UNAVCO Facility Interim Report, January-March 2006 EAR-0321760: Support of UNAVCO Community and Facility Activities

1.0 Quarterly Summary

The UNAVCO Facility through this Cooperative Agreement provides engineering, equipment, data, and information technology support to NSF- and NASA-funded efforts. UNAVCO researchers use GPS and other high precision geodetic techniques to study earthquake processes, mantle properties, active magmatic systems, plate boundary zone deformation, intraplate deformation and glacial isostatic adjustment, global geodesy and plate tectonics, global change, and polar processes. Over the last quarter, UNAVCO supported numerous individual PIs, large collaborative projects such as the PBO Nucleus, and the even larger multi-disciplinary, multi-agency EarthScope MREFC project as well as operational support for the NASA Global GPS Network (GGN) jointly managed with JPL. In addition to project support, UNAVCO Community activities include community meetings, such as the UNAVCO Science Workshop held in March 2006, external Facility committees, and education and outreach.

Presented below are summaries of Community activities, the Quarterly Featured Project (which this month is UNAVCO support to the NSF Office of Polar Programs), Engineering and Data group highlights with support details and statistics. Section 2 contains detailed monthly reports for January, February, and March 2006.

UNAVCO Community Activities

The UNAVCO Community has grown to 78 Members and Associate Members from around the globe (Figure 1). Members and other scientists and students from the geodetic science community met at 2006 UNAVCO Science Workshop held March 14-16 in Denver, Colorado. The meeting, supported by this NSF Cooperative Agreement, had a full agenda with planned science sessions that included: Imaging, Transients, Continental Deformation, Hazards, and Global Navigation Satellite Systems (GNSS) Geodesy (Figure 2). Science sessions were complemented by 13 Special Interest Group sessions that provided smaller venues for detailed discussions and interactions on a wide range of topics from UNAVCO Facility engineering and data services to broadening the participation in geodetic science (see agenda below). To broaden our community, UNAVCO funded two undergraduate students, one teacher from and underrepresented population and a RESESS intern. The intern presented a poster and two of these undergraduates will work with Eric Calais at Purdue on summer research in Tanzania. UNAVCO forged partnership with Texas department of education at this meeting to disseminate GPS and plate tectonic activities.
Figure 1. The UNAVCO community has grown to 54 members and 22 affiliate members from around the world. The 2006 UNAVCO Science workshop was held in March at the historic Brown Palace Hotel in Denver, Colorado.

UNAVCO 2006 Science Workshop Agenda

Organizing Committee:  Mark Tamisiea, Chair, Evelyn Roeloffs, Co-Chair and Herb Dragert, Co-Chair

SCIENCE SESSION I - Observing and Modeling Transient Tectonics
Chair:   Tony Lowry (University of Colorado)
Speakers:   Jim Rice and Yajing Liu (Harvard)
Tony Lowry (University of Colorado)
Takeshi Sagiya (Nagoya University)
Thora Arnadottir (University of Iceland)

SCIENCE SESSION II - Continental Deformation and Hazards
Chair:   Giovanni Sella (NGS)
Speakers:   Eric Calais (Purdue University)
Roy Dokka (Louisiana State University)
Alessandro Forte (University of Quebec)
Seth Stein (Northwestern University)

SCIENCE SESSION III - Imaging with InSAR and LiDAR
Chair:   Gerald Bawden (USGS, Sacramento)
Speakers:   Tim Wright (University of Oxford)
Chuck Wicks (USGS)
Michael Bevis (Ohio State University)
Bawden (USGS, Sacramento)

SCIENCE SESSION IV – GNSS Geodesy: Achieving and Utilizing mm Global Geodesy
Chair:   Tom Herring (MIT)
Speakers:   Jim Davis (CfA)
Ralf Schmid (Munich)
Tom Heaton (Caltech)
John Wahr (University of Colorado)

SPECIAL INTEREST GROUPS

LiDAR Data: Management, Processing and Access, Organizers: Dana Piwiniski (IAGT) and Chris Crosby (ASU)

Transient Tectonics, Panel: Jim Rice and Yajing Liu (Harvard), Tony Lowry (U. of Colorado), Takeshi Sagiya (Nagoya U.) and Thora Arnadottir (U. of Iceland)
New Data Search and Access Tools at the UNAVCO Archive, Organizer: Fran Boler (UNAVCO)

Writing a Successful Education Proposal, Organizer: Susan Eriksson (UNAVCO)

GeoEarthScope, Organizer: Phillips (UNAVCO)

Broadening Participation in our Science, Organizer: Susan Eriksson (UNAVCO)

Instrumentation Challenges for the International Polar Year, Organizer: Bjorn Johns (UNAVCO)

PBO (Plate Boundary Observatory), Organizer: Mike Jackson (UNAVCO)

SNARF (Stable North American Reference Frame), Organizer: Geoff Blewitt (University of Nevada, Reno)

InSAR Data Availability and Access, Organizer: Andrea Donnellan (JPL)

Strainmeter Data Handling and Processing, Organizer: Kathleen Hodgkinson (UNAVCO)

Data and Data Product Issues, Organizers: Greg Anderson (UNAVCO) and Tom Herring (MIT)

UNAVCO Facility Engineering and Equipment Support, Organizers: Steve Fisher, Freddy Blume, Jim Normandeau and Bjorn Johns (UNAVCO)

UNAVCO Dinner Talk - Communicating About Natural Hazards: The State of the Art
Speaker: Dennis Mileti (University of Colorado)

UNAVCO Proposal Chair: Eric Calais (Purdue University)

NEW INITIATIVES MEETING Chair: Seth Stein (Northwestern University)

Figure 2. UNAVCO Science Workshop. (left) Anne Douglas, GNS Science New Zealand, discussing New Zealand GeoNet GPS network expansion and the observation of slow earthquakes. (center) Tim Wright, University of Oxford, presenting InSAR results from the massive 2005 Dabbahu (Afar, Ethiopia) rifting event and his experiences in installing continuous GPS sites along the rift. (right) Fredrick Blume (UNAVCO) describing the local geology during the Red Rocks field trip. Over 70 presentations and posters were given and 120 persons attended the meeting.

1.1 Quarterly Featured Project

Project: UNAVCO Polar Services
UNAVCO Facility Project Manager: Bjorn Johns
Funding Source: NSF Office of Polar Programs
Principle Investigators: Numerous
Project Locations: Arctic and Antarctica

Figure 3. Continuous site ROB4 at Cape Roberts. Operation of this site is a joint effort between the Ohio State University, the USGS, UNAVCO, and Land Information New Zealand (LINZ).
UNAVCO Polar Services provides high-precision GPS technology support to the National Science Foundation Office of Polar Programs. Surveying, mapping, and other GPS support services are available to NSF-OPP funded scientific investigators working in the Arctic and Antarctic. A record Antarctic season was just completed, with 80 geodetic GPS receivers provided in support of 25 individual PI-based science project campaigns, with six left for long term data collection. Three new continuous stations were installed, and four were upgraded. Highlights include deformation studies of the world’s largest icebergs (Doug MacAyeal), uplift and faulting of the Transantarctic Mountains (Terry Wilson), tidal effects on ice stream dynamics (Sridhar Anandakrishnan), and rift developments on the Amery Ice Shelf (Helen Fricker). Highlights from the season include:

1. Three GPS sites in the Transantarctic Mountain deformation Network (TAMDEF) were upgraded for year-round operation with telemetry and daily data retrieval by the UNAVCO archive (Figure 3). This effort included power system upgrades the installation of a radio repeater on Mt. Erebus, and Iridium satellite data retrieval from the most remote site at Fishtail Point.

2. The installation of a GPS testbed site at McMurdo Station for the purpose of field testing components before deployment to more remote location, and for testing higher risk new products and configurations in the Antarctic environment without jeopardizing science data.

3. The installation of a new monument and receiver at the South Pole, site AMU2. GPS site AMUN at the Amundsen Scott South Pole Station was decommissioned this year as operations were moved to the new South Pole Station, and a new receiver and monument were established as the first science instrumentation in the station science laboratory. A tie was made with the old station AMUN, and the true geographic pole was resurveyed and positioned due to ice motion (Figure 4). Operation of this site is provided jointly by UNAVCO and the USGS (Larry Hothem).

4. Installation of a UNAVCO operated base station at the West Antarctic Ice Sheet (WAIS) Divide drilling project site to support glaciology research during the lifespan of the camp (Fig. 5). The antenna is mounted high due to ~1m per year snow accumulation at the site, and a wireless connection allows the receiver to be controlled and downloaded from inside the camp buildings which are moved annually.

5. Installation of a community GPS base station at McMurdo Station. A new Trimble NetRS receiver was added to the NASA GGN site MCM4 for local access and use. This
provides local users the ability to configure the receiver for applications such as high rate data collection without interfering with GGN operations.

In January, UNAVCO and IRIS submitted a joint proposal Collaborative Research: Development of a Power and Communication System for Remote Autonomous GPS and Seismic Stations in Antarctica to address the unique power and communication challenges of operating remote GPS and seismic instrumentation in the extreme Polar environment. This Major Research Instrumentation proposal was written together with the science community that will benefit from UNAVCO and IRIS providing dedicated resources towards the effort as part of proposed geophysical networks for the International Polar Year.

Arctic field season planning is in progress for 11 funded projects, with engineer visits scheduled for multiple visits to Alaska and Greenland, including establishing a permanent GPS base at Summit Camp in Greenland. Training sessions are also scheduled at UNAVCO and in Barrow, Alaska for local staff who support UNAVCO maintained GPS systems. Field planning is also beginning for the 2006-07 Antarctic season.

### 1.2 Engineering Highlights

#### NSF/EAR Program Support

**University PI Project Support**

Fifteen different projects funded by NSF/EAR programs were provided engineering and equipment support during the quarter (Table 1). The project mix included eight permanent networks involving installation, operation and ongoing maintenance; seven campaigns or mixed mode projects involving episodic deployment of equipment. Proposal planning and budget development support was provided for four new projects proposed under NSF programs. Photo highlights given in Figure 6.

<table>
<thead>
<tr>
<th>Project Name</th>
<th>PI</th>
<th>Mode</th>
<th>Support Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopian Emergency Response</td>
<td>Calais</td>
<td>Mix mode</td>
<td>Prepared 10 quasi-permanent NetRS systems, designed and fabricated GPS monuments</td>
</tr>
<tr>
<td>Guerrero Coast</td>
<td>Larson</td>
<td>Permanent Network</td>
<td>RMA 3 Ashtech receivers and shipped to Mexico.</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Dixon</td>
<td>Permanent Network</td>
<td>2 Recon trips, assemble and shipped</td>
</tr>
<tr>
<td>Project/Year</td>
<td>Equipment/Support</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>SIGMA 2007</td>
<td>Assemble; configure NetRS and Ethernet radio modems. Shipped equipment to Argentina.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mount Washington</td>
<td>Repair GPS receiver and replaced download computer.</td>
<td></td>
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<tr>
<td>Kashmir 2006</td>
<td>Equipment and tech support.</td>
<td></td>
<td></td>
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<tr>
<td>Saudi Arabia</td>
<td>Shipped new download computer, remote technical support and troubleshooting.</td>
<td></td>
<td></td>
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<tr>
<td>Joshua Tree 2006</td>
<td>Support 2 campaigns with 10 receivers each.</td>
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<td></td>
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<tr>
<td>Mount Erebus Mapping</td>
<td>Gave short course on RTK survey methods</td>
<td></td>
<td></td>
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<tr>
<td>T-Rex</td>
<td>Met with PI and consulted on GPS options for their experiment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galapagos 2006</td>
<td>Consulted with PI on equipment options for protect.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Sky 2006</td>
<td>Equipment and tech support.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenland Seismology</td>
<td>Consulted with PI on equipment options for protect.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plum Island 2006</td>
<td>Consulted with PI on equipment options for protect.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilauea 2006</td>
<td>Consulted with PI on equipment options for protect.</td>
<td></td>
<td></td>
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</tbody>
</table>

**Figure 6. PI Project Support:** (left) Reconnaissance field engineering for the Nicoya Peninsula permanent station network, Costa Rica, Tim Dixon (University of Miami/RSMAS), Marino Protti (Universidad Nacional, Heredia), Susan Schwartz (UC Santa Cruz), and Victor Gonzalez from OVSICORI (Universidad Nacional, Heredia); (center) Receivers and technical support for the Ethiopian rift event response Eric Calais (Purdue University) and Tim Wright (Oxford University); (right) Receivers for the Joshua Tree campaign, Rick Bennett (University of Arizona).

**EAR Network Operations and Management**

The Facility provides O&M support to 271 continuously operating stations (Figure 7). The engineering group handled approximately 75 troubleshooting incidents at stations monitored for EAR PIs. This included resolving communication and equipment issues, shipping replacement equipment and working with local contacts to resolve problems.
Figure 7. The UNAVCO Facility Engineering Group provides operations and maintenance support to 271 continuously operating stations from university PI projects around the globe. Facility support includes a range of services, from low to high levels of support depending on PI and local collaborator resources and capabilities. A key objective is to ensure that data from these permanent stations is archived at UNAVCO and freely distributed to the research community.

PBO Nucleus Project Support
The first year of the PBO Nucleus project is complete as of 1 March 2006; the Annual Progress Report was accepted by NSF and year 2 funding released as requested in January. 28 more station upgrades were performed this quarter. The total number to date of 89, or 42% of the 210 station network, puts us well ahead of schedule to complete the integration of the network into PBO by Q4 of 2008. Further progress has been made this quarter on other aspects of this integration as well, including the submission of six permit applications to the FAA and private landowners to remonument existing stations in northern California and Oregon (including MEE1, pictured below). Nucleus Project Manager attended the annual PBO Operations Group meeting in Salt Lake City, which will greatly increase the level of joint project operations in the future.
The first two upgrades in the critical 13 station Parkfield GPS network were done in March using CDMA modems, the first use of this technology in the area. The work was performed by Nucleus and PBO personnel in conjunction with the USGS, USC, UC Berkeley, and UC San Diego. These two stations, which include the central location at Carr Hill, will allow us to evaluate the suitability of CDMA for use at the remainder of the stations later this year, as well as having real-time two way access to Parkfield GPS stations for the first time.

**Facility EarthScope/PBO Project Support**

Delivery was taken on the final 50 Topcon GB-1000 systems that form the basis for the EarthScope portable GPS Array, completing the 100-unit pool. Underway is the design and construction of complete self-contained portable systems suitable for use in either extended campaign or semi-permanent mode.

Demand for the systems from EarthScope-funded projects continues to be light, with only a single six-system deployment to measure the 2006 Cascadia ETS event having been funded this quarter. Planning for the Rio Grande Rift project is ongoing, with the construction of 24 shallow drilled-braced monuments in NM and CO currently scheduled for Q3 of this year. NGS Colorado State Geodetic advisor Pamela Fromhertz is now involved with station siting and other synergistic activities with her agency. The map at right shows the updated proposed locations for this experiment, with dark green triangles showing relocated stations. PBO and PBO Nucleus stations are shown as red stars, and other CORS stations as circles.
Both the PBO Nucleus project and EarthScope project support were represented at the annual PANGA investigators’ meeting in Eugene, OR and at the UNAVCO Science workshop in Denver this quarter, and at the AGU/AAAS Congressional Visit Days in Washington, DC.

Planning for the PBO permanent stations at collocated US Array stations continued with USGS/ASL with four new stations going in. Engineering group staff members were provided for several regional station reconnaissance trips and monument installation. Campaign equipment was provided to several PBO satellite offices.

**GeoEarthScope Support**

GeoEarthScope is the component of NSF’s EarthScope project that includes the acquisition of aerial and satellite imagery and geochronology to examine the strain field beyond the decade time scales available from PBO geodetic instrumentation and to assist with PBO station siting. Two PI-led imagery projects were active in 2006 Q1: “A Precise Ground Velocity Map for the Basin and Range Province Based on InSAR” (PI: Falk Amelung, University of Miami, see Figure 8 below) and “Determination of Slip Rates on the Death Valley-Fish Lake Valley Fault System: Toward an Understanding of the Spatial & Temporal Extent of Strain Transients” (PI: James Dolan, USC). Data acquisition activities for these projects will continue in 2006 Q2. Under guidance from NSF, the GeoEarthScope project management plan was significantly revised in 2006 Q1. The new plan will include the formation of GeoEarthScope working groups that will identify and prioritize scientific targets and make recommendations with respect to airborne laser swath mapping imagery (ALSM, a.k.a. airborne LiDAR), satellite InSAR imagery and geochronology data acquisition. Once the working group recommendations are reviewed and approved by NSF, UNAVCO will oversee the appropriate data acquisition efforts. The GeoEarthScope Project Manager participated in several community meetings in 2006 Q1, including the NASA/ESTO LiDAR Community Forum in Washington, D.C. in January, the EarthScope GeoFrame workshop in St. Louis, MO in February, the 2006 UNAVCO Science Meeting in Denver, CO in March, and the EarthScope Northern California LiDAR Workshop in Marshall, CA in March. The Project Manager also made institutional visits to the NSF office, the EarthScope Office and Ohio State University in 2006 Q1. A GeoEarthScope Special Interest Group was held during the 2006 UNAVCO Science Meeting.
UNAVCO support of the NSF OPP is the featured highlight this quarter.

UNAVCO with JPL provides support for the NASA GPS infrastructure through a network of 75 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 (Figure 9). Data from these stations are used to produce highly accurate products that are essential for Earth science research, multidisciplinary applications, and education. The products include GPS satellite ephemerides, Earth rotation parameters, global tracking station coordinates and velocities, GPS satellite and tracking station clock information, zenith tropospheric path delay estimates, and global ionospheric maps. These products support Earth science and other activities such as: improving and extending the International Terrestrial Reference Frame (ITRF) maintained by the International Earth Rotation and Reference Systems Service (IERS), monitoring deformation of the Earth, monitoring Earth rotation, monitoring the troposphere and ionosphere, and determining orbits of scientific satellites. NASA also supports the IGS Central Bureau in its management of an organizational infrastructure for GPS data.
collection and distribution in support of science and research applications utilizing the GGN data.

Approximately 220 (through March 20th) individual trouble and maintenance issues were responded to by the UNAVCO Facility during this fiscal quarter (Q4), including equipment, computer, and communications upgrades at several GGN stations that are summarized below.

Most GGN stations have a local computer to facilitate data transfer and real-time operations. The process of upgrading the GGN is continuing and this quarter one new Linux computer was deployed to upgrade the GGN station (SOLA) in Saudi Arabia and to support two SENH stations (HALY and NAMA). Three more Linux computers are being prepared for network upgrades and a new installation in Richmond, FL. The wireless Internet upgrade in Seychelles has been completed and a new Linux computer and Ashtech uZ receiver installed. The station is operational. Several GGN stations have faulty Ashtech uZ receivers awaiting upgrades as soon as these receivers are returned from warranty repairs at Thales. One station has had a receiver swap already (QUIN). Ongoing work on improving H-Maser frequency standard performance at two sites (PIE1 and CRO1).

Support for the NASA sponsored L2C experiment is ongoing. Six (McMurdo, Fairbanks, Hawaii, South Africa, Spitsbergen, and at UNAVCO Facility) Trimble NetRs receivers (and three chokering antennas) have been deployed and are operational. Data is being collected and archived at JPL. New L2C firmware release from Trimble has been tested. Seven new NetRs receivers with Zephyr antennas were added to the UNAVCO community purchase for GGN use. Two new NetRs receivers w/ chokering antennas were added to the UNAVCO community purchase (through separate PO) for deployment to GGN stations in Central Asia.

The new equipment test station being planned at Marshall Field outside Boulder for investigation of receiver and antenna performance, equipment mixing, and new GPS observables issues, is nearing completion. Monument design has been finalized with drawings and site plans. Drilling is finished and concrete bids are being reviewed. The new prototype triangular monument gig has been made and delivered to UNAVCO.

"NASA Project" front page for UNAVCO Web w/interactive station maps (GGN and SENH) is live. Poster on the UNAVCO support to the GGN and the Web work was presented at the UNAVCO Science Workshop in March. See: http://facility.unavco.org/project_support/nasa/nasa.html
Figure 9. Interactive status map of the NASA Global GPS Network. UNAVCO staff monitor, maintain and operate the GGN Network for NASA-JPL. Monitoring efforts and first response authority to ensure continuous operation of the GGN are maintained at a sub-hourly level. JPL personnel are closely involved in day to day operations and direct long term goals and priorities.

The upcoming AFREF Workshop in Cape Town has been postponed till July 2006. UNAVCO will play a role in the workshop proceedings and discussions. A UNAVCO/JPL abstract for the upcoming Western Pacific Geophysics Meeting has been submitted. The focus of the abstract is to highlight the important role of the NASA GGN in precision GPS applications and to bring attention to the future infrastructure requirements of the global GNSS geodetic community. An abstract for the upcoming IGS Workshop is also being prepared.

Management of the UNAVCO Community Equipment Pool

The UNAVCO-managed NSF shared pool of GPS systems continues to be a very popular resource for the high precision GPS research Community. The state-of-the-art and well maintained and equipped receivers in the UNAVCO pool offer the best geodetic data quality, are rugged for traditional campaign field surveys, and feature low power/large
memory for semi-permanent applications. Systems include ancillary equipment such as tripods, calibrated tripods, calibrated tribrachs, batteries, field enclosures, and solar panels. Equipment has been systematically upgraded through a separate Facility NSF EAR I&F grant, supplements associated with specific PI projects, regular NSF OPP purchases, and the new NSF EAR PBO campaign pool. There are currently a total of 290 receiver systems in the pool of which 232 are not currently on long-term projects and are considered to be in the “available” pool (Table 2). By maintaining a standardized pool of receivers provided by multiple sponsors, UNAVCO achieves economy of scale both in procurement discounts and technical support efficiency. Supporting multiple agencies with different field seasons keeps the equipment pool in use nearly year-round with non-PBO equipment usage ranging from 30 to 100%. Current pool usage is given in Figures 10-13.

Table 2. UNAVCO Receiver Pool. Table shows the quantities of receivers by funding source and type. The “Available Pool” receivers are not currently assigned to long-term projects at the time of this report.

<table>
<thead>
<tr>
<th>Make/Model</th>
<th>EAR</th>
<th>OPP</th>
<th>Total</th>
<th>Assigned to Long-term Projects</th>
<th>Available Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimble NetRS</td>
<td>34</td>
<td>19</td>
<td>53</td>
<td>2-Salton Trough 2005 1- RETREAT</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6-Mauna Loa 2005, 9-OPP</td>
<td></td>
</tr>
<tr>
<td>Trimble 5700/R7</td>
<td>30</td>
<td>55</td>
<td>85</td>
<td>10-Denali EQ Response 1 -RETREAT</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2-Barrow, 1-Toolik Lake</td>
<td></td>
</tr>
<tr>
<td>Topcon GB-1000*</td>
<td>100</td>
<td></td>
<td>100</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Trimble 4000**</td>
<td>26</td>
<td>8</td>
<td>34</td>
<td>3-SAGE-NZ, 6-MIT, 5-Antarctica, 2-U. Maine, 1-PBO Nucleus, 2-Baja, 2-Parts</td>
<td>13</td>
</tr>
<tr>
<td>Trimble 4700/4800**</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Ashtech MicroZ/Z-XII**</td>
<td>12</td>
<td></td>
<td>12</td>
<td>4-Nisqually EQ Response, 1-U.Colo.</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>205</td>
<td>85</td>
<td>290</td>
<td>58</td>
<td>232</td>
</tr>
</tbody>
</table>

*For projects in the EarthScope PBO footprint, ** Occasional use, but unsupported and being phased out by attrition
Figure 10. The Trimble R7/5700 receiver pool is the mainstay of the portable equipment pool and is heavily subscribed over the year. Projected utilization will approach 100% over the summer until October 2006.

Figure 11. The NetRS receiver pool is primarily intended and outfitted for use in longer-term “semi-permanent” surveys. Demand for these systems has increased greatly and 16 additional units have been added to the pool. Projected utilization will be approximately at 100% over the summer until October 2006.
Figure 12. The Topcon receiver pool was purchased for the EarthScope Plate Boundary Observatory and use of this equipment is primarily for EarthScope funded projects though other approved projects in the EarthScope footprint can be considered.

Figure 13. The Trimble 4000 pool is being phased out and is being reserved as spare parts for the community for receiver repairs.
Community Member Receiver Purchase and Related Facility Support

Another 150 GPS receivers were purchased in the February 2006 semi-annual group purchase. UNAVCO negotiated prices with vendors for associate members (out of country). Of the February purchase, the Facility ordered sixty-four for PBO nucleus, nine for Polar, and 59 for University PI projects supported by the Facility. A new Facility senior technician was hired this quarter (to replace the technician who moved to PBO) and has already completed both Trimble and Topcon repair training. Fourteen repairs were made during the quarter. UNAVCO is now an authorized repair depot for Trimble and Topcon receivers. Facility equipment operations were moved under the Engineering group this quarter and PBO equipment operations moved to PBO management in order to provide better integrate equipment integration within each group.

1.3 Data Highlights

Archiving and Data Management

Holdings. Archive holdings in the online repository, which is the primary copy of all GPS related files and products, total 0.94 Tb in compressed form (1.9 Tb when uncompressed to their usable form). Holdings in the ftp pickup area, which is also the secondary copy of all GPS-related files and products, total 1.3 Tb. The bar graphs (Figure 14) show the cumulative and annual archive data volume growth through time for the primary copy of GPS files. The map (Figure 15) shows the global distribution of GPS monuments with data in the Archive.

Figure 14. (left) The cumulative volume of data in the Archive repository and (right) the annual data volume. The total number of files has just crossed over a million files. The increase in data volume growth continues to increase with over 50% of all holdings added since 3/2005.
Figure 15. Locations of permanent stations (pink) and campaign monuments (red) with data archived at UNAVCO. There are now over 8700 individual locations.

*Permanent Stations.* Currently, 869 active global permanent stations are being archived at UNAVCO. Thirty-nine new PBO sites were added this quarter. An additional eighteen sites from a variety of global networks were added this quarter for automated daily archiving.


*Plate Boundary Observatory Data Support.* The IRIS mirror and ftp server for PBO data was populated with all Nucleus and PBO holdings.

*Nucleus Data Support.* All historical data for all 210 Nucleus sites has been archived, including completion of the SCIGN network this quarter.

*SCIGN Network Support.* The UNAVCO Archive was selected to archive data from approximately 95 USGS-operated SCIGN stations for 2006.

*GGN-SENH Data Support.* An internal review of the GGN backup procedures and software was conducted and possible improvements to the process were identified.

*Data Pickup.* For the quarter, a monthly average of 794,000 files were picked up from the Archive. The pie chart shows pickup traffic by domain (Figure 16).
Figure 16. Data retrieval from UNAVCO by domain. Educational institutions are the largest users of archive data.

*IT Infrastructure and Software.* An extensive upgrade of the archive web interface is underway and a prototype has been developed and presented for community review (Figure 17). A new GPS Seamless Archive Centers (GSAC) Retailer server was configured and put into production, replacing the previous server, which had been purchased in 1999. Planning discussions for infrastructural needs for GeoEarthScope archiving (including image data from LiDAR and InSAR) were held.

Figure 17. Development of new Archive database web access tools is underway with a full rewrite of query forms and the addition of Google Maps-based interface. The prototype [http://facbeta.unavco.org/data/data.html](http://facbeta.unavco.org/data/data.html) was unveiled at the UNAVCO Science Workshop and community feedback solicited.
1.4 Education and Outreach Activities

**UNAVCO E&O Website Revision**

The UNAVCO E&O website (Figure 18) has undergone a major revision over the last year in order to reflect the many new activities underway at UNAVCO, to provide enhanced outreach, and to provide appropriate information for a range of users including researchers, teachers, faculty, students, and the general public. In addition, our UNAVCO community is actively sending us current research material for our rotating highlights on the UNAVCO front page.

![UNAVCO Education and Outreach](http://www.unavco.org/edu_outreach/edu_outreach.html)

**Figure 18.** The new UNAVCO Education and Outreach web pages. See: http://www.unavco.org/edu_outreach/edu_outreach.html.
**Socorro Survey Training**

A 17-person, 2.5-day course was taught by UNAVCO engineers Beth Bartel and Nicole Feldl at the New Mexico Institute of Mining and Technology (New Mexico Tech) in Feb-March 2006. The class was a hands-on introduction to scientific surveying using UNAVCO GPS equipment, specifically, Topcon GB-1000 receivers. Static, fast static, post-processing kinematic, and real-time kinematic techniques were covered. The purpose of the class was to familiarize participants with the capabilities of GPS, as well as to provide practical instruction in using the instruments for individual field projects.

**UNAVCO Jules Verne Voyager Redesign**

The UNAVCO Jules Verne Voyager web mapping tool Java front end was completely rewritten over the last quarter. Voyager is used both for E&O and Archive data and data product display. The new interface (Figure 19, left) uses Java Swing and incorporates GUI design elements that were based on extensive user involvement including students from Prof. Tamara Sumner’s Center for Lifelong Learning and Design at the Computer Science Dept. at the U. of Colorado, Boulder (Figure 20). Base map and feature selection is greatly simplified. The GUI layout can also easily be changed using configuration files on the server. A new series of graphical help and legend figures helps users understand and interpret map options and content (Figure 19, right). The implementation is a collaborative project involving Prof. Michael Hamburger, Indiana University; Prof. William Holt and Glenn Richards, SUNY Stonybrook; Marianne Wiengroff, DLESE Program Center; with support from the NSF EarthScope Program. UNAVCO participants included Stuart Wier, Susan Eriksson, Lou Estey and Charles Meertens at UNAVCO. The new Voyager (beta-version) can be found at: [http://jules.unavco.org/Voyager2/Earth](http://jules.unavco.org/Voyager2/Earth).

Figure 20. Last year student engineers from the Center for LifeLong Learning and Design participated in the Voyager Redesign. (Right) Emily Elliott, Joe Kahim, Camille Dodson, and Anh Dang. (Left) Chris Poyze, Allen Bagwell, Antonio Romero, and Adrian Chavez. Elements from their detailed design reviews were incorporated in the new Voyager interface.

2.1 January 2006

Facility Data Group

NSF/EAR Data Support
- Routine archiving of permanent stations proceeded with 103 Gb archived.
- Five new permanent stations were added for ongoing data management and archiving (Antarctica Transantarctic Mountains: FTP4; UNAM: UNIP). Currently, data from 847 sites are actively managed and archived.
- Numerous data flow problems and data file manual archiving, chopping, merging etc. problems solved.
- Archiving was completed for two campaigns totaling 1.3 Gb Mb this month (Antarctica Support 2004/2005, revisited; Pakistan 2006).
- 530,952 files (156.5 Gb) were picked up from the ftp area during the previous month.

NASA Data Support
- 3 GGN sites were added to the Archive database for tracking and support of the GGN.
- Maintenance tasks such as resetting hung receivers were performed.
- Data from CHPI were manually archived.

NSF/EAR NUCLEUS Data Support
- The rsync of Nucleus raw and RINEX files to data-out2, the ftp server at IRIS, was implemented.
- NetRS conversions for three Nucleus sites (BEMT, EWPP, CCCC) required new data handling procedures to be put in place.
- Historical data archiving for thirty-three stations of the SCIGN Nucleus network was completed. For the SCIGN-Nucleus network, historical archiving is complete for most stations with 4-character ID lexically less than RHCL. About 30 SCIGN stations remain to have historical archiving completed. All other Nucleus stations are caught up with historical archiving.

NSF/EAR Plate Boundary Observatory Data Support
- 9 stations (AV21, P063, P166, P427, P471, P499, P509, P510, P618) were added to the Archive metadata databases and archiving of raw data with RINEXing was initiated. As of the end of the month, 273 stations have had data flow to the Archive.
- Reporting to the PBO state-of-health system of the Archive’s handling of hourly files was implemented.
The rsync of PBO data product level 2+ files to data-out2, the ftp server at IRIS, was implemented.

The UNAVCO Archive pulled hourly files from Mt. Augustine stations during the PBO server migration.

Permanent station AUGL, formerly part of the Data Archive’s Alaska Network, was terminated in order to resurrect it as AV21.

A comprehensive metadata report from the SQLServer permanent station database was generated to assist PBO in backfilling installation and maintenance records from initiation of station installs to the present in the PBO Operations Database.

**Information Technology Infrastructure**

- System administration, PBO and Data Group staff met with EMC representatives to receive their report on the need for a software upgrade to avoid future incidents such as the integrity checking errors that occurred in November, 2005.
- EMC’s recommended upgrades were installed; 2 hours of unanticipated downtime occurred and recovery measures were initiated for data archiving of files received during the downtime.

**Software Development**

- A dedicated software development machine for archiving and GNSS data format-related development was implemented.
- The general redesign of Archive database backed web pages in PHP initiated in September is proceeding.
- The concept for a Data Archive Interface web portal was developed through several meetings.
- The campaign data and documentation extraction scripts were rewritten from the ground up to maximize re-use of code and add new functionality.
- Planning for new development in the data delivery sphere was accomplished. Schema changes to support data delivery were designed.

**Archiving Operations**

- Staff attended the ESIP (Earth Science Information Partners) Federation Winter Meeting in Washington DC to learn about data and metadata exchange mechanisms in use or planned within that community.
- Scripts to check RINEX headers against visit metadata were implemented.
- Schema revisions and additions to better document monumentation were implemented.
- The Permanent Station Archiving Student Assistant hired in December was trained.
- LDM configuration was streamlined on data management and data handling machines.
• Reports were created against the equipment database to show dates of equipment return.
• Enhancements to the project support request tools were designed and implementation initiated.

**GNSS Data Formats**
• A GNSS modernization informational web page was developed.
• RINEX version 2.11 was finalized and rolled out.
• Specifications for RINEX 3.00 developed with Werner Gurtner were released for comment.
• Numerous definitions in the UNAVCO GNSS glossary (available on the web) were added and/or cleaned up for entries related to Galileo, GLONASS, SBAS, etc.

**Database Services to Headquarters, Facility, and PBO**
• Several Solomon system reports and new functions were designed and implemented.
• The UNAVCO Science Workshop web pages and registration, abstract and abstract figure submittal, registration approval web pages were placed in production.
• Purchase request and HQ monthly expense reports were enhanced.

**Education and Outreach**
• A prototype of Voyager “PaleoEarth” was implemented in the Jules Verne Voyager mapserver.

**Engineering Group**

**General**
• Opened and announced the February UNAVCO member receiver mass buy. Coordinated with many interested parties, approximately 150 units are now forecasted.
• Performed multiple membership consults related to current receiver purchase opportunity.
• Budget and support letter for Andean Glacier project in Peru for Bryan Mark.
• Helped with two proposal budgets being submitted to NSF MRI program.
• Opened and announced FE II position.
• Integrating equipment service function within Engineering Group.
  o Existing staff transferred to into group.
  o New Senior Equipment Technician Patrick Lee started.
• Established management and sharing policy for temperature test chamber. Assigned responsibility to schedule chamber time within group.
• Assisted with responding to questions by management review panel.
• Worked with Facility Administrator to clean up charges on project and equipment accounts.
• Established how to handle associate member receiver purchases with Topcon and Trimble.
• Revised equipment purchase web page.
• Reviewed PI abstract list.
• Put a great deal of thought into how to more effectively manage group to support PI needs and taking action within group to define and apply good management control.
  o Project managers asked to define objectives and how they plan, monitor and control their activities and performance.
  o Asked project managers to develop quarterly task plans for their project areas starting next quarter.
• Arranged property transfer of surplus GPS equipment from UCSB.
• Started evaluating tie survey requirements at co located geodetic stations to evaluate whether TLS can make job more efficient.
• Started planning new south Florida GGN station.
• Scheduled support requests through summer timeframe.

**NSF-EAR University PI Project Support**

*Projects*

• Ethiopia (E. Calais):
  o Configured and shipped 10 quasi-permanent NetRS systems on short notice
  o Tested receivers in temperature chamber
• Guerrero Coast (K. Larson):
  o Shipped systems back to Mexico on 12/20/05.
  o Assisted with resolving customs issues
• Costa Rica (T. Dixon)
  o 2 week deployment in county assessing communications options for permanent stations
• SIGMA (B. Brooks)
  o Configured and shipped 2 Ethernet bridges to Mt. Aconcagua, Argentina.
  o Tested PIs NetRS in temperature chamber.
• Mt. Washington (S. Nerem)
  o Configured and shipped new download computer
  o Tested receiver to check for downloading error
• KODK Permanent Station (J. Freymueller)
  o Configured and shipped new Ashtech MicroZ and USR telephone modem
• Kashmir 2006 (R. Billham)
- Provided PI with replacement 5700. Configured and test PIs 5700 receivers.
- Saudi Arabia (R. Reilinger)
  - Configured and shipped new download computer
- U.C. Davis (L. Kellogg)
  - Configured and shipped NetRS for evaluation on site UCD1
- Joshua 2006 (R. Bennett)
  - Project preparation. Configured 11 5700 campaign systems. Consulted with PI on various issues concerning project.
- Yucca Mountain (B. Wernicke)
  - Finalized billing issues with CDMA modem. Shipped remaining equipment to CalTech.
- Marshall Field Monument (O. Ruud)
  - Drilled 24” pillar monument. Assemble monument structure

**Permanent station O&M support**
- BARGEN: TUNG, HEBE, BEAT, FERN, RYAN, BULL, GOSH
- Yucca Mountain: ASHM, ROGE
- Galapagos GPS Network: GV03
- Philippines GPS Network: KAYT, TGYT, TVST, L1 sites
- Northwest Mexico GPS Network: YESX
- Bhutan: TIMP
- Antarctica: FLM2, ROB4, FTP1
- Eastern Med.: TETN, TUBI
- Socorro: CDVV, PDGB, CARB
- US Array: LOZ1, WMOK, JCT1
- Mount Washington: MTWO
- Las Vegas Network: UNRI

**PBO permanent network support**
- Assisted in the installation of three deep drill braced continuous GPS sites in the Southern California region.

**Equipment Support**
- Repairs
  - 3 Purdue receivers
  - 2 CU receivers
  - 1 U. Miami
- Finishing outfitting 15 campaign boxes for receivers.
- Completed move to annex building
NSF-EAR EarthScope Plate Boundary Observatory Project Support

PBO Nucleus Project

- Upgrades of four Nucleus stations: CCCC, BEMT and EWPP (SCIGN Network), and SEDR (PANGA Network).
- Site visits to repair existing station configurations at LKCP (PANGA), SCIA, LNMT and BMHL (SCIGN) and MEE1, MEE2, GR8V, QCYN, WINT (BARD).
- Remote troubleshooting for stations MLFP, ECFS, BKAP (SCIGN), GOSH, HEBE (BARGEN), CHZZ, PUPU, BLYN (PANGA), GTRG, LKWY, HLID, TSWY (EBRY), and the download hub for the 13 station Parkfield network at Carr Hill (BARD/SCIGN).
- Permit transfer of 3 BARGEN stations to UNAVCO complete, others in progress (R. Lewman).
- Permitting and recon for remonumentations of BARD stations MEE1, MEE2, QCYN, and GR8V. These are semi-permanent stations built and operated on private land by the University of Wisconsin and will be converted into permanent PBO-style stations later this year.
- Permit transfer application submitted to NFS for EBRY station BBID, and to FAA for BARD station WINT, including permission to remonument the station.
- Year 1 Annual Progress Report accepted by NSF Program Manager K. Shedlock and Year 2 funding released and received by UNAVCO.
- Coordination of purchase, configuration and testing of CDMA modems with Alltel service with manufacturer, PBO DMIT and engineering groups and PBO Basin and Range field personnel. The first unit was demonstrated to be good option for PBO and Nucleus comms in areas not served by Verizon in AZ and NM and will be tested in NV in Feb.
- Joint planning of telemetry network with PBO NCAL staff for Nucleus/PANGA upgrades and new PBO construction.
- Transferred download responsibility for AKDA station SELD from U. of Alaska to UNAVCO Boulder in response to Augustine eruption, pending DSL/NetSR upgrade this spring. This will allow us to automate and keep data flow current.
- Clarification from K. Shedlock regarding proposed payment of honoraria to K-12 teachers assisting in development of project-related modules.
- Planning of Bearmat radio network upgrades (SCIGN network)

Nucleus Network Summary: Upgrades to Date: 65, Upgrades this month: 4
EarthScope Campaign Support

- Received 50 Topcon GB-1000 systems and 4 RTK supplements ordered in December, completing the UNAVCO/Topcon purchase agreement.
- Made preliminary arrangements to provide 6 campaign systems to EarthScope funded 2006 collaborative Cascadia ETS project (T. Melbourne et al., PI's).
- Continued dialog with Topcon management regarding outstanding hardware, software, and training issues.
- Planning with facility engineering group of Topcon RTK training in Socorro, NM for New Mexico Tech earth sciences dept. (P. Kyle, PI).
- Discussion and clarification of PBO data policy as it applies to past and future EarthScope GPS campaigns. Awaiting response from K. Shedlock re: R. Bennett Cascadia 2005 campaign.
- EarthScope Campaign support web page online (http://facility.unavco.org/project_support/es/pbo-camp/pbo-camp.html) and linked from main PBO page.
- Fulfilled requests for short-term GB-1000 evaluation units to M. Bevis, OSU and C. Valladares, Boston College.

Campaign System Summary: 51 Total, 26 in-house, 1 missing from Cascadia ETS Campaign shipment, 3 at PBO NCAL (Coyle), 1 on MSH (Lisowski), 20 awaiting upgrade/repair at Topcon factory. Total requested this month: 1

NSF OPP Support

Antarctic

- One staff and 75 receiver pool deployed at McMurdo Station, Antarctica (S. White).
- 24 receivers deployed for ice stream velocity measurements (S. Anandakrishnan/R. Bindschadler).
- Six receivers deployed for Amery Ice Shelf rift study project (H. Fricker).
- Four receivers deployed for West Antarctic Ice Sheet strain grid surveys (K. Matsuoka).
- Three receiver systems deployed for 15 month continuous data collection for Taylor Glacier calving study (E. Pettit).
- Three receivers provided for soil stability surveys in Dry Valleys (J. Putkonen).
- Filed support to Dry Valleys Long Term Ecological Research projects (M. Gooseff, D. McKnight).
- One receiver provided for Antarctic Weather Station surveys (C. Stearns).
- Provided pre-deployment training for Weddell Sea iceberg research project (T. Scambos).

Arctic
- Presented GPS base station installation plans at Greenland Summit Camp planning workshop in Boulder (B. Johns).

General Support and Infrastructure Development
- Set up winterover vacuum vs. foam insulated enclosure performance comparison at McMurdo GPS test-bed (S. White).

NASA Program Support
- Started work on FY06SOW and GGN-PEM Meeting.
- "NASA Project" front page for UNAVCO Web live.
- AFREF Workshop postponed till July 2006.
- Submitted abstract and picture for UNAVCO meeting.
  - Marshall Test Site Installation:
    - Monument design finalized and drilling started (drill rig broke down and drilling is not finished yet). Expect drilling and concrete work to be finished mid-February.
    - Triangular monument gig made and delivered to UNAVCO. UCAR permit is OK.
- Working on new GGN installation in Richmond, FL
- Six (6) MicroZ receivers shipped to Thales for repair and upgrades.
- Five (5) new NetRs w/ Zephyr antennas for GGN (on UNAVCO community purchase) arrived and tested OK.
- Two (2) NetRs w/ chokering antennas for Sasha (CHUM and SELE upgrades possibly) arrived and tested OK. Will ship to Sasha February.
- New computers for SOLA (arrived), IISC, CIC1, Richmond (in prep)
- Support to Pseudorange Bias experiment.
- No news on Guadalupe Project from Javier or SCIGN Group.
- Inventoried NASA international partner agreements and helping to plan renewal of ones that will expire soon.
- Started investigating tie survey requirements and survey methods previously used at GPS/VLBI collocated stations. Considering whether ground based laser scanning could help characterize VLBI antenna structure flexure.
- L2C experiment status:
  - MCM4 operational
New (L2C) firmware released by Trimble. Installed on one test rx at UNAVCO.

Site highlights:
- AREQ: New agreement NASA-UNSA signed. Some Internet outages. Received Internet invoices from Janet ($1056 left in account). UZ tracking problems resolved itself. Data publishing is back on.
- CHPI: Changed download script from EGADS to beta download script to combat download/file problems, -seems to work. Also, local telecom Co. changed dialing prefix for the download location, script updated.
- CIC1: Our computer power. supply faulty, will send new computer (sent out IGSSTATION email). Francisco sent the needed log info and pictures. Preparing IGS log update.
- CORD: Dave S. is working w/ NASA-HQ on new agreement. Some Internet outages.
- CRO1: Locals will move rx to inner (temp controlled) room w/ Maser. Will prepare extra cables and new uZ rx for station upgrade.
- FAIR: Checking on Real-Time Comms. VSAT (6000) pricing and availability in case NOAA pulls Internet.
- IISC: Sridevi has installed new MET3A unit, but requested that the data not be published until unit has been purchased and evaluated.
- ISPA: Installed APC ups on computer following power outages.
- KUNM: New TR power supply installed by locals. Data flow back on. Still uncertain about the origin of the new Ashtech equipment?
- PIE1: Local contact installed attenuator on H-Maser line to receiver, brought power level close to 0 dBm. JPL monitoring clock performance.
- RBAY: JPL moved operations to new computer due to system restoration.
- SEY1: Still waiting on uZ repair from Thales. Two faulty units returned to UNAVCO and sent to Thales.
- SOLA: New Linux download PC delivered to KACST. Awaiting installation by locals.
- Approximately 75 individual NASA trouble or maintenance issues were handled during this month.

**Geo-EarthScope**
- GeoES Project Manager gave presentation on GeoES to program officers at NSF in Washington, D.C. on January 12, 2006 (additional details under
Meetings section). Feedback from NSF during the presentation resulted in ideas for a new geochronology plan for GeoES. This new plan would include the formation of a working group consisting of geochronology community members who would identify scientific targets and help create an RFP to identify labs capable of providing geochronology products (i.e. age dates) for these targets; based on responses to the RFP and with guidance from the working group and NSF, UNAVCO would purchase age dates from providers who respond to the RFP.

- GeoES Project Manager attended NASA/ESTO LiDAR Community Forum on January 10.
- Development of GeoES working groups continues.
- Development of revised 3-year plan for GeoES milestones and budget based on recent program-level changes.
- Development of GeoES special interest group session for 2006 UNAVCO Science Meeting.
- Initiated communications with G. Bawden (USGS) and C. Walls (PBO) regarding applications of InSAR imagery to PBO site selection.
- Submitted abstract for Seismological Society of America 2006 meeting. Title: “GeoEarthScope: Imagery and geochronology to support investigations into the structure and evolution of the North American continent and the physical processes controlling earthquakes”. Authors: D. Phillips, W. Prescott, M. Jackson, C. Meertens.
- WInSAR consortium announced decision to move to UNAVCO. There will likely be some overlap between GeoES InSAR activities and WInSAR activities at UNAVCO.
- Support for PI-funded GeoES projects continues (Basin & Range InSAR by F. Amelung; Death Valley LiDAR by J. Dolan). This month required low level support only.
- Updates made to GeoES web page (unavco.org/geoeathscope)

2.2 February 2006

Facility Data Group

NSF/EAR Data Support

- Routine archiving of permanent stations proceeded with 115.8 Gb archived.
• Four new permanent stations were added for ongoing data management and archiving (Idaho National Lab: HPIG, TCSG; Mauna Loa: PHAN; Hawaii: BYRL). Currently, data from 869 sites are actively managed and archived.

• Numerous data flow problems and data file manual archiving, chopping, merging etc. problems solved.

• Archiving was completed for one campaigns totaling 2.6 Gb Mb this month (RETREAT – Italy 2005).

• 1,218,068 files (120.9 Gb) were picked up from the ftp area during the previous month.

**NASA Data Support**

• Staff assisted with RINEXing and QC of test data.

• Software fixes to GGN backup-related scripts was performed.

• Hourly reports were modified to show last 24 hours instead of current day information.

• Internal review of GGN backup procedures and possible improvements was conducted.

**NSF/EAR NUCLEUS Data Support**

• The rsync of Nucleus raw and RINEX files to data-out2, the ftp server at IRIS, was implemented.

• NetRS conversions for 12 Nucleus sites (BKMS, BSRY, CBHS, CDMT, CHMS, CHZZ, HCMN, KELS, LNMT, ORMT, RDMT, WOMT) required new data handling procedures to be put in place.

• Historical data archiving for thirty stations of the SCIGN Nucleus network was completed this month. This completes the historical archiving of the Nucleus SCIGN sites.

• Historical data archiving is complete for all Nucleus sites from all networks.

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

• Fourteen stations (AC06, P003, P009, P011, P043, P055, P167, P309, P395, P436, P449, P497, P516, P523) were added to the Archive metadata databases and archiving of raw data with RINEXing was initiated. As of the end of the month, 289 stations have had data flow to the Archive.

• Site AC06 was setup for hourly data handling.

• Site SG27 was setup for high rate data archiving.

• Archive staff attended two planning meetings organized by PBO staff to coordinate the migration from metadata submissions through the Facility permanent station database to the PBO Operations Database being the source of record for metadata going to the Archive.

• Archive staff worked with the Analysis Center Coordinator to make sure that product files that had missed being archived due to an LDM issue at MIT were transmitted to the Archive.
• Archive staff created graphical reports to help monitor receipt of expected products from the Analysis Centers.
• Automated metadata discrepancies indicated multiple problems with receiver serial numbers and missing maintenance reports. Most of these were reconciled.
• Seven files from 2005 that missed being archived at some point were put through the system for archiving. The reasons these were missed originally cannot be confirmed, but may have been a communications problem or a T00 unpacking problem.
• Archive staff participated in the Analysis Centers conference call.
• Mechanisms for reporting equipment location to the POD were created.

**Information Technology Infrastructure**
• Added another set of RAID disks to the ftp area.
• A system was set up to replace the aging GSAC Retailer system and the database was configured and populated. This system is now online as the GSAC Retailer.
• A meeting was held with the GeoEarthScope Project Manager to plan for infrastructure needs related to archiving of GeoEarthScope datasets.

**Software Development**
• Development on the new generation Archive web pages continued.
• Software to populate the data delivery schema area was incorporated for testing within the automated data handling software.

**Archiving Operations**
• Schema changes to support data delivery mechanisms were further developed and tested.
• Monumentation information has been incorporated and is being backfilled for permanent stations in the Archive database.
• Incorporation of database schema changes in the development database instance for tracking arbitrary collections of stations was accomplished.

**GNSS Data Formats**
• Began implementing Ashtech R-file record 9 translation.

**Database Services to Headquarters, Facility, and PBO**
• The equipment database manual was revamped.
• Support and enhancements for the front end to the equipment database were provided.
• Planning meetings were held for the Solomon upgrade.
• Maintenance and enhancement of the 2006 Science Workshop database and web front end were provided.
Several financial reports were tailored to the needs of the accounting group.

**Education and Outreach**

- The Data Group Head agreed to sit on the RESESS Steering Committee and then participated in a selection committee meeting for RESESS candidates.

**Engineering Group**

**General**

- Consulted with National Geographic Television on locations for educational TV series on Volcanoes.
- Made new user FAQ page for web.
- Consulted with G. Sella at NGS on VSAT service options for CORS stations.
- Consulted with J. Ray at NOAA regarding coordination and requirements of tie surveys at core geodetic stations.
- Consulted with P. Glaser on budget for proposal being submits to NSF-GEO Carbon and Water in the Earth System program.
- Planned 3 SIGs for UNAVCO science workshop.
- Prepared report for BOD meeting.
- Began coordinating group contribution for annual report.
- Multiple consultations on receiver mass buy.
- Helped with budgeting for Kuril project with M. Simons and M. Kogan – submitting to NSF-EAR for possible SGER (Small Grant for Exploratory Research Grant) funding.

**NSF-EAR University PI Project Support**

**Projects**

- Costa Rica (T. Dixon, Univ. of Miami)
  - 2 week deployment in county assessing communications options for permanent stations
  - Found locations for two new DDBM stations, met with drilling contractor, obtained estimates, local equipment and supplies recon, established deployment schedule, established equipment budget, (created project budget template in excel)
  - In progress: equipment purchasing, assembly, testing, NetRS config, oven testing, GSM modem config, testing
- Joshua Tree 2006 (R. Bennett, Univ. of AZ)
  - Shipped 11 campaign systems to support project
- Marshall Field Monument (O. Ruud, NASA)
  - Drilled 2nd monument and excavated trench between the pillars Assemble monument structure for 2nd monument.
- Mt. Erebus Mapping (P. Kyle, NMT)
- Prepared and gave a short-course on introduction to GPS theory and surveying at the New Mexico Institute of Mining and Technology.
- Shipped 4 Topcon Systems
- Greenland Petermann 2006 (Konrad Steffen, University Colorado).
  - Shipped one complete system
- Breidamerkurjokull 2006 (Tulaczyk Slawek University of Washington.)
  - Shipped 6 solar panels and 1 GPS Antenna.
- T-Rex (T. Weckwerth, UCAR)
  - Met with PI at UCAR to discuss equipment requirements for upcoming experiment to study rotors.
- RETREAT (R. Bennett, Univ. of Arizona)
  - Provided technical support to in county contact on how to download receivers and reconfigure power systems.
- SubAndes (M. Bevis, Ohio State Univ)
  - Shipped PI 3 tripods and tribrach to support his campaign surveys

**Permanent station O&M support**
- BARGEN: TUNG, UPSA, SLID
- Yucca Mountain: ASHM
- Galapagos GPS Network: GV03
- Northwest Mexico GPS Network: YESX
- Bhutan: RBIT
- Antarctica: FLM2, ROB4, FTP1
- Eastern Med.: TETN, IFRN
- Socorro: CDVV, PDGB
- US Array: BLA1
- Mount Washington: MTWO
- Las Vegas Network: UNR1
- Greenland: KULU
- Alaska: KODK
- Antarctica: FTP4
- Cotapaxi: CX01, CX02

**PBO permanent network support**
- US ARRAY: 4th site, BLA1, installed. Assisted with comms issues with field techs.
- Assisted with installation of four deep drill braced monuments in Southern California (P523, P540, 546, P516).
- Shipped Ancillary equipments to AK office. 3 Antenna cables, 1 Tripod and Antenna bags.
Equipment Support

- Outfitting 25 NetRS campaign systems.
- Finalizing move to annex building. Finished re-arranging the Annex Building racks. Moved 2 racks back to the main building. Finished installing 2 racks for POLAR Group and still waiting for 6 more racks in order that need to be installed in the Annex for Michael Hasting’s group.
- Senior Tech complete weeklong training at Trimble
- Received the returned of the Antarctica 2005 project (2nd half). 34 systems total, in the process of checking them in and recalibrating all the systems and getting them ready to assign for the next project.
- Repairing of NetRS and R7/5700 receivers in house is now happening.

NSF-EAR EarthScope Plate Boundary Observatory Project Support

PBO Nucleus Project

- Upgrades of fourteen Nucleus stations: ORMT, WOMT, LNMT, RDMT, HCMN, CDMT, BSRY, CBHS, CHMS, and BKMS (SCIGN Network), TUNG (BARGEN), and PUPU, CHZZ, KELS (PANGA Network).
- Site visits for repair or maintenance of existing station configurations at GRNX (AKDA Network), PUPU (PANGA), GMRC, GNPS, LDSW, BKAP, CCCC (SCIGN).
- Remote troubleshooting for stations TUNG, HEBE, SMEL, and SLID (BARGEN), MAWY, OFW2, HLID, and AHID (EBRY), and DDSN, BLYN (PANGA).
- Attended annual PANGA investigators meeting in Eugene, OR, 2/18-19. Gave oral and video presentation "Memorial for Dan Johnson", and poster presentation "PBO Nucleus Network Status in the Pacific Northwest".
- Finalized configuration of USGS/UNAVCO Private Network which is ready for use by Nucleus, PBO, and USArray GPS stations collocated with NSN and GSN seismic stations.
- Continued planning of joint Nucleus/PBO data communication networks in NCal, SCAL, RM, and B&R regions.
- Recon for upgrade of PANGA station NEWP showed that complete remonumentation will be necessary. Coordinated FAA permit transfer from
Oregon State (C. Goldfinger) to UNAVCO and applied for permit to build new monument adjacent to the existing station.

- Receiver notification from El Camino Community College in Los Angeles that Nucleus station ECCO will be decommissioned due to new construction on campus. Decision on replacement is pending reconnaissance of possible new locations, or inclusion of USGS-operated SCIGN station LASC.

- Provided extensive emergency troubleshooting and GPS data support to Barrow Arctic Science Consortium and J. Hutchings (U. of Alaska) following failure of BASC base station during sea ice drift buoy experiment 2/24-26.

Nucleus Network Summary as of 2/28/06: Upgrades to date: 78, Upgrades this month: 14

EarthScope Campaign Support


- Received 16 GB-1000 receivers from Topcon having been upgraded for memory configuration and repaired for heat-related display failures. Further hardware failure resolution outstanding on 4 units still at Topcon factory.

- In conjunction with B. Bartel (UNAVCO Facility) and J. Mullen (Topcon), planned and taught 2.5 day workshop "GPS Surveying and Processing using Topcon GB-1000 hardware" and New Mexico Tech. in Socorro, NM. Class was attended by 20 students, faculty, and surveyors from New Mexico Tech, UTEP, and the New Mexico Bureau of Mines and Geology. Topics included static and RTK surveying and DGPS post-processing using Topcon software packages.

- Coordination of Topcon community purchase with interested members from Boston College (C. Valladares), Ohio State (M. Bevis and D. Raleigh), UTEP (S. Harder), and University of Alaska (M. Truffer).

- Meeting with NGS Colorado State Geodetic Advisor Pam Fromhertz and K. Bohnenstiehl on 2/8, with regard to siting of Rio Grande Rift project stations. Further coordination throughout the month of siting, permitting, and installation plans with PI's Lowry and Sheehan (CU) and Roy (UNM).

Campaign System Summary as of 2/28/2006: 101 Total, 85 in-house, 4 at New Mexico Tech for on-site training session (N. Feldl), 1 missing from Cascadia ETS Campaign shipment, 3 at PBO NCAL (Coyle), 1 at PBO RM (Friesssen), 1 at Boston College for system evaluation (C. Valladares), 1 at Ohio State for system evaluation (M. Bevis), 1 on MSH (Lisowski), 4 awaiting repair at Topcon Factory. Total requested this month: 1.
**NSF OPP Support**

**Antarctic**
- One staff and 75 receiver pool receivers returned from McMurdo Station, Antarctica, wrapping up field project processing and archiving.
- Three receiver systems deployed for 15 month continuous data collection for Taylor Glacier calving study (E. Pettit).
- One receiver deployed on iceberg C-16 (D. MacAyeal).
- Three receivers deployed for Weddell Sea iceberg research project (T. Scambos).

**Arctic**
- Planning GPS/RTK system installation for Summit Station, Greenland.
- Planning GPS/RTK system upgrade for Barrow Arctic Science Consortium, Alaska.
- Planning support to Kennecott Glacier, Alaska project (R. Anderson).
- One receiver on loan for development and testing prior to Greenland deployment (K. Steffen).
- Support to Greenland Supraglacial Lakes continuous data collection project in progress (I. Joughin/G. Catania).
- Receiver loan to Greenland Margins Peripheral Thinning project for development activities (S. Das/T. Neumann).
- Investigating possibility of supporting a geodetic base station near Jacobshaven for multiple NASA and NSF glaciology projects.
- Abstract submitted to International Arctic Workshop.
- Provided proposal support letter for LeConte glacier proposal (M. Truffer).

**General Support and Infrastructure Development**
- Setting up warehouse and fabrication facility in UNAVCO Annex.
- Testing Iridium communications with Trimble R7 receiver.

**NASA Program Support**
- Finished FY06SOW (draft) for GGN-PEM Meeting.
- Marshall Test Site Installation:
  - Monument drilling finished. Concrete work to be finished early March.
  - Triangular monument gig made and delivered to UNAVCO.
  - UCAR permit is OK.
- Working on new GGN installation in Richmond, FL.
- Preparing for GGN installation (w/ IDA) on Madagascar.
- Six (6) MicroZ receivers shipped to Thales for repair and upgrades (memory module and firmware upgrades).
Seven (7) new NetRs w/ Zephyr antennas for GGN (on UNAVCO community purchase) arrived and tested OK. Firmware upgraded to 1.1-5.

Two (2) NetRs w/ chokering antennas for Sasha (CHUM and SELE upgrades possibly) arrived and tested OK. One failed after 1.1-5 upgrade. Needs board replacement.

New computers for SOLA (arrived, but not installed), IISC, CIC1, Richmond (in prep)

No news on Guadalupe Project from Javier or SCIGN Group.

L2C experiment status:
- MCM4 operational
- FAIR operational
- KOKB operational
- HRAO operational
- NYAL operational
- UNAC operational
- New (L2C) firmware (1.1-5) released by Trimble and installed on test rx at UNAVCO.

Site highlights:
- AREQ New agreement NASA-UNSA signed. Situation moving back towards normalcy. Requested wire transfer for Internet charges for FY06 ($340/month). Ashtech uZ rx has failed, will send new CQ00 rx. Station is down, sent out IGSSTATION email.
- CIC1 Francisco sent the needed log info and pictures. Submitted updated IGS log. Station still down awaiting new computer.
- CORD Dave S. is working w/ NASA-HQ on new agreement. UNAVCO will “donate” old computer/comms. equipment but retrieve and swap GPS equipment. Deadline is May 23, 2006.
- CRO1 New CQ00 rx swapped and moved into inner (temp controlled) room w/ H-Maser. New 12’ antenna cable section installed. H-Maser input to rx now attenuated 25 dBm (to bring power level close to 0). Data public, IGSSTATION email sent and updated log submitted.
- GLPS Received FY03-05 ($18,000) invoices from CDF. Asked for invoices to be itemized. Power and VSAT outage, back up at end of month.
- GUAM Received annual invoice for Internet ($2400).
- HARV VSAT down. Need help from platform people to diagnose. Site down.
- HRAO Antenna blown out by lightning twice!! Updated log(s) and sent out IGSSTATION emails. Ludwig had extra Ashtech antennas on-site.
- KELY Submitted updated log w/ new DOMES#.
- KUNM Still uncertain about the origin of the new Ashtech equipment?
PIE1          Local contact installed attenuator on H-Maser line to receiver, brought power level close to 0 dBm. Clock performance has not improved ...

SEY1          New CQ00 rx arrived, but not installed yet. Received (old) ISP invoices from SNOC. Emailed UCSD reg. any phone charges.

SHAO         TR and modem moved to new location. Phone line connection (for GNEX) is intermittent with some data loss. No antenna change or movement.

SOLA         New Linux download PC delivered to KACST. Awaiting installation by locals. Ethernet wiring has to be completed.

USUD         Updated log w/ H-Maser maintenance info.

Approximately 95 individual NASA trouble or maintenance issues were handled during this month.

Geo-EarthScope

- Community discussion regarding GeoES geochronology plan at the EarthScope “GeoFrame06” workshop in St. Louis, MO, Feb 3-5, 2006. No formal presentation was prepared or given but GeoES became a topic of interest during open forum discussions and current plan was presented by K. Shedlock and D. Phillips. Valuable community feedback was received.

- Development of GeoES working groups continues with guidance from NSF. EAR program directors met in Feb 2006 at NSF to discuss the current GeoES plan and to establish official guidelines for GeoES working groups. L. Patino will be taking lead of GeoES geochronology efforts at NSF.


- Institutional visit to Ohio State University to meet with Mike Bevis and his group regarding the B4 airborne LiDAR project and its applications/implications for GeoES LiDAR data acquisition plans.

- Development of revised 3-year plan for GeoES milestones and budget based on recent program-level changes continues.

- Support for PI-funded GeoES projects continues (Basin & Range InSAR by F. Amelung; Death Valley LiDAR by J. Dolan). This month required low level support only.

2.3 March 2006

Facility Data Group

- Data Group staff participated in the UNAVCO Science Workshop. A poster describing the current Archive status and a Special Interest Group on the
topic of the Archive’s web data search and access interface that has been released in beta version was presented.

NSF/EAR Data Support
- Routine archiving of permanent stations proceeded with 59.6 Gb archived.
- No new (non-PBO) permanent stations were added for ongoing data management and archiving. Currently, data from 888 sites are actively managed and archived.
- Preparations were initiated for archiving of data from 95 USGS Southern California stations under an award from the Southern California Earthquake Center.
- Numerous data flow problems and data file manual archiving, chopping, merging etc. problems solved.
- Archiving was completed for two campaigns totaling 0.6 Gb Mb this month (Monument Hill Fault 2005, Pico del Aguila Anticline 2005).
- 632,533 files (81.7 Gb) were picked up from the ftp area during the previous month.

NASA Data Support
- Staff met with JPL staff to go over GGN backup procedures.

NSF/EAR NUCLEUS Data Support
- NetRS conversions for eleven Nucleus sites (BBRY, BLYN, CARH, CRBT, CTMS, RHCL, SFDM, SKYB, SPMS, TWHL, WKPK) required new data handling procedures to be put in place.

NSF/EAR Plate Boundary Observatory Data Support
- Sixteen stations (BLA1, P012, P031, P050, P052, P054, P107, P123, P208, P227, P228, P290, P407, P540, P546, P561) were added to the Archive metadata databases and archiving of raw data with RINEXing was initiated.
- Archive staff attended a planning meeting to coordinate the migration from metadata submissions through the Facility permanent station database to the PBO Operations Database being the source of record for metadata going to the Archive.
- Archive staff continued to work with the Analysis Center Coordinator to make sure that the set of archived product files is complete.

Information Technology Infrastructure
- A beta-version of the archive webserver was implemented to allow presentation of beta versions of data search and access pages.
- Recurrent failures of storage equipment were analyzed and presented to the vendor for action.
**Software Development**

- Development of the new generation Archive web pages continued.
- Software enhancements were designed and implemented in the testing system to facilitate tracking of holdings in the ftp area.

**Archiving Operations**

- Development of the new generation Archive web pages continued.
- Software enhancements were designed and implemented in the testing system to facilitate tracking of holdings in the ftp area.

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

- Several financial reports were tailored to the needs of the accounting group.
- Web-based course registration materials were created for courses UNAVCO will offer to the community.
- Database staff provided logic and information to PBO database developers for emailing notifications of maintenance work to interested UNAVCO staff or Nucleus external partners.
- Mechanisms for exchange of information with the POD for tracking of the location of government property were further developed.

**Engineering Group**

**General**

- Finalized semi annual receiver purchase with several last minute consultations. Approximately 150 receivers are on order between Facility and Members.
- Finalized budget and planning support for Simons, Kogan and Glaser proposals.
- Finished up BOD report.
- 3 SIG sessions were conducted at UNAVCO Science Workshop.
- Hosted visit by JPL GGN PEM Dave Stowers to coordinate NASA task plan.
- Made final review and revisions of new beta version project planning database and began using it.
- Focused effort began to update technical information on web – updated campaign training section, developing set of Topcon user documentation.
- Hosted visits by Eric Malikowski and Rui Fernandes after Science Workshop.
- Consulted wit IGSCB on AFREF project and coordination of other items.
- Reevaluated GGN back up method and revised plan in conjunction with JPL.
- Populated web site with several highlights.
- Planning participation in IGS workshop in May.
- Sent user questionnaire to PIs supported this quarter.
- Drafter GGN abstract for WPGM in Beijing.
- All group members participated in required diversity training.

**NSF-EAR University PI Project Support**

*Projects*

- Costa Rica (T. Dixon, Univ. of Miami)
  - In progress: equipment purchasing, assembly, testing, NetRS config, oven testing, GSM modem config, testing
  - Bulk of equipment shipped to Costa Rica
- Joshua Tree 2006 (R. Bennett, Univ. of AZ)
  - Checked in returned equipment, 11 campaign systems to support project
- Marshall Field Monument (D. Stowers, NASA)
  - Finished assembling structures, waiting for weather window to pour cement.
- Yucca Mountain Expansion Network (B. Wernicke)
  - Planned logistics for field work to begin April 1.
- Galapagos 2006 (D. Geist)
  - Submitted a budget for two permanent stations to PI.
- Socorro Magma Body (A. Newman)
  - Returned to sites (CDVV, PDBG) to stabilize the enclosure posts with guy wires.
- UNAVCO Dome Test 2006 (C. Meertens)
  - Planned and organized data for radome testing to examine the effect of a SCIGNN dome on positioning results when applying tropospheric modeling.
- Big Sky 2006 (K. Gardner)
  - Assembled and shipped receiver to PI.
- Greenland Seismology (J. Davis)
  - Starting to prep equipment. Working with Co-PI on shipping issues. Shipped one system to PI for evaluation.
- Kilauea 2006 (P. Segal)
  - Began project planning phase. Set installation schedule to start 08/21/06.
- Gulfnet Emergency Response (R. Dokka)
  - Arranged for return of VSAT and GPS equipment.
- Plum Island 2006 (W. Lee)
  - Worked with PI equipment needs and scheduled field dates.
Permanent station O&M support

- BARGEN: TUNG, UPSA, SLID
- Yucca Mountain: ASHM, Parump repeater, SIXM
- Galapagos GPS Network: GV02
- Northwest Mexico GPS Network: USMX
- Bhutan: RBIT
- Cotapaxi: COTO
- Antarctica: CONZ, FTP4
- Eastern Med.: TETN, IFRN
- Socorro: CDVV, PDGB, CARB
- US Array: BLA1
- Mount Washington: MTWO
- Greenland: KULU
- Alaska: KODK
- Snake River Plane: HPIG, – setup script to automated downloading

PBO permanent network support

- US ARRAY. Completed meta data forms to allow for data flow into archive

Equipment Support

- Outfitting 25 NetRS campaign systems.
- Senior Tech complete weeklong training at Topcon
- Sent senior tech to field to fix 3 Nucleus sites in NV.

NSF-EAR EarthScope Plate Boundary Observatory Project Support

PBO Nucleus Project

- Upgrades of fourteen Nucleus stations: BBRY, CRBT, CARH, RHCL, SKYB, SPMS, CTMS, SFDM, and WKPK (SCIGN Network), and BLYN (PANGA Network).
- Site visits for repair or maintenance of existing station configurations at GRNX (AKDA Network), TWHL, DDSN, and KELS (PANGA), CNPP, BEMT, OAES, RDMT (SCIGN), UPSA, TUNG, and SLID (BARGEN).
- Remote troubleshooting for stations SMEL (BARGEN), NDAP, CARH (Parkfield Hub), BVPP, and BDTM (SCIGN), JNPR (BARD), LTUT, EOUT (EBRY), and DDSN (PANGA).
- F. Blume attended PBO Operations group meeting, Salt Lake City 3/1-2. Gave 30 minute presentation on PBO Nucleus project and integration into PBO.
• Began transfer of permits to UNAVCO/PBO of 1 station in AKDA network, 5 stations in the PANGA network and 31 stations in the SCIGN network. BARGEN permit transfer for all 26 stations ongoing through R. Lewman (PBO Reno), and SCIGN has hired part-time Nucleus Permit Coordinator (D. Stark) on 3/20.

• Coordination of first Parkfield network upgrades (CARH, CRBT) with USGS, UCSD, UC Berkeley, and SCIGN personnel.

• Field testing in NV of Alltel-served Proxicast CDMA modem with PBO and Alltel staff.

• Blume filmed interview segments for Spanish language TV network Univision show "Aquí y Ahora" in Parkfield, CA on 3/21. Show scheduled to air on 3/30 or 4/6.

Nucleus Network Summary as of 3/24/06: Upgrades to date: 88, Upgrades since 3/1/06: 10

EarthScope Campaign Support

• Completion of "GPS Surveying and Processing using Topcon GB-1000 hardware" seminar in Socorro: 2/28-3/2.

• Plans to support non-EarthScope funded projects in Iceland (R. Bennett, P.I.) and Kuril Islands (M. Simons) rejected by N.S.F. program manager.

• Blume conference call with Topcon Moscow Software Development Manager D. Kolosov and GB-1000 Manager Tom Morris on 3/21. Detailed requirements for new user interface were presented by Blume, and development plans and patches to existing interfaces by Kolosov. Timetable and progress updates are still due from Morris.

• Blume attended UNAVCO Science Workshop in Denver 3/14-16. Led geological field trip to Red Rocks Park on 3/15 (50 participants), and presented summary of EarthScope Portable GPS support at Facility Engineering Group SIG on 3/16

Campaign System Summary as of 3/24/2006: 101 Total, 89 in-house, 1 missing from Cascadia ETS Campaign shipment, 3 at PBO NCAL (Coyle), 1 at PBO RM (Friessen), 1 at Boston College for system evaluation (C. Valladares), 1 at Ohio State for system evaluation (M. Bevis), 1 on MSH (Lisowski), 4 awaiting repair at Topcon Factory. Total requested this month: 0.

NSF OPP Support

Antarctic

• Wrapping up Antarctica field project processing and archiving.

• Three receiver systems deployed for 15 month continuous data collection for Taylor Glacier calving study (E. Pettit).
- One receiver deployed on iceberg C-16 (D. MacAyeal).
- Three receivers deployed for Weddell Sea iceberg research project (T. Scambos).
- Assembling Support Information Package for 2006-07 Antarctic field season.
- Planning and hosted training for GPS/RTK system installation for Palmer Station, Antarctica.
- Acquired 1 new Trimble R7 pool receivers.

**Arctic**

- Planning and hosted training for GPS/RTK system installation for Summit Station, Greenland.
- Planning for and hosted meeting for GPS/RTK system upgrade for Barrow Arctic Science Consortium, Alaska.
- Planning support to Kennecott Glacier, Alaska project (R. Anderson).
- One receiver on loan for development and testing prior to Greenland deployment (K. Steffen).
- Support to Greenland Supraglacial Lakes continuous data collection project in progress (I. Joughin/G. Catania).
- Field equipment delivered to Greenland Margins Peripheral Thinning project (S. Das/T. Neumann).
- Investigating possibility of supporting a geodetic base station near Jacobshaven for multiple NASA and NSF glaciology projects.
- Presented at International Arctic Workshop.
- Acquired 6 new Trimble R7 pool receivers.

**General Support and Infrastructure Development**

- Hosted Polar Special Interest Group session at UNAVCO Science workshop.
- Setting up warehouse and fabrication facility in UNAVCO Annex.
- Testing Iridium communications with Trimble R7 receiver.
- Presented UNAVCO internal informational talk “UNAVCO at the Poles”.
- Met with JPL engineer (Alberto Behar) regarding microcontrollers for remote GPS receiver operation.
- Visited to Cablenet fabrication facility regarding custom power board assemblies.

**NASA Program Support IGS**

- Meeting with GGN-PEM at UNAVCO.
- Forwarded FY06SOW to GGN-PEM.
• Discussion of support for FY06, new stations, receivers, IRIS collaborations, UNAVCO backup capabilities and preparedness, Marshall installation, IGS/AFREF Meetings, etc.

• Marshall Test Site Installation:
  Monument drilling finished. Concrete work to be finished by end of March.

• Working on new GGN installation in Richmond, FL.

• Three (3) MicroZ receivers returned from Thales with incorrect s/n and p/n labeling.

• New computers for SOLA (arrived, but not installed), IISC, CIC1, Richmond (in prep)

• 2C experiment status:
  o L MCM4 operational
  o FAIR operational
  o KOKB operational
  o HRAO operational
  o NYAL operational
  o UNAC operational
  o New (L2C) firmware (1.1-5) released by Trimble and installed on test receiver at UNAVCO.

• Site highlights:
  o AREQ Wire transfer for Internet charges for FY06 ($340/month) sent. Station is down, awaiting repaired uZ rx. U. Pittsburgh will add $1k.
  o CIC1 Station still down awaiting new computer.
  o CORD UNAVCO will “donate” old computer/comms. equipment but retrieve and swap GPS equipment. Deadline is May 23, 2006. Few power outages w/ data loss.
  o CRO1 Increased internet delays caused by faulty media converter locally, -resolved. Clock performance still not optimal.
  o GLPS Received FY03-05 ($18,000) invoices from CDF. Asked again (!) for invoices to be itemized. VSAT sat modem replaced locally.
  o GODE TR-ACT power supply faulty. Will moved GGN ops to Ashtech Z-XII3 on site. AOA antenna powered through powered (1x8) splitter.
  o GUAM Paid annual invoice for Internet ($2400).
  o HARV VSAT down. Reboot did not help. Requested engineer visit. Site down.
  o KELY Radar runs through month of March. Sent out IGSSTATION notice.
  o MCM4 Sci tech has “reserved” two “old” IPs for future GGN work if needed.
  o SEY1 New CQ00 rx and computer installed. Site operational. Submitted updated log and IGSSTATION email. Checking on MET pack connection.
- SHAO Phone line connection (for GNEX) is intermittent with some data loss. MOU (GPS included) w/ NASA renewed 2005 for 10 yrs.
- SOLA New Linux download PC delivered to KACST. Awaiting installation by locals.
- Approximately 50 individual NASA trouble or maintenance issues were handled during this month (through March 20th).

**Geo-EarthScope**

- New GeoEarthScope Imagery and Geochronology acquisition plans finalized, officially announced to community, and posted on GeoEarthScope web page.
- GeoEarthScope LiDAR, InSAR and Geochronology working group charters finalized, officially announced to community, and posted on GeoEarthScope web page.
- GeoEarthScope LiDAR, InSAR and Geochronology working groups established.
  - Oral presentation: “GeoEarthScope Overview and LiDAR Acquisition Plan” by D. Phillips.
- Support for PI-funded GeoEarthScope projects continues
  - Basin & Range InSAR (PI: F. Amelung): PI provided materials for data acquisition proposal to European Space Agency; proposal will by submitted by UNAVCO.
  - Death Valley LiDAR (PI: J. Dolan): LiDAR provider has scheduled survey for April 2006.