCIGN, trip being planned.
- Ashtech MicroZ capacitor "recall" repairs and tests at UNAVCO ongoing. Ashtech CQ00 firmware tests and re-installations.
- Network O&M: Approximately 36 troubleshooting and maintenance incidents were responded to on the 271+ stations monitored for EAR PIs.
  - Saudi Arabia (R. Reilinger): HALY, SOLA, NAMA
  - Mid America (R. Smalley) - PTGV
  - IGS (D. Stowers): SEY1, CHPI
  - Mediterranean GPS Network (R. Reilinger): TETN, IFRN, DIYR (new computer shipped)
  - SBAR (B. Wernicke): - RYAN, CRAT, GABB, RELA, REPO, ROGE, ECHO, RAIL, DYER
  - NBAR (B. Wernicke): MINE, NEWS, UPSA, SLID, BAMO, LEWI, COON, ELKO, TOIY, TUNG, SPIC, EGAN
  - Guerrero Coast (K. Larson): CPDP, COYU
  - Polar: CONZ
  - Philippines (M. Hamburger): TAAL
  - Northwest Mexico (R. Bennett): USMX
  - Central Asia (T. Herring): Facility SSi rx shipped to Kyrgyzstan (replacing old TR), site KRTV.

### **NSF-EAR EarthScope Plate Boundary Observatory Project Support**

#### *PBO Permanent GPS Network*

- Provided engineering group staff member for Southern California region station reconnaissance for two week field trip, plus reporting time.
- US Seismic Array Co-Located Stations: Continued assembly and testing of equipment and consulting on site selection and installation with IRIS staff.

#### *PBO Nucleus Project*

- Hardware and software troubleshooting of stations in all networks in NV, WA, UT, CA, and AK. CF card failure confirmed in NetRS at SLID, NV (will be replaced early June), and diode failure confirmed in NetRS at BKAP, CA (has been replaced and repaired).
- Upgrades of three Nucleus stations: CHAB (in BARD network done by Blume, Murray, and Hamilton), ATW2 (AKDA network done by Kaufman, UAF), and ECHO (BARGEN, done by Behr, BARGEN consultant).

- Visited with BARD personnel in Berkeley to plan Nucleus and ExNet project implementation and spending, train personnel in upgrade procedures, and visit stations in the Bay Area
  - Visited station SLAC at Stanford Linear Accelerator Center, developed plan for upgrading station later in the year with the operators, and procured all historical raw data and station history.
  - Visited four semi-permanent stations in King City/N. Parkfield area installed and operated by Chuck DeMets (U. Wisc), and included in Nucleus project under BARD auspices. Coordinated preliminary plans for remonumentation of three and relocation of one with Chuck and student Sarah Titus at Wisc. U and Mark Murray. Tentative agreement to pay remonumentation costs using unspent BARD subaward money from Existing Networks grant will be pursued further next month.
  - Visited several Parkfield SCIGN/Nucleus stations with USGS manager John Langbein, and developed tentative upgrade strategy for GPS hardware, communications and power systems, and for permitting with USGS man-on-the-scene Andy Snyder. Real-time capabilities currently being developed by Y. Bock will be preserved and remain independent of UNAVCO operated comm. and data flow.
  - Planned and configured equipment for imminent upgrades of BARGEN and PANGA stations in June.
8. Finalized details of having UNAVCO Facility archive and publish raw and rinex data from SCIGN/Nucleus stations prior to their being upgraded. \$22.2k from SCIGN sub-award originally designated for SOPAC in the proposal will instead be returned to UNAVCO Facility.
- Continued coordination of request for high-rate data at Nucleus and PBO stations in conjunction with NOAA airborne mapping survey of Washington coast.
  - Delivered first set of equipment for Tucson Basin Subsidence project using four surplus Nucleus Zephyr antennas receivers from upgraded BARGEN stations (Rick Bennett PI). Three more surplus receivers from SCIGN upgrades have been received and will be sent to AZ following testing and configuration along with surplus Zephyrs.

Implemented VPN at Mt. Lewis, NV CDMA hub serving BARGEN/Nucleus stations BAMO, LEWI, and MINE in preparation for transfer to PBO data flow.

Nucleus Network Summary: Upgrades to Date: 27, Upgrades this month: 3

#### *EarthScope Campaign Support*

- Evaluated and accepted new GB-1000 controller board Firmware 2.12U which restores external memory functionality and formatting capabilities and adds remote communication capability.
- Began evaluation of GB-1000 receiver board firmware 2.5p1b1, which adds new BINEX capabilities to the system.
- Extensive communications with TopCon personnel regarding suggested user interface improvements and redevelopment. Tentatively plan is to meet with TopCon management and software developers in July.
- Coordinated ES Campaign budget requirements and purchasing schedule for remainder of FY2005 and FY 2006 with B. Stephanus.

- Purchased remainder of ancillary parts to complete 28 complete campaign system boxes, including optical plummets and tribrachs.
- Finalized (with Rick Bennett and Dan Johnson) NSF Supplement budget to fund Cascadia ETS Campaign in summer/fall 2005. 30 GB-1000 systems will be used if available.
- Troubleshooting of hardware issues with GB-1000 systems currently deployed at PBO NCal and RM regions. Confirmed PG-AI antenna failure at RM and power cable failure in NCal.
- Received notification of funding for 5-year \$500k ES Proposal to instrument Rio Grande Rift using ES Campaign Pool. Initiated contacts and preliminary planning with PI's (Sheehan, Lowry, Nerem at CU, and Roy at UNM), and PBO RM RE Bohrenstein, and other UNAVCO staff.
- Further assisted Mike Bevis and OSU students with instruction, troubleshooting, and data QC of GB-1000 system.
- Purchased 4 TopCon RTK kits for use in PBO "metes and bounds" permitting surveys.

Earthscope Campaign System Summary: 28 Total, 19 in-house, 3 at PBO NCal (Coyle), 2 on MSH (Lisowski), 1 PBO RM (Lyman), 1 OSU (Bevis), 1 MIT (McClusky), 1 awaiting repair. Total requested this month: 30

## **NSF OPP Support**

### *Antarctic*

- Reviewing project requests from Support Information Package for 2005/06 field season.
- Annual report completed.
- Palmer Station RTK/DGPS upgrade proposed and approved by NSF.
- Geodetic control points and meta-data on-line database updated.

### *Arctic*

- Provided equipment and remote support for RTK and GPR integration for Arctic Hyporeic Zone project (B. Bowden)
- Replaced RTK/DGPS base station at Toolik Field Station, Alaska, due to a firmware error (A. Balser)
- Preparing support for Barrow Biocomplexity project (C. Tweedie) and DGPS system support (G. Sheehan).
- Prepared NetRS receiver systems for Ethernet connectivity with 80211 protocol telemetry on Columbia Glacier project (T. Pfeffer).

### *General Support and Infrastructure Development*

- Announced Polar field and development engineer position.
- Completed cold chamber (-50C) testing of GPS system batteries for engineering evaluation of remote Polar GPS systems.
- Continued Iridium system field validation at the Niwot Ridge test site.
- Built and deployed development "Polar remote site" at Marshall facility.

- Planning with community for IRIS/UNAVCO meeting Polar Geosciences session and related activities.

#### *Equipment loan*

- Taku Glacier project in progress (R. Motya).
- Iceland Breidamerkurjokull project in progress (S. Tulaczyk).
- McCall Glacier project in progress (M. Nolan).
- Circumpolar Active Layer Monitoring Network project in progress (F. Nelson).

#### **NASA Program Support**

- Hosted planning meeting w/ JPL PEM. Finalized NASA FY05 SOW.
- Developed plan and diagram for Marshall site (GGN "super station").
- Septentrio vs. Ashtech rx discussions for future installations.
- Ashtech firmware and equipment problems discussions.
- Responding to NASA desire for real-time data from SOLA.
- NOAA has two more uZ receivers (w/ caps repaired) for installations at existing GGN stations in the US (possible sites: NLIB and MDO1). Planning.
- Approximately 110 individual NASA trouble or maintenance issues were handled during this month.
- Site highlights:
  - AREQ Gilat Internet terminated. New ISP, -Speedy. Station operational. David Carter has visited station to negotiate new agreement, etc. w/ University. No word on progress or outcome of negotiations.
  - BOGT Ashtech equipment needs to return as five year temporary importation agreement is up this July. Planning on shipping uZ receiver.
  - CHPI Site private (no data publishing). New Ashtech uZ rx has arrived in Sao Paulo, but no word about customs release or rx swap.
  - CRO1 Still waiting on locals to install new cable in permanent conduit. Site still private till this is resolved. Old equipment returning this week (25th.)
  - FAIR uZ receiver put back on local H-Maser. Old equipment returned to UNAVCO (faulty uZ returned earlier)
  - GODE New rackmount installed after security screening at Goddard. Some problems with local ntp service--resolved.
  - HRAO Ashtech choking antenna replaced by Ludwig after tracking stopped. New log and IGSSTATION email. Site public again.
  - IISC Numerous power and communications outages at receiver site. Will work with locals for site upgrade. Real-time stream restored after firewall upgrade at C-MMACS.
  - ISPA Agreed to pay half the cost (w/ IDA) of VSAT dish re-alignment on island to move link to another satellite. This will align operations with ASL equipment on Hawaii and (hopefully) improve link throughput.
  - MSKU VSAT equipment arrive and link restored. Computer has been up throughout outage and is full of backlogged data files to be pulled to JPL. Station still not public.
  - NSSP Change of local ISP and computer IP. Connection restored after some interaction and changes. Station operational.

- PIE1 JPL on email list w/ GPS jamming info from White Sand Missile Range, NM.
- SEY1 New Ashtech uZ installed, but burglary at equipment hut on May 12th, - lost computer (and some IRIS equipment). Old Ashtech uZ to return for warranty cap repair. New wireless 24/7 Internet application in the works.
- SHAO Possible reconstruction work scheduled at station could impact operations/data flow. Checking w/ contact.
- SUTH Network upgrade locally. Internet connection restored on same IP after upgrade. uZ rx connection down. Sent out IGSSTATION email. No data publishing.
- USUD Connection to receiver down April 17th. Locals report Z-XII faulty. Will ship Z-XII from CRO1 to Japan. Sent out IGSSTATION notification.
- YAR1 Coordinated return of old JPL equipment to Pasadena with Unitrans.
- YKRO Internet connection problems again. And rx needs replacement. No working TR at UNAVCO. Site private. No change.
- S.Arabia (SOLA, HALY, NAMA) computer HD problems. Will attempt to do a fsck with local contact. Sent out IGSSTATION notification reg. outage.
- CRAO Received invoice for customs fees for return of old TR receiver to UNAVCO. Payment (wire) initiated.
- RABT Computer connection problems. Reboot restored operations. Backlogged data recovered.

## Equipment Group (Chuck Kurnik)

### Facility Equipment Support

- Three NASA/GGN projects shipped in May.
- The Equipment Group continues to implement the new red “Property of UNAVCO” tag on important equipment that is not considered Government Property. Kurnik is auditing the process.
- Kurnik was on selection panel for new Engineering Supervisor

### Boulder Warehouse

- Developed a new test and configuration procedure for the new style Proxycast modems.
- Completed a forecast for communications equipment thru the end of YR2.

### QC Issues

- Hardware has been ordered for PV mounting kits.
- We have been steadily receiving Trimble choke ring antennas.

### Ordering

- We are ordering parts to fulfill year-2 requirements without ordering against year-3 funds.

## 2.3 June 2005

### Facility Data Group (Fran Boler)

- Data Group staff presented a poster and a Special Interest Group talk at the UNAVCO/IRIS Annual Meeting.

#### NSF/EAR Data Support

- Routine archiving of permanent stations proceeded with 94.9 Gb archived.
- One new permanent station was added for ongoing data management and archiving (SuomiNet-A: SA46). Currently, data from 624 sites are actively managed and archived.
- Archiving was completed for three campaigns totaling 22 Gb this month (American Samoa 2004, Irian Jaya 2004, San Simeon Earthquake 2003 High-Rate).
- 345,024 data files (94.2 Gb) were picked up from the ftp area during the previous month.
- Data requests for 16 campaigns were filled totaling 8.4 Gb.

#### NSF/EAR NUCLEUS Data Support

- SCIGN: Routine archiving of 120 SCIGN Nucleus sites continues this month. Three sites are currently not operational. Historical data were archived this month for 63 sites going back to January 1, 2004.
- Historical data for 6 PANGA sites were archived back to January 1, 2003.
- NetRS conversions for one Nucleus site (SC03) required new data handling procedures to be put in place.
- Archiving of high-rate data for two sites (ECHO, ATW2) for multiple days was completed.

#### NSF/EAR Plate Boundary Observatory Data Support

- Four sites (P160, P266, P373, P586) were added to the Archive metadata databases and archiving of raw data with RINEXing was initiated.
- Facility Staff met with staff of the Analysis Centers, the Analysis Center Coordinator, and the PBO Data Products Manager to discuss PBO data products delivery to the UNAVCO Archive. LDM delivery of data and products was discussed, and file naming conventions were determined.
- The Facility System Administrator worked with the IRIS System Administrator to select hardware for the Secondary PBO Archive data management computer system.
- Archiving of high-rate data for three sites (P261, P262, P401) for multiple days was completed.
- Preparations for archiving of high-rate data from two additional Southern California sites were completed.

#### NASA/SENH Data Support

- To improve metadata tracking and reporting capabilities 42 GGN sites were incorporated into the Archive data flow. Daily files are archived and hourly files are pulled to verify that data are available.
- To improve metadata tracking, full metadata history for 12 GGN sites was entered into the Archive metadata database.

## **Information Technology Infrastructure**

- ArcIMS, ArcSDE, and WMS connector for ESRI were installed so that testing of this environment as a platform for presenting map-based information could be initiated

## **Software Development**

- Permanent station data management software was modified in preparation for upcoming transition in directory structure on the ftp pickup server.
- Configurations and new scripts were tested for the new directory structure for data delivery on ftp://data-out.unavco.org.
- New permanent station database tracking of site log locations for non-UNAVCO-produced site logs was implemented.
- Internal web-based data history visual tools for permanent stations were developed.

## **Database Services to Headquarters, Facility, and PBO**

- FTP transfer capability for Solomon reports was added to the financials system.
- Forecasting tools and deployments reporting tools were altered for the inventory system.
- Career web pages were modified.
- A Solomon desktop issue was corrected.
- An alternative travel expense entry tool was created in Excel at the request of PBO to streamline expense entry for field engineers.

## **Education and Outreach**

- The DLESE Annual Meeting workshop on using Voyager Map Tool was prepared for presentation in July.
- Staff worked with the JASON Foundation for Education to provide Mars images using Voyager Map Tool for incorporation in their publication: “JASON Expedition: Mysteries of Earth and Mars”.

## **Engineering Group (Steve Fisher)**

### **NSF-EAR University PI Project Support**

- RETREAT Part I (R. Bennett): Deployed 8 NetRS campaign systems to Italy to be installed for 3 months of continuous operation. Field engineer in country to support project.
- San Andreas Fault Swath Mapping (M. Bevis ): Completed control and ground truth surveys in southern California using 17 R-7 systems with Choke Ring antennas in support of high-resolution airborne LIDAR topographic survey of the San Andreas fault (SAF)
- Proposal planning and budgeting: Provided proposal planning and budgeting support to 5 new projects being proposed under EAR programs
- Prepared funding supplements for two ongoing projects in Mexico (C. Demets) that UNAVCO is supporting.
- Calibration Experiment for Pseudorange (K. Larson): continued support for PI’s staff.
- Acceleration Calibration Experiment (P. Elosegui): Continued technical and equipment support to project assess the GPS capability for detecting short-term transient motions.

- Yucca Mountain Network Expansion (B. Wernicke): Continued testing and assembly of equipment at UNAVCO. PI staff continues working on permitting and building monuments. July/August instrumentation installation planned.
- Guadalupe (SCIGN): Preparing for site visit to Guadalupe Island for upgrade w/ SCIGN staff. NetRS receiver was ordered for SCIGN, trip being planned.
- Greece CGPS Installation: (Reilinger): Prepared equipment and shipped to PI institution.
- Galapagos (Geist) Shipped 2 Ashtech MicroZ receivers to PI to replace defective units on the island.
- RESESS Intern 2005 (Larson) Provided GPS equipment operation training.
- K2 2005 (Shroder) Prepared 3 GPS systems and field units.
- Oregon Coast 2005 (Schmidt): 8 new Topcon campaign systems built and shipped to PI.
- Network O&M: Approximately 36 troubleshooting and maintenance incidents were responded to on the 271+ stations monitored for EAR PIs.
  - Saudi Arabia (R. Reilinger): HALY, SOLA, NAMA
  - Mid America (R. Smalley) - PTGV
  - IGS (D. Stowers): SEY1, CHPI
  - Mediterranean GPS Network (R. Reilinger): TETN, IFRN, LAUG
  - SBAR (B. Wernicke): - RYAN, CRAT, GABB, RELA, REPO, ROGE, ECHO, RAIL, DYER
  - NBAR (B. Wernicke): MINE, NEWS, UPSA, SLID, BAMO, LEWI, COON, ELKO, TOIY, TUNG, SPIC, EGAN
  - Guerrero Coast (K. Larson): CPDP, COYU
  - Polar: CONZ
  - Philippines (M. Hamburger): TAAL
  - Northwest Mexico (R. Bennett): YESX

## **NSF-EAR EarthScope Plate Boundary Observatory Project Support**

### *PBO Permanent GPS Network*

- Provided engineering group staff member for Alaska region station for installation of site on the Akutan Volcano

### **PBO Nucleus Project**

- Upgrades of three Nucleus stations: EGAN and SPIC (BARGEN network, done by B. Johns), and TSWY (EBRY network, done by J. Normandeau).
- Hardware and software troubleshooting in EBRY, PANGA, and BARGEN networks in AK, UT, NV, WA, MT, and WY. Upgraded stations failed at EGAN, NV (NetRS CF card failure) and SC03 (Mt. Olympus, WA, Intuicom radio failure), and NEAH, WA (CDMA failure) SC03 has been repaired with no data loss, NEAH was visited to download data, but remains off line but logging data pending a future visit, and EGAN is inoperable pending a future visit. Upgraded station at SLID, NV remains inoperable pending future visit as snow prevented S. Fisher from reaching the station, but a 4000 receiver remains operable so data continues to flow from the mountain. The Mt. Lewis VPN hub was replaced by B. Johns resulting in improved performance.
- Discussion with Trimble representatives regarding EGAN receiver memory failure, and implemented pre-deployment testing in both Nucleus and PBO as a result.

- DC timers were tested in conjunction with PBO tech staff and approved for use in keeping CDMA modems connected by periodic power cycles. They are currently in use at 10 of the upgraded Nucleus stations with no problems.
- Attended UNAVCO/IRIS Joint workshop, and conducted 1 hour "special Interest" discussion/information presentation on the PBO Nucleus project. Project participants, steering committee members, and others all returned positive feedback on the state of the project.
- Finalized Statement of Work for Caltech/BARGEN subaward with B. Wernicke and N. Niemi, and initiated Contracts and Grants process to initiate funding.
- Planning of BARD remonumentation and upgrades with M. Murray. Conference call pending with Prescott, Murray, and Romanowicz to discuss status of remaining Existing Network and Nucleus subaward funding to BARD/UCB.
- Ongoing coordination and development of PBO/Nucleus network integration in Yellowstone and Nevada with PBO RE's.
- Ongoing planning for 13 station upgrade of SCIGN/Parkfield area stations, including participation in USGS permit procurement, with J. Langbein and A. Snyder of USGS. Also facilitated multipath problem identification at Parkfield station LOWS for K. Larson, CU.
- Nucleus/ES Campaign Project Engineer Nicole Feldl on the job as of June 20. She spent her first week working on PBO installations in the northern California region.
- Planning of near future SCIGN/Nucleus upgrades and long-term plans with SCIGN network coordinator and field personnel.
- Planning of summer Nucleus upgrades in EBRY and PANGA networks.

Nucleus Network Summary: Upgrades to Date: 30, Upgrades this month: 3

### **EarthScope Campaign Support**

- Configured and shipped 8 complete ES campaign systems to U. of Oregon (D. Schmidt, PI) for two-week deployment on Oregon Coast 2005 project. Gave PI hands-on training with equipment during UNAVCO/IRIS workshop, and have given extensive support since equipment was shipped.
- Further discussions with Rio Grande Rift PI's, PBO Siting Committee, and PBO personnel during UNAVCO/IRIS workshop resulted in relocating 3 PBO installations to the benefit of the project. Initiated contacts between USGS, IRIS, PBO, and RGR project PI's to collocate PBO station with ANSS seismic station at Snowmass, CO.
- Further display and promotion of campaign systems to community during meeting.
- Support and data archiving for USGS GB-1000 deployment on Mt. St. Helens.
- Discovered that the GB-1000's delivered to date contain 128MB rather than 1GB of internal memory as expected. Traced the issue to a July 2004 miscommunication on Topcon's part, and they have agreed to reconfigure future deliveries and retrofit our existing stock by July 15. Other improvements to the functionality and future capabilities of the GB-1000 will also result from this reconfiguration. We have tentatively agreed to a small price increase to continue to receive 1GB of external memory, and purchase contract will be revised accordingly.
- Ongoing discussions with Topcon on suggested modifications/improvements to GB-1000 in conjunction with the above.
- Exercised option to purchase 22 additional GB-1000's subject to reconfiguration and time frame discussed above.

- Approved request to support USGS-funded Coachella Valley subsidence experiment with 8 EarthScope campaign systems in July.
- Continued planning for EarthScope funded ETS Cascadia ETS/Seismology deployment of 30 campaign systems, targeting July 25th departure from UNAVCO with N. Feldl in new PBO PNW region truck.

Campaign System Summary: 28 Total, 12 in-house, 8 at U. of Oregon Campaign (Schmidt), 3 at PBO NCAL (Coyle), 2 on MSH (Lisowski), 1 PBO RM (Lyman), 1 OSU (Bevis), 1 MIT (McClusky). Total requested this month: 8

## **NSF OPP Support**

### *Antarctic*

- Participated in Raytheon/NSF 2005-06 project review meeting.
- Palmer Station RTK/DGPS upgrade proposed and approved by NSF.
- Geodetic control points and meta-data on-line database updated.
- Planning 2005-06 field season support activities

### *Arctic*

- Provided equipment, training, and field engineering support for three Barrow, Alaska based projects – Beringia/Oden Icebreaker cruise, Barrow Biocomplexity, and Barrow Area Information Database IMS (C. Tweedie)
- Conducted annual maintenance support visit for the RTK/DGPS survey system at the Barrow Arctic Science Consortium, Alaska, and replaced the base receiver with a networked Trimble NetRS (G. Sheehan)
- Prepared for High Arctic Field Course, Thule, Greenland

### *General Support and Infrastructure Development*

- Interviewed candidates for Polar field and development engineer position.
- Continued Iridium system field validation at the Niwot Ridge test site.
- Continued Iridium system field validation at “Polar remote site” at Marshall facility.
- Attended IRIS/UNAVCO meeting, participated in Polar Geosciences SIG session and related activities.
- Hosted meeting with IRIS regarding Antarctic remote geophysical observatories

### *Equipment loan*

- Taku Glacier project in progress (R. Motya).
- Columbia Glacier project in progress (T. Pfeffer)
- Iceland Breidamerkurjokull project in progress (S. Tulaczyk).
- McCall Glacier project in progress (M. Nolan).
- Circumpolar Active Layer Monitoring Network project in progress (F. Nelson).

## **NASA Program Support**

- Started preparations for L2C experiment.
- Computer and TR equipment arrived at Diyarbikir, Turkey.

- Questions about GNEX configuration, etc. Still no data or site pictures, description, etc.
- Site highlights:
  - BOGT Shipped new Ashtech equipment to replace equipment that will return under temporary importation agreement. Swap expected in early July.
  - BREW Intermittent slow network problem solved centrally at NRAO.
  - CHPI New Ashtech uZ rx installed 22nd. New antenna cable not installed yet. Evaluating data for publication.
  - CRAO Reset TR and GNEX a few times. Old faulty rx returned to UNAVCO.
  - CRO1 Still waiting on locals to install new cable in permanent conduit. Site still private till this is resolved. Old equipment has been returned.
  - EISL Site decommissioned. Old equipment returned to UNAVCO.
  - HARV Link outage restored, data recovered.
  - IISC Some outages (serial and network). Updated log w/new marker info submitted. Changed computer runlevel to 3. Needs IGSSTATION notification of updated log changes, etc.
  - ISPA VSAT dish realignment performed. Link throughput better. Invoice for work paid. Local power outage late in June.
  - PIE1 New uZ and antenna installed following tracking outage. Pigtail antenna in lab was also loose, local repairs performed. Site is tracking OK, but questions regarding apparent position jump after swap.
  - POL2 Somehow Ashtech Z-XII was turned off. Operations restored OK.
  - RABT Changed data retrieval from push to UNAVCO archive pull (hourly).
  - SEY1 New wireless 24/7 Internet connection still up in the air. Will ship new rackmount computer ASAP.
  - SHAO Reconstruction work started at station. Data flow stopped June 1st. Sent out IGSSTATION email.
  - SUTH uZ connection down still. Ludwig is checking on computer and receiver ports.
  - USUD New Z-XII (same antenna still) installed on June 15th. Site operational again. Faulty Z-XII returned, but Ashtech will no longer service units.
  - Saudi Arabia (SOLA, HALY, NAMA) possible hard-disk problem on computer.

Approximately 130 individual NASA trouble or maintenance issues were handled during this month.

## Equipment Group (Chuck Kurnik)

### Facility Equipment Support

- Three NASA/GGN projects shipped in May.
- The Equipment Group continues to implement the new red “Property of UNAVCO” tag on important equipment that is not considered Government Property. Kurnik is auditing the process.
- Kurnik was on selection panel for new Engineering Supervisor

**Boulder Warehouse**

- Developed a new test and configuration procedure for the new style Proxycast modems.
- Completed a forecast for communications equipment thru the end of YR2.

**QC Issues**

- Hardware has been ordered for PV mounting kits.
- We have been steadily receiving Trimble choke ring antennas.

**Ordering**

- We are ordering parts to fulfill year-2 requirements without ordering against year-3 funds.