ABSTRACT

In order to support portable GPS deployments required for EarthScope campaigns, the UNAVCO Facility, a panel, PBO has purchased and implemented 100 Topcon GB-1000 GPS systems. These systems are equipped with real-time kinematic (RTK) capability, allowing for precise positioning in real-time. The Topcon GB-1000 systems are designed to support semi-permanent GPS networks and can be used in a variety of environments, including remote areas with limited infrastructure. The systems are equipped with a solar charge regulator, a 18Ah battery, and a 32 watt solar panel, providing a reliable power source for long-term deployments.

EQUIPMENT

100 GPS systems are available for UNAVCO-supported EarthScope campaigns. Each campaign system includes a Topcon GB-1000 receiver, which will be used to record data collected by the system. The Topcon GB-1000 system includes a 1 GB internal and redundant external memory, and a solar charge regulator. In 2010 absolute phase center calibrations for the Topcon PG-A1 weigthed plane antenna were performed at the Geo++ robotic facility in Hanover, Germany, and the type-mean results have been made available to the public by Topcon. The equipment is housed in a waterproof case, with optional exterior security bracket and lock. The system is designed for stand-alone deployment, with low-power dual frequency GPS receiver and solar power requirements supplied by the solar-charged batteries. GB-1000 systems are equipped with real-time kinematic (RTK) capability for such uses as rapid fault mapping and GIS-based geologic mapping.

MONUMENTATION

Monumentation options include:
- Topcon PG-A1 masts
- traditional tripod/tribrachs
- low-profile spike mounts
- single mast
- full-scale DBM's or SBM's

Recent Project Highlights

From 2005-2011, UNAVCO has supported eleven EarthScope GPS projects using the Topcon GB-1000 equipment, including:

- 29-unit, 3 month monitoring the September 2005 Cascadia Episodic Tremor and Slip event
- Coachella Valley, CA: measuring groundwater-induced subsidence
- Oregon Coast: determining interseismic strain
- 5-station emergency response to the 2006 Ha'apai earthquake on the island of Hawaii
- Rio Grande Rift semi-permanent network of 25 stations in CO and NM, operating through 2011
- San Bernardino campaign, 25 points occupied each summer from 2006-2011
- Colorado Plateau Campaign - 34 new GPS monuments in Arizona, southern Utah and southeastern Nevada
- San Bernardino Campaign
- investigating disagreements between geologically and geodetically estimated slip rates for the San Bernardino and San Gorgonio Pass sections of the San Andreas fault
- Professor舀ly McGilli (California State University, San Bernardino) leads a team of undergraduate students and high school teachers (accompanied by some of their students) in an annual, week-long campaign to collect new survey-mode GPS data. During each summer from 2006-2011 the team collects 4 to 5 days of GPS data from 25 sites
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Colorado Plateau Project

- Professors Comé Kreemer and Rick Bennett installed 34 new GPS stations in Arizona, southern Utah and southeastern Nevada.
- GPS measurements are conducted to establish how the crust of the Colorado Plateau moves relative to stable North America.
- Interpretation of the horizontal velocities tells the investigators whether the area moves as a coherent block or is internally deforming.
- These stations complement and densify the long-running continuous GPS stations of NSF EarthScope's Plate Boundary Observatory.
- Many of the new GPS stations are installed in National Parks and Monuments, as well as in State Parks. The investigators provide educational material to inform the parks about the active tectonics of the region and the aim of the project.
- The goal of these outreach activities is to educate the park visitors that the geologic wonderland they are in is actively moving.

Ongoing Project: Rio Grande Rift semi-permanent network

As part of the ongoing Rio Grande Rift project operated by the Universities of Colorado and New Mexico, UNAVCO oversees the design and construction of 25 high-stability GPS monuments. These stations will be operated through at least 2011 to provide the first-ever high-precision measurements of extension across the rift.

Installation of the network by UNAVCO personnel was completed between August 2006 and June 2007. PIs are Anne Sheehan (CU), Tony Lowry (now at USU), Steve Nerem (CU), and Mousumi Roy (UNM).