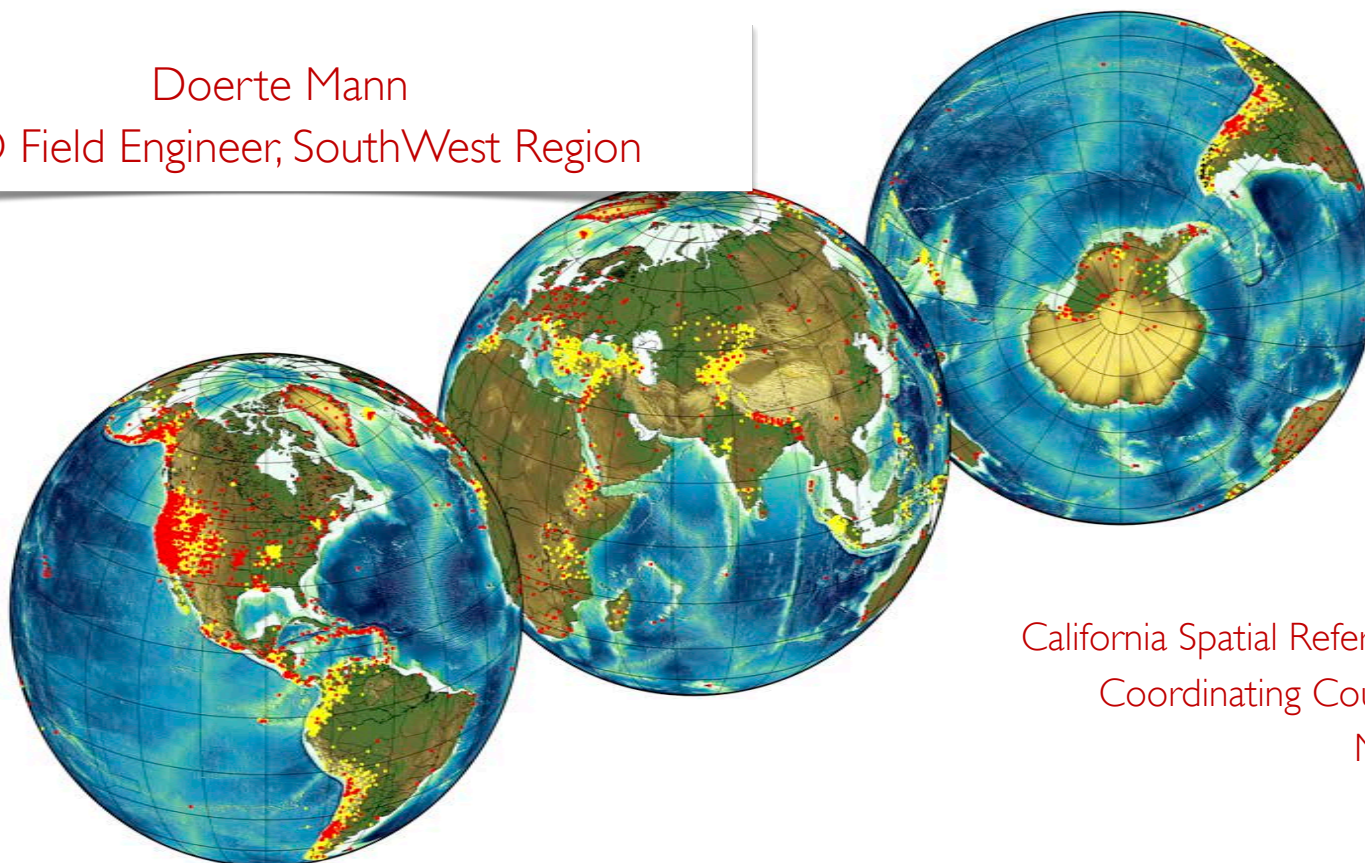


UNAVCO & PBO Update

Doerte Mann
PBO Field Engineer, SouthWest Region



California Spatial Reference Center
Coordinating Council Meeting
May 16, 2013

Presentation Outline

UNAVCO

- Networks, Support, Resources

PBO Status Overview

- Network Performance and Data Return
- Real Time

Other PBO Projects

- Cascadia Expansion
- Recent Upgrades in SW Region
- Edison/Geopentech
- Multi-Monument



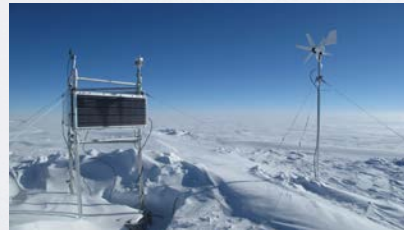
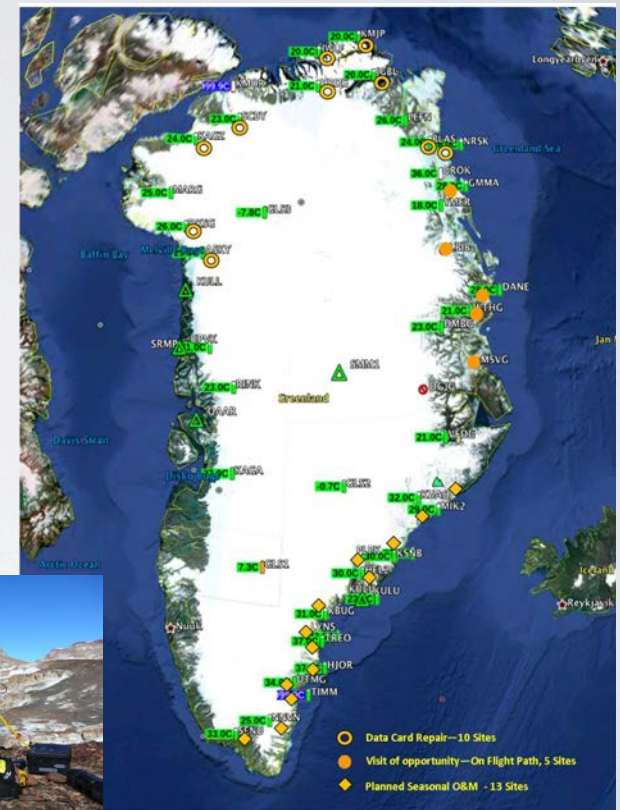
P231 Hopkins Station



P183 Bodega Head

Polar Services

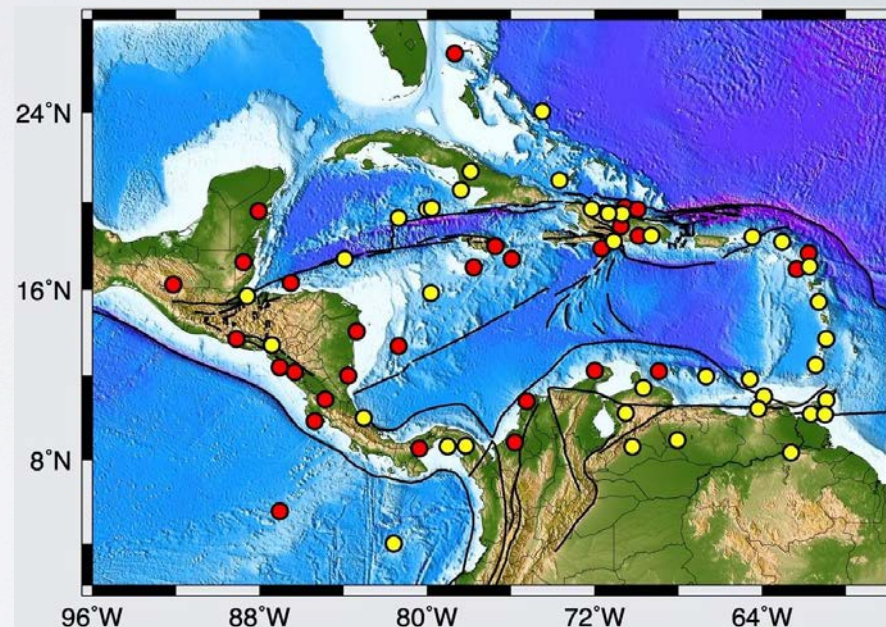
- Arctic - Support for 24 PI projects in Alaska, Greenland, Shetland Islands during the 2012 season
- Antarctic - Support for 28 PI projects during the 2012/2013 season; first continuous GPS site on South Georgia Island
- Campaign and permanent station GPS, Lidar
- Determine vertical and horizontal velocity fields to investigate ice mass changes, ice dynamics, sea level change





Continuously Operating Caribbean GPS Observational Network

- **Planned: 47 new, 21 refurbished stations**
- Current status:
34 completed (red dots)
34 to be completed (yellow dots)
- **This spring, new stations installed in Panama (3), the British Virgin Islands, and the Lesser Antilles**
- Permit obtained for the Camaguey, Cuba station. Working with US Department of Treasury on export requirements for materials



Terrestrial Laser Scanning (TLS)

- Unavco maintains pool of instruments, provides engineering support, processing
- Steady increase of demand for a large variety of applications



Mapping sedimentation change
in the Toutle River, Mount St.
Helens, WA



Examining
geology and
glacial sediments
in bluff beneath a
12th century
castle, Tirol, Italy



Characterizing forest
structure for snow
prediction, INSTAAR
Mountain Research
Station, CO

PBO Status Overview

PBO is the geodetic component of EarthScope

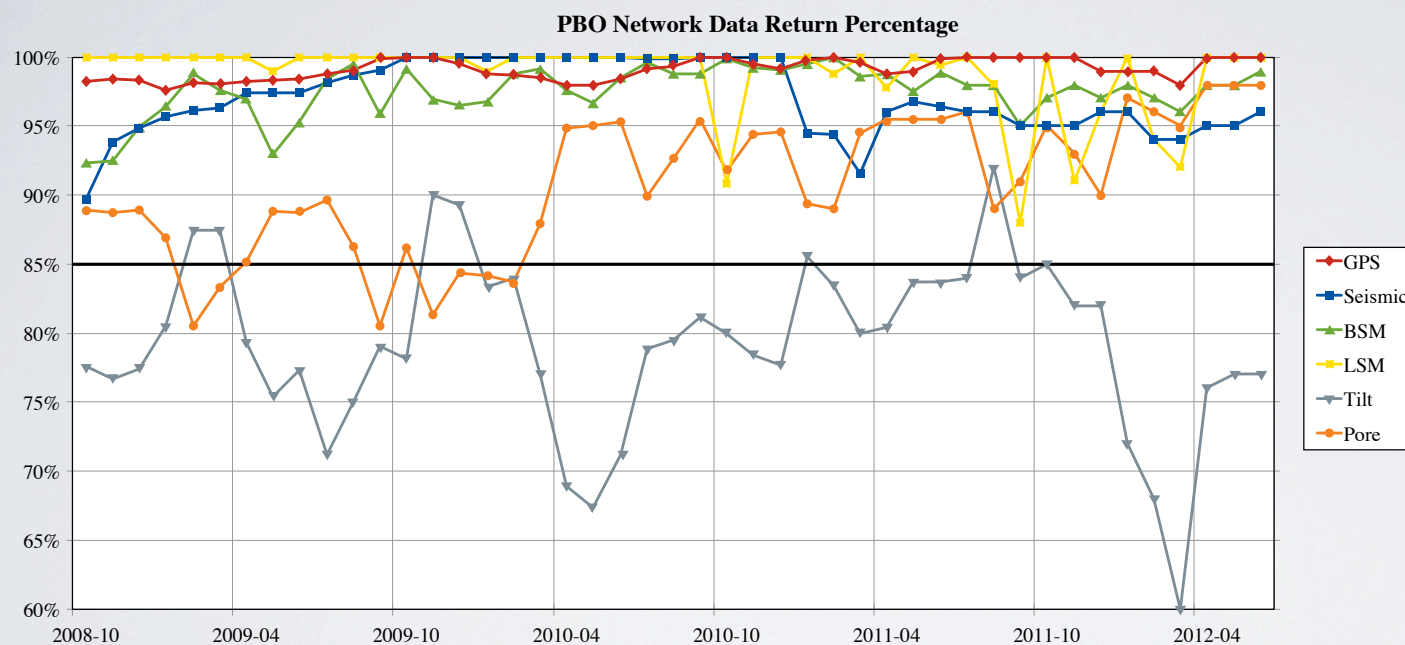
- 1107 Continuous GPS
- 78 Borehole Strainmeters and Seismometers
- 6 Laser Strainmeters
- 26 Shallow Borehole Tiltmeters



PBO Network Uptime

	GPS	BSM	Seismic	Tilt
March 2013	95.3%	94.5%	95.2%	
FY2013 Q2 (Jan-March 2013)	95.9%	93.3%	93.5%	74.6%
O&M Project (since 2009)	94.1%	93.3%	89.9%	

PBO Network Data Return



Cumulative data return since the beginning of the O&M project:

99% for GPS/Met
 97% for seismic
 98% for BSM
 99% for LSM
 91% pore pressure
 79% for tilt

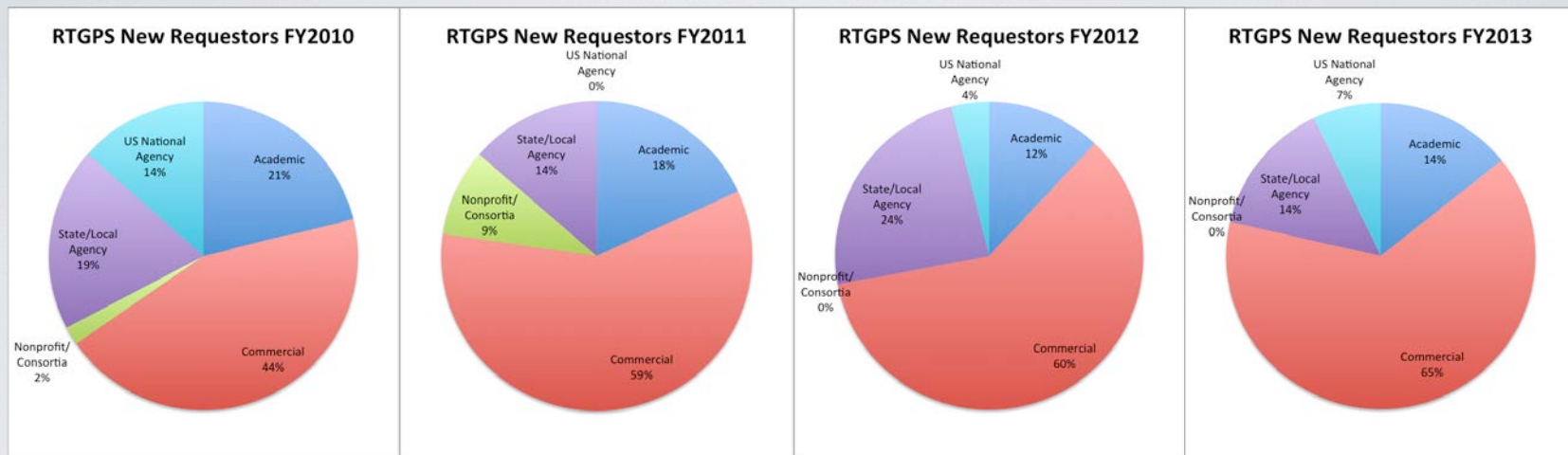
David Phillips, Kathleen Hodgkinson, Christine Puskas, Dave Mencin, Karl Feaux

Real-Time GPS (April 2013)



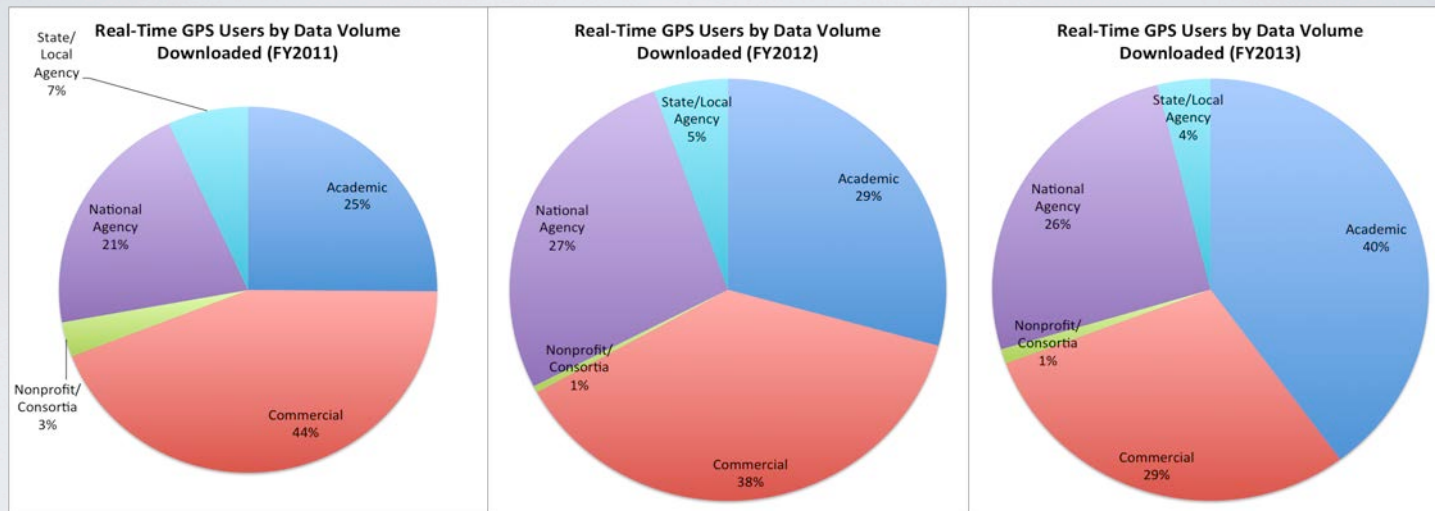
- 411 (348) PBO stations are operating in real-time at 1 Hz
- **Completeness: 88%**
- Average latency: 500ms
- **Unique “Active Users”: 98**
- 14.4Tb RT data delivered since 2009-01; 1.9 Tb in last quarter (2013-02)

Real-Time GPS Data Users



Number of new users: Percentage of commercial users relative to academic and agency users has increased consistently over the past 4 years

Real-Time GPS Data Users



Volume of data downloaded: Percentage of commercial users relative to academic and agency users has decreased consistently over the past 3 years

Other PBO Projects

- Cascadia Expansion
- East Region
- Recent Upgrades in SW Region
- Multi-Monument
- Edison/Geopentech



P812



P493

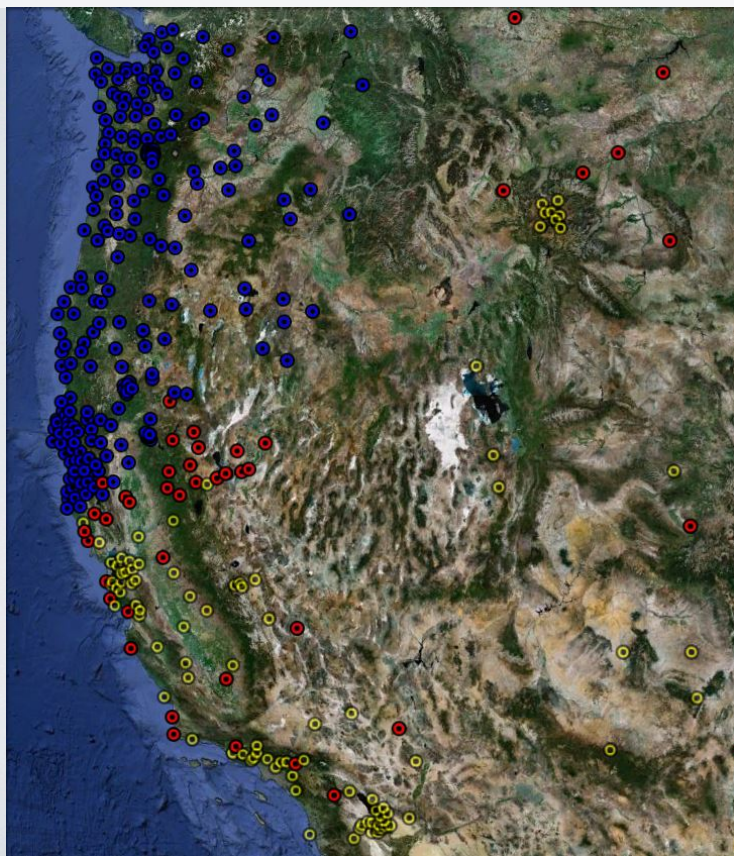


P299



P811

Cascadia Expansion



- Original Cascadia RT upgrades: 230 sites – blue
- Cascadia RT expansion: 50 sites – red (44 completed)
- Other RT sites: ~130 – yellow
- 22 additional meteorological instruments (20 completed)
- 3 sites with BGAN comms failover systems (P365, P405, NEAH); will be installed June 2013

East Region Installs

P802 North Dakota



P803 Wisconsin



P807 Texas



CAYU New York



P804 P805 P806 Georgia



- Replaced 3 underperforming sites in Texas, Georgia, New York (green)
- Added 2 new sites in North Dakota and Wisconsin to fill in gaps in the network. Will add 1 more site in Pennsylvania this summer.

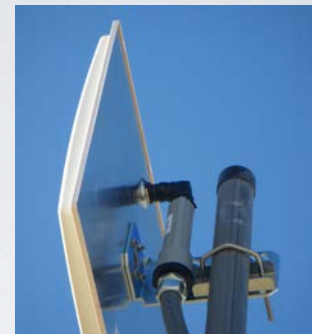
SW Region: Network Improvements

Improvement of Data Communications, Power Systems
(ongoing effort)

- Upgrade to High-Speed Cellular (3G & 4G)
- Upgrade slower radios (replace 900MHz with 5GHz)
- Additional solar panels/batteries

Data Communications in the South West region:

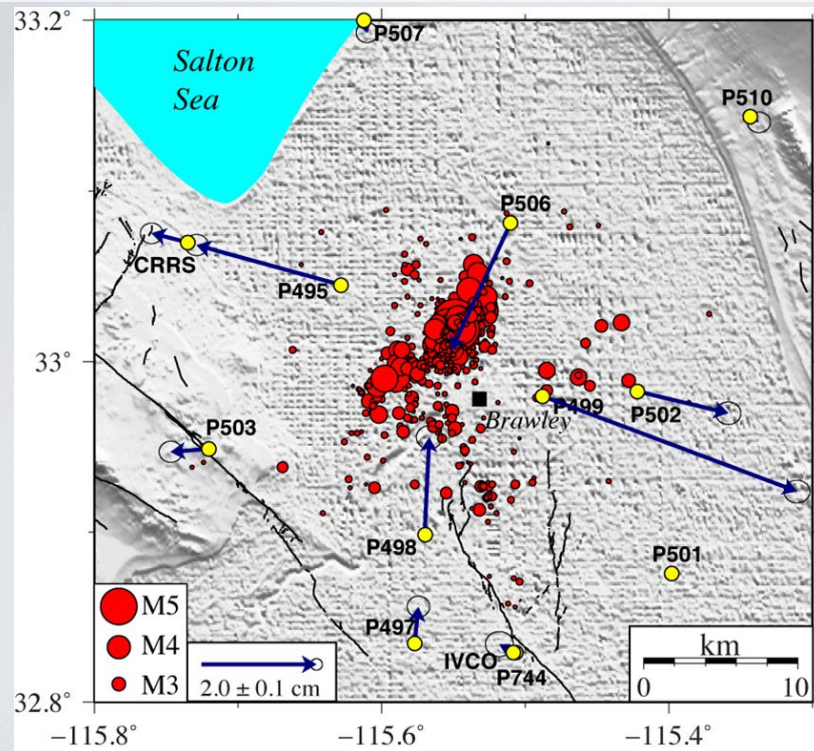
- Cell modems: 291
- Radios: 100
- VSAT: 32
- DSL/T1/other: 25
- Manual downloads: 1



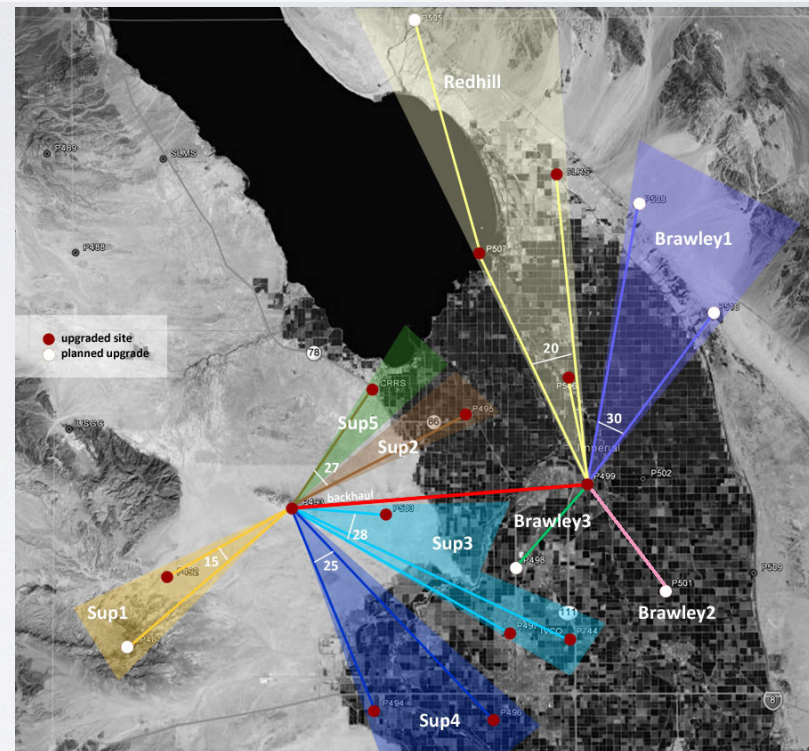
P493 Superstition Mountain radio tower install



Salton Trough Radio Network Upgrades

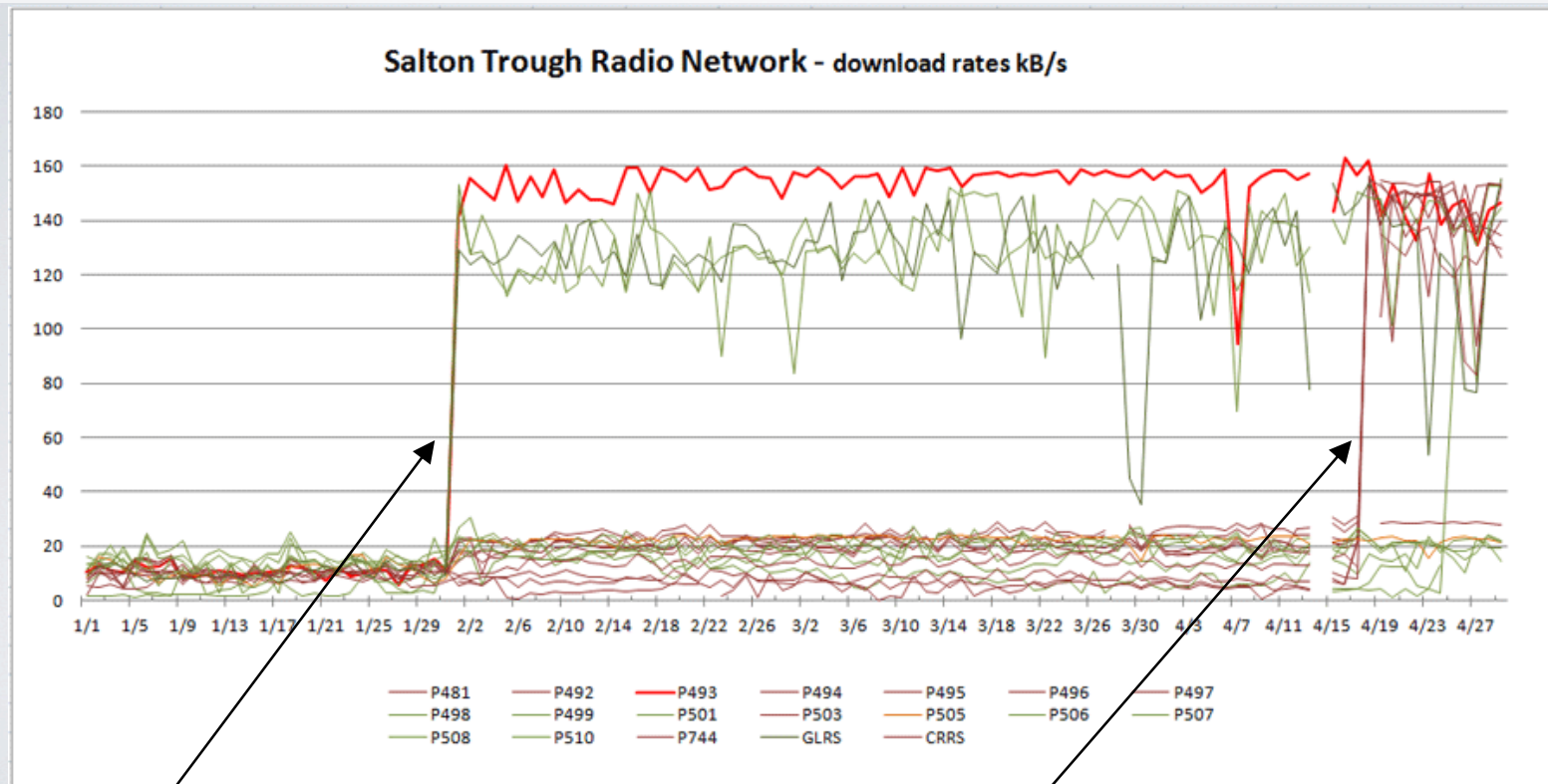


Brawley earthquake swarm August 2012



Salton Trough Radio network (19 stations)

Salton Trough Radio Network Upgrades



Phase 1: 4 sites upgraded

Phase 2: 8 additional sites upgraded

Vandalism



Multi-Monument Project

- Install 2 additional GPS monuments at 5 existing PBO sites
- Compare long-term monument stability of various types of monumentation
- 3 of 5 sites installed (The Rock, GA; Delano, CA; California City, CA)
- Permitting in progress at proposed sites in Forks, WA, and Wilbur, WA



P591, P811, P812 - California City, CA



P565, P809, P810 - Delano, CA

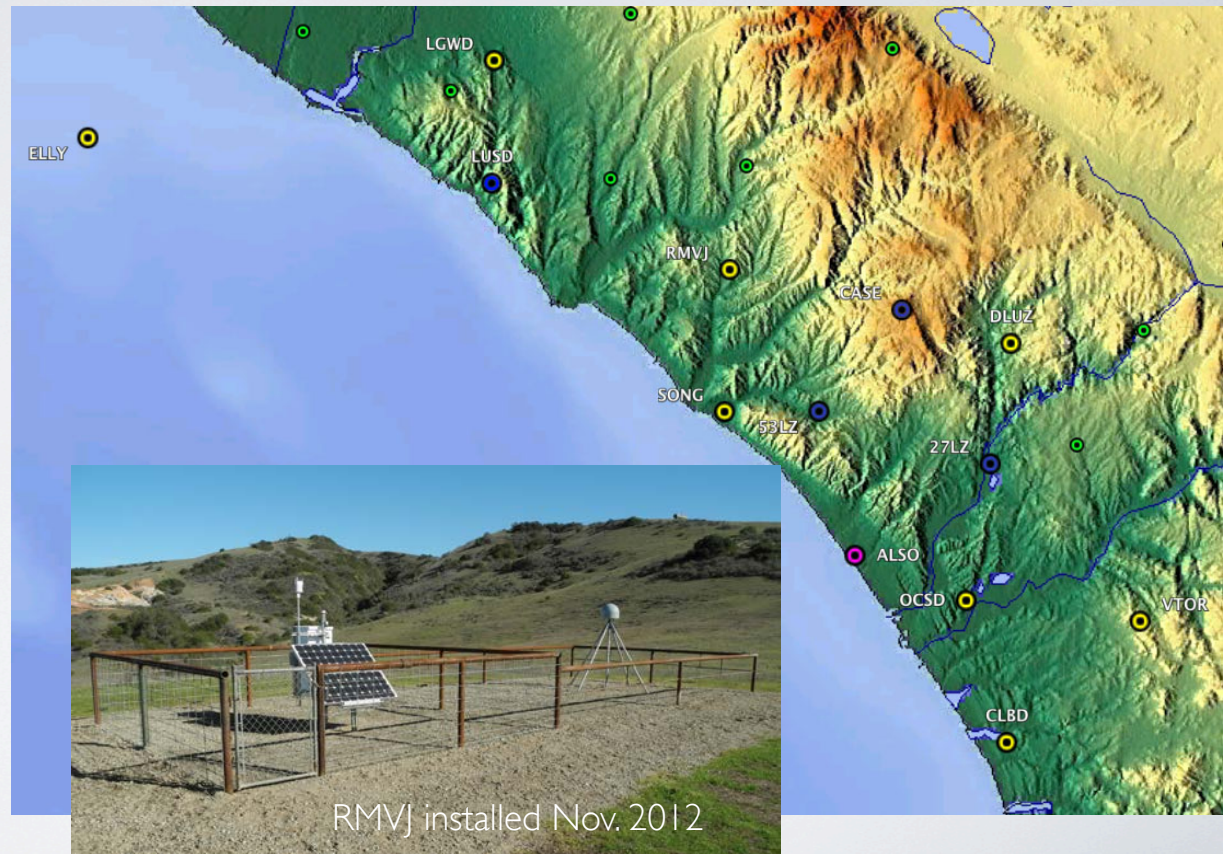
GeoPentech-Edison

Goals:

- 12-13 new stations
- Augment existing network (PBO, SCIGN-SIO, green)
- SONGS Seismic Source Characterization

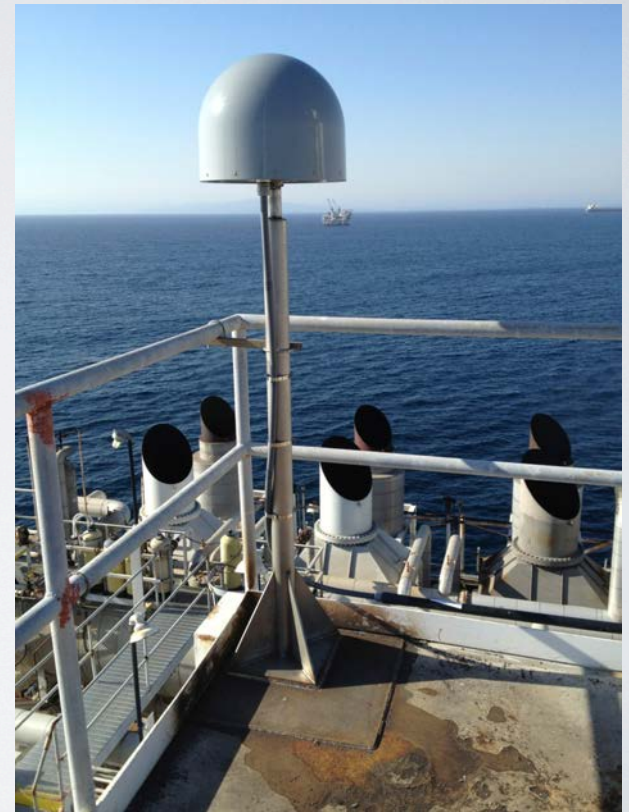
Progress:

- 8 Stations built (yellow)
- 4 Permits in process (LUSD and 3 Pendleton - blue)
- 1 Siting in progress (ALSO - red)



UNAVCO

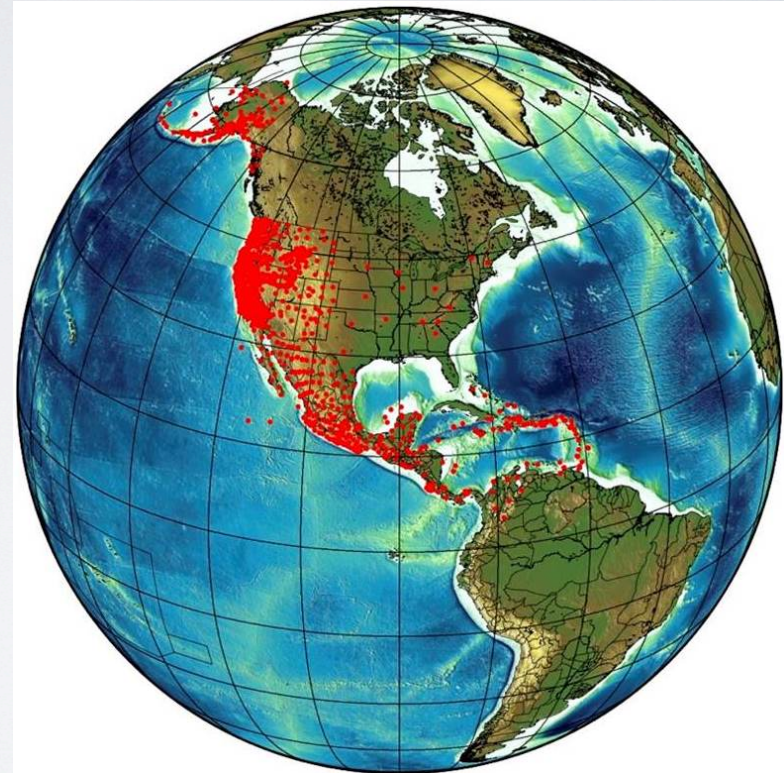
ELLY



What's ahead?

GAGE – Geodesy Advancing Geosciences and EarthScope

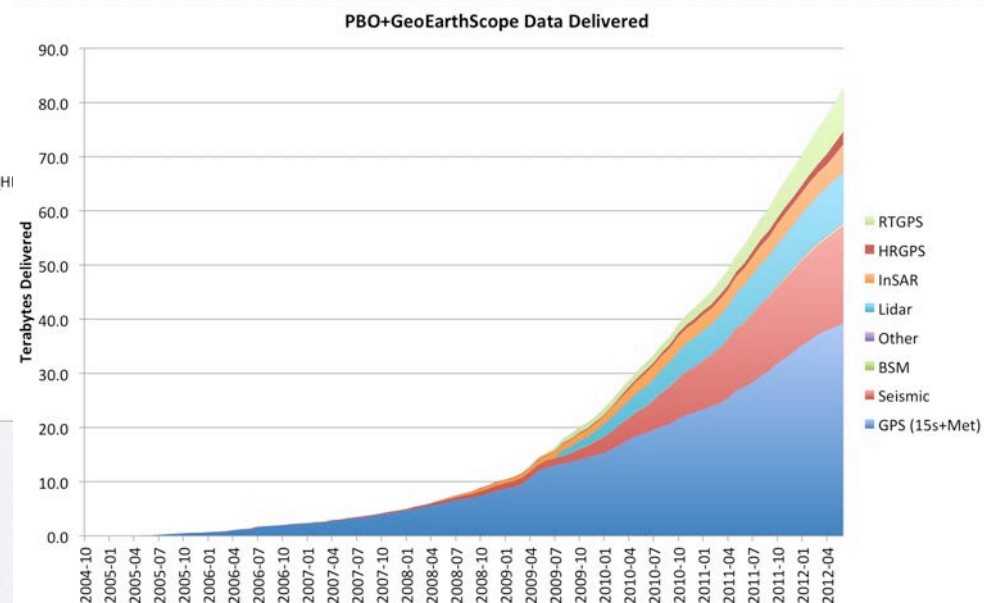
- Integration of Unavco's core funding streams and activities into a single Facility (Geodetic Infrastructure, Geodetic Data Services, Education & Community Engagement)
- Continued upgrade of PBO stations with advanced GNSS and Real-Time capabilities
- 750+ Real-Time stations



UNAVCO

The End





Real Time Integrated Atmospheric Water Vapor and TEC from GPS

