Permanent GNSS/GPS Stations: Overview of Support Provided by UNAVCO

158 Beth Bartel December 1, 2009 GNSS Permanent Stations, Information for PIs 4014

Permanent GNSS/GPS Stations - Overview

Permanently installed, continuous GPS stations have played a growing role in solid-Earth Science studies over the last decade. Although permanent installations are more expensive than episodic campaign surveys, they provide site motions at the highest precision and are especially suited to observing volcanic, post seismic, or other deformation transients. The UNAVCO Facility provides complete "cradle-to grave" permanent station support including proposal and budget preparation, site reconnaissance, installation and operation of stations, ongoing maintenance including daily monitoring of network performance and data quality checking and archiving. The service provided by the Facility is scalable and can be quickly tailored to a Principal Investigator's (PIs) experience level. Unique services provided by the Facility include a single point of contact for all NSF and NASA-GGN permanent station installation and troubleshooting questions, an up-to-date permanent station database including data flow diagrams, individualized weekly network status reports emailed to PIs and collaborators, and a data archive that actively pushes data files to investigators via anonymous ftp.

Pre-Project Technical Support

The UNAVCO Facility frequently provides technical support to PIs in the initial design phase of a project. The UNAVCO Facility provides a single point of contact to the PI for support in a number of technical issues. Oftentimes, this support can be used as a resource for the PI in the proposal-writing phase of the project. The Facility can help the PI in answering a variety of questions including:

- What kind of GPS monumentation is required given the science objectives, budget, and location of the project?
- What kind of GPS receivers and antennas should be used given the science objectives and budget for the project?
- What are the power requirements for a typical GPS system that includes a GPS receiver and data communications?
- How will the data be downloaded and stored in a secure place?
- What are the data communication options available?
- What are the Internet security concerns?

Budget Preparation

The UNAVCO Facility provides support to PIs in answering another critical question: How much will it cost to install this network? One of the services the UNAVCO Facility provides to PIs is the preparation of project budgets, which include equipment costs, engineer travel costs if needed, and purchased services costs such as ongoing satellite service expenses. These budgets can be presented in the project proposal to the NSF. In addition, the UNAVCO Facility can provide suggestions, including equipment-sharing strategies that could make their proposal stronger. Once the project is funded by NSF-EAR, the funds must be transferred internally within NSF between the awarding program and EAR Division. NSF EAR has agreed to pass those funds to UNAVCO, Inc. via established mechanisms.

Online Request for Support

Once a science proposal has been funded by NSF-EAR, the PI can request UNAVCO support via the online form. The PI should use this form, even if the only request is for data archiving. However, the PI can request any level of support from budget preparation to project planning, design, testing, or network installation Once the request has been submitted, the PI should expect some sort of follow-up, either by phone or email from the UNAVCO Facility. In most cases, a UNAVCO Facility network engineer will contact the PI to discuss the details of the project.

Project Planning

If requested, the UNAVCO Facility can provide almost any level of the project planning support for the PI. This support includes scheduling of resources and hardware, negotiations with foreign collaborators, as well as the design, purchasing, fabrication, and testing of equipment to be installed in the permanent GPS network. A two-week burn-in period, including a GPS data quality check, is mandatory before sending equipment into the field. The only part of a project that is not considered to be the responsibility of the Facility is in the station permitting.

Reconnaissance

Reconnaissance is a critical and oftentimes overlooked part of a successful permanent station installation. The UNAVCO Facility can perform the reconnaissance or assist the PI in a number of ways relating to the reconnaissance. The purpose of the reconnaissance is to analyze the proposed site for its suitability as a permanent GPS site. Factors that determine a suitable location for a permanent GPS station are bedrock or soil condition, security, ease of access, sky view, available power, and data communications options. The overall quality of the GPS data should be determined in the reconnaissance phase of the project. The UNAVCO Facility has online reconnaissance forms that address each of these important factors in detail. The engineer or agent of the PI should fill out and submit these forms once the proposed site is visited. Once submitted, these forms are archived at the Facility and can be reviewed by the PI and UNAVCO Facility personnel. These recon forms can then be the basis for further discussions between the PI, UNAVCO engineer, and other collaborators.

Shipping

The UNAVCO Facility has substantial experience in shipping GPS equipment, both domestically and

internationally. Since 1988, the UNAVCO Facility has shipped equipment to every continent, including Antarctica. UNAVCO will follow-up on any shipment that leaves the Facility until its final delivery has been confirmed.

Network Installation

A UNAVCO Facility engineer installed one of the first permanently operating GPS stations in central Asia (POL2) in 1994. Since then, the UNAVCO Facility has provided support, either directly or indirectly, in the installation of hundreds of permanent GPS stations worldwide. If requested, the UNAVCO field engineers can install the permanent GPS network for the PI. This is a valuable service for PIs who do not have the experience or desire to install monuments, power systems, data communication systems, and other hardware necessary at a permanent GPS station. The engineer will provide to the PI the site installation documentation as well as a complete set of station photos, both of which will be archived and made available online.

Network Monitoring

As part of the network monitoring and trouble-shooting effort, a UNAVCO Facility network engineer monitors daily data volumes for all stations for which UNAVCO has primary oversight responsibility. If a station shows low data volumes, the engineer logs onto the station host computer and checks connections, station logs, and tracking files. The engineer troubleshoots the problem, determines the cause of data loss, and attempts to correct the problem to restore normal data flow from the station. Corrective actions include logging on to remote station computers and receivers to fix problems, contacting local site representatives, exchanging equipment, and making engineering site visits. Once the problem is resolved, a maintenance report is logged into the permanent station database at UNAVCO, and a report is forwarded to the PI and the project collaborators.

Send questions or comments to Support (support@unavco.org)