The background of the slide is a topographic map of the Earth, showing the Americas and the Pacific Ocean. The colors range from green for low elevations to brown and orange for higher elevations, with blue for the oceans. The EarthScope Project logo is centered at the top, featuring the word "earth" in a white serif font, "scope" in a white serif font with a globe icon inside the letter 'o', and "PROJECT" in a smaller, spaced-out, orange sans-serif font below it.

earth  
scope  
PROJECT

# Plate Boundary Observatory GPS Update

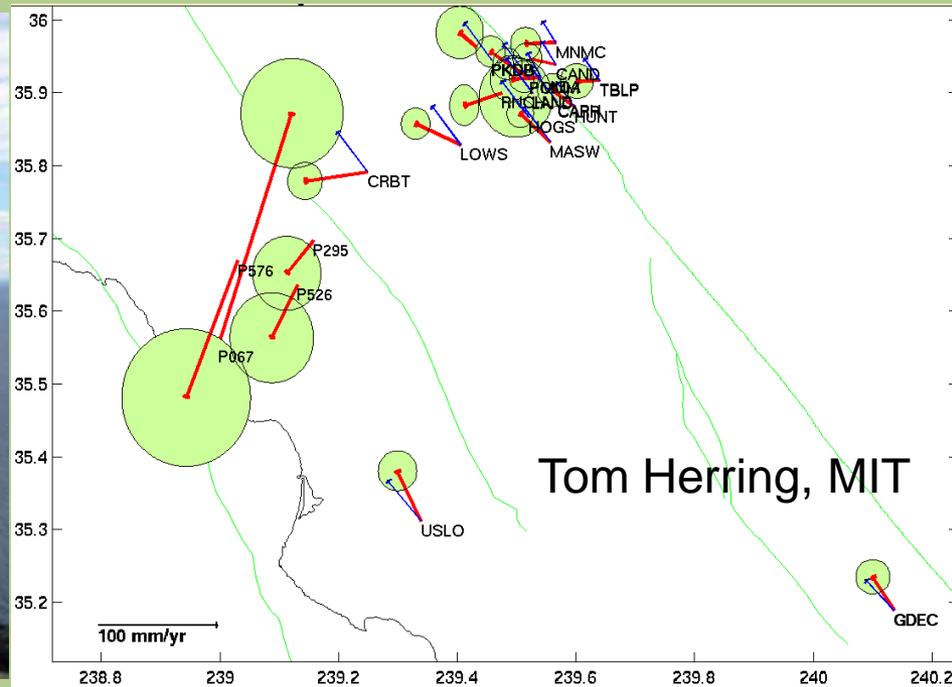
**Greg Anderson**

PBO Data Products Manager

*CORS Users Forum, Long Beach, CA  
13 September 2005*

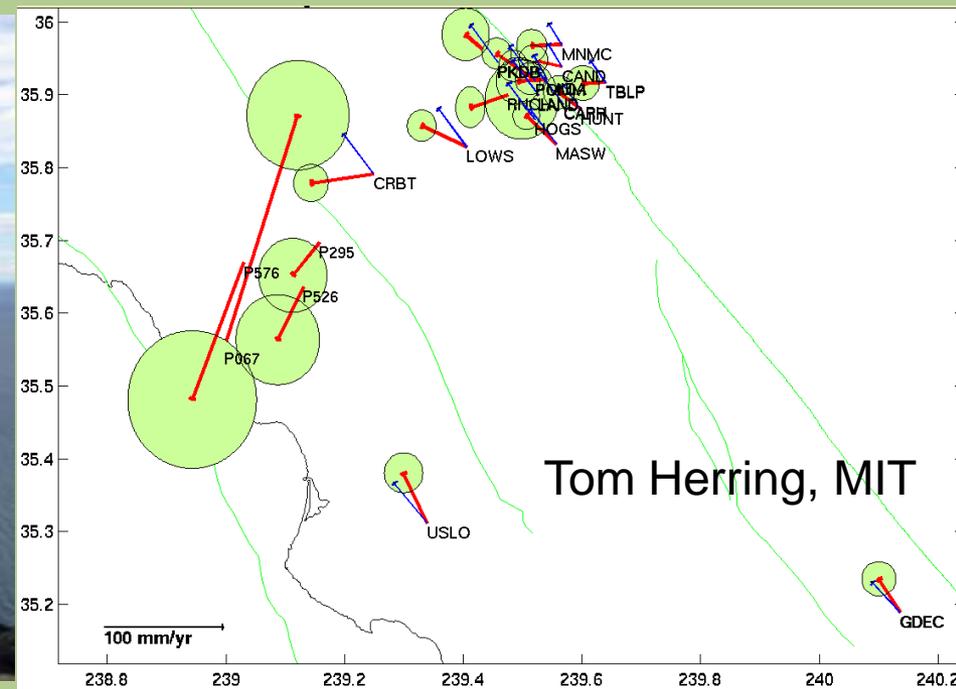
# Topics

- What is the Plate Boundary Observatory?
- PBO GPS equipment
- Network operations/construction status
- Data management status/real-time progress
- Mt. St. Helens response



# Topics

- What is the Plate Boundary Observatory?
- PBO GPS equipment
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# What is PBO?

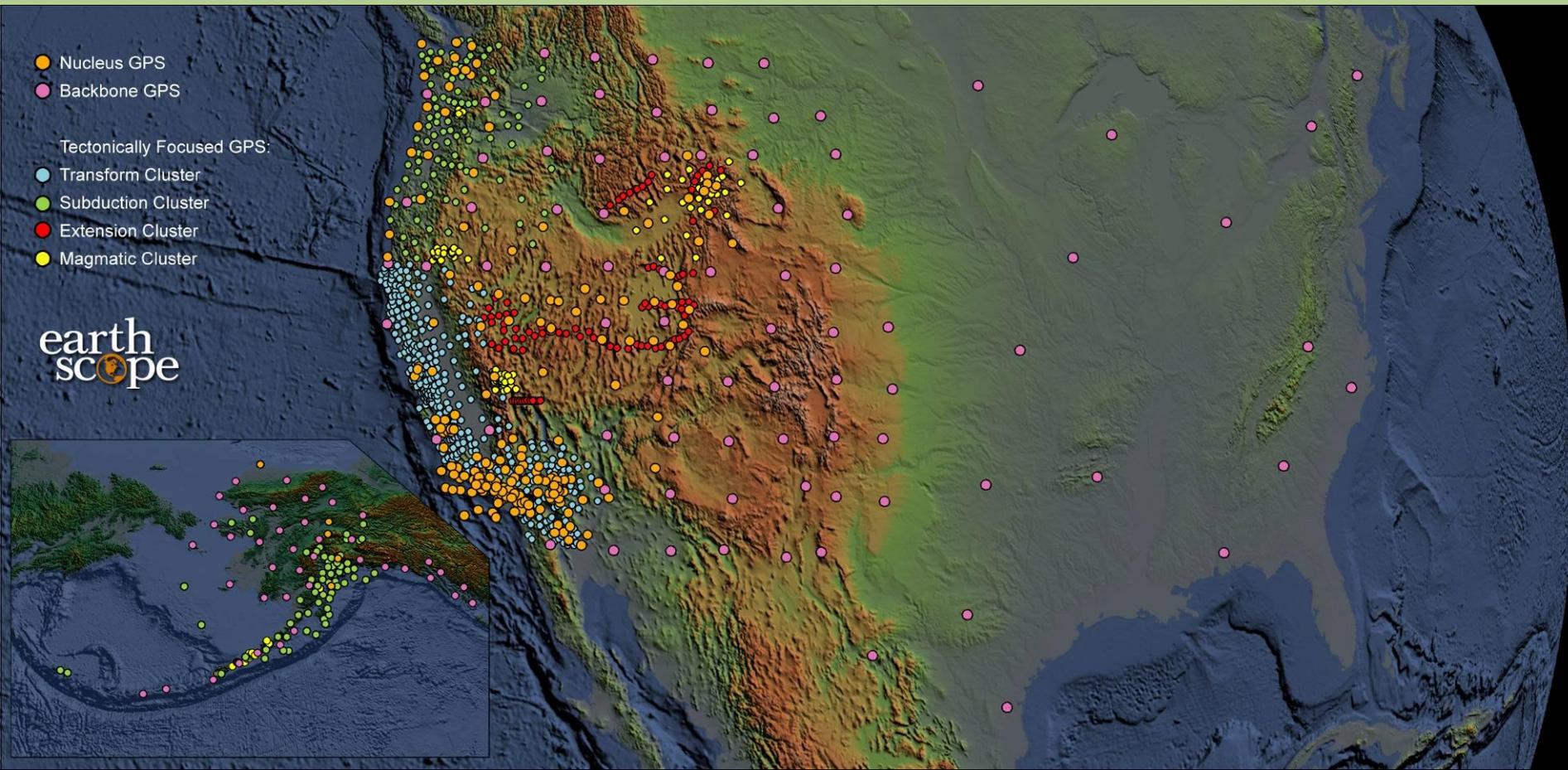
- Geodetic component of EarthScope, installed and operated by UNAVCO and funded by the National Science Foundation.
- Install & run large network to study:
  - Earthquake processes & seismic hazards
  - Magmatic processes & volcanic hazards
  - Active deformation & tectonics
  - Continental geodynamics



# PBO GPS Network

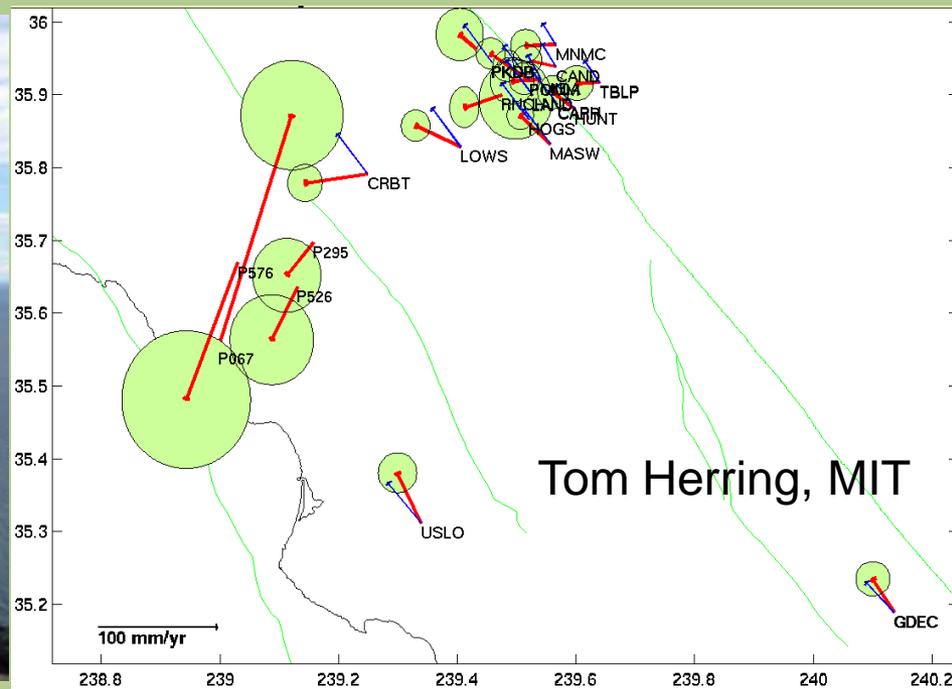
**875 new stations 209 existing stations**

**100 survey-mode receivers**



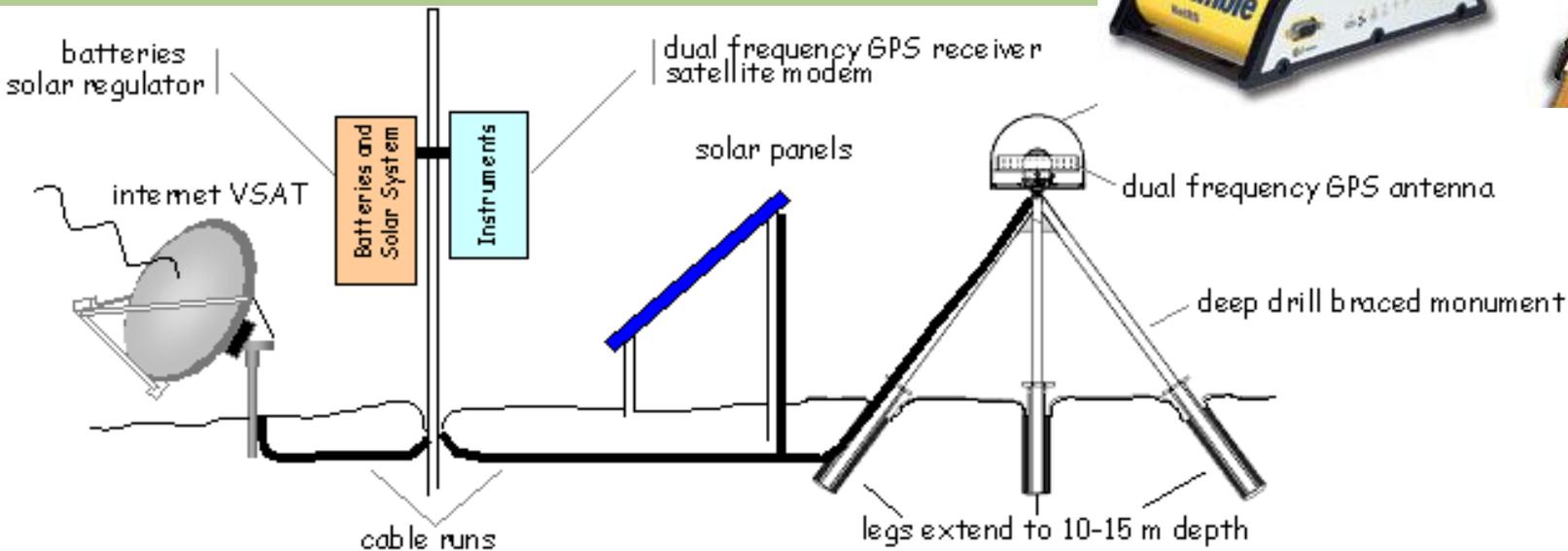
# Topics

- What is the Plate Boundary Observatory?
- **PBO GPS equipment**
- Network operations/construction status
- Data management status/real-time progress
- Mt. St. Helens response



# CGPS Equipment

- Trimble NetRS receivers and choke-ring antennas
- SCIGN-type deep- and shallow-drilled monuments
- Solar/wind DC power, AC where possible
- CDMA, VSAT, radio deliver IP-based data comms



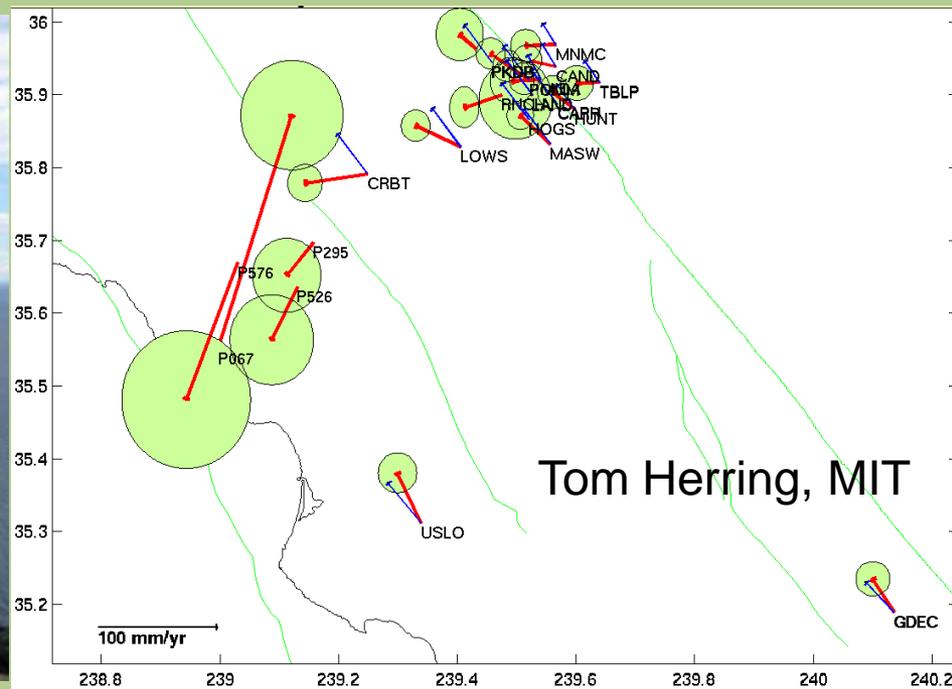
# Survey-mode GPS Equipment

Topcon GB-1000 w/Tech 2000 mast  
28 in 2005, another 72 in 2006  
Available to researchers via  
proposal process



# Topics

- What is the Plate Boundary Observatory?
- PBO GPS equipment
- Network operations/construction status
- Data management status/real-time progress
- Mt. St. Helens response



# Network Progress: 31 Aug 2005

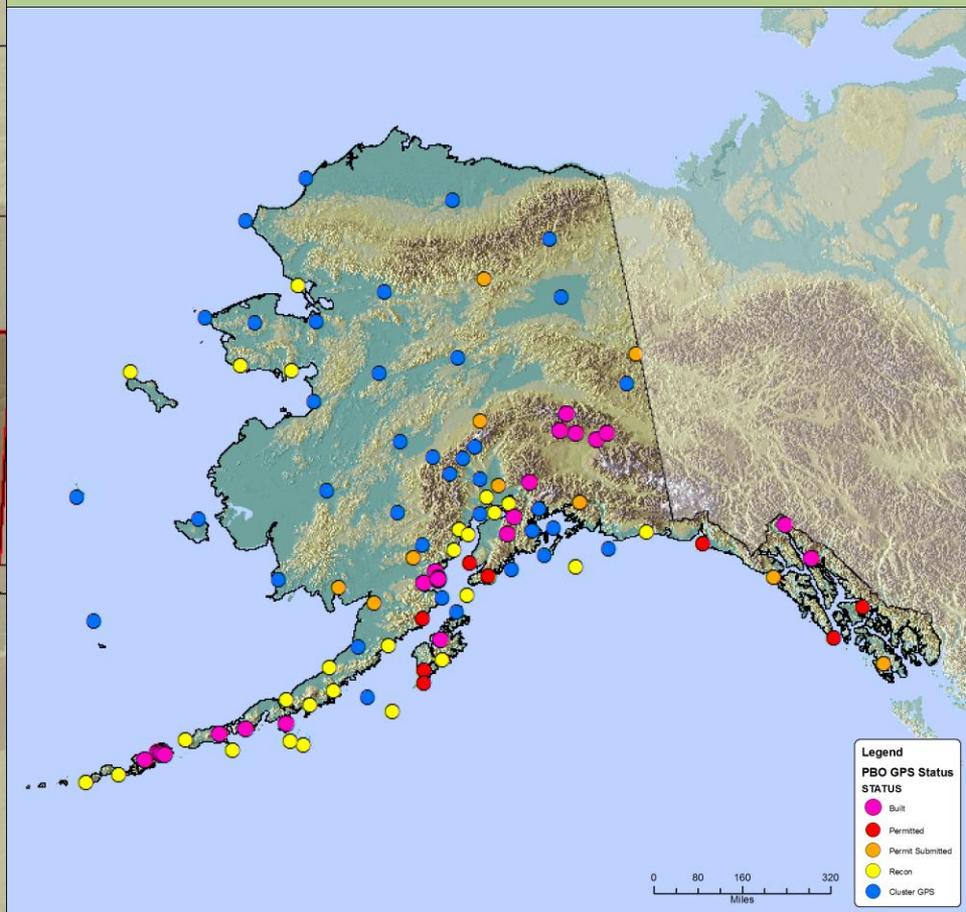
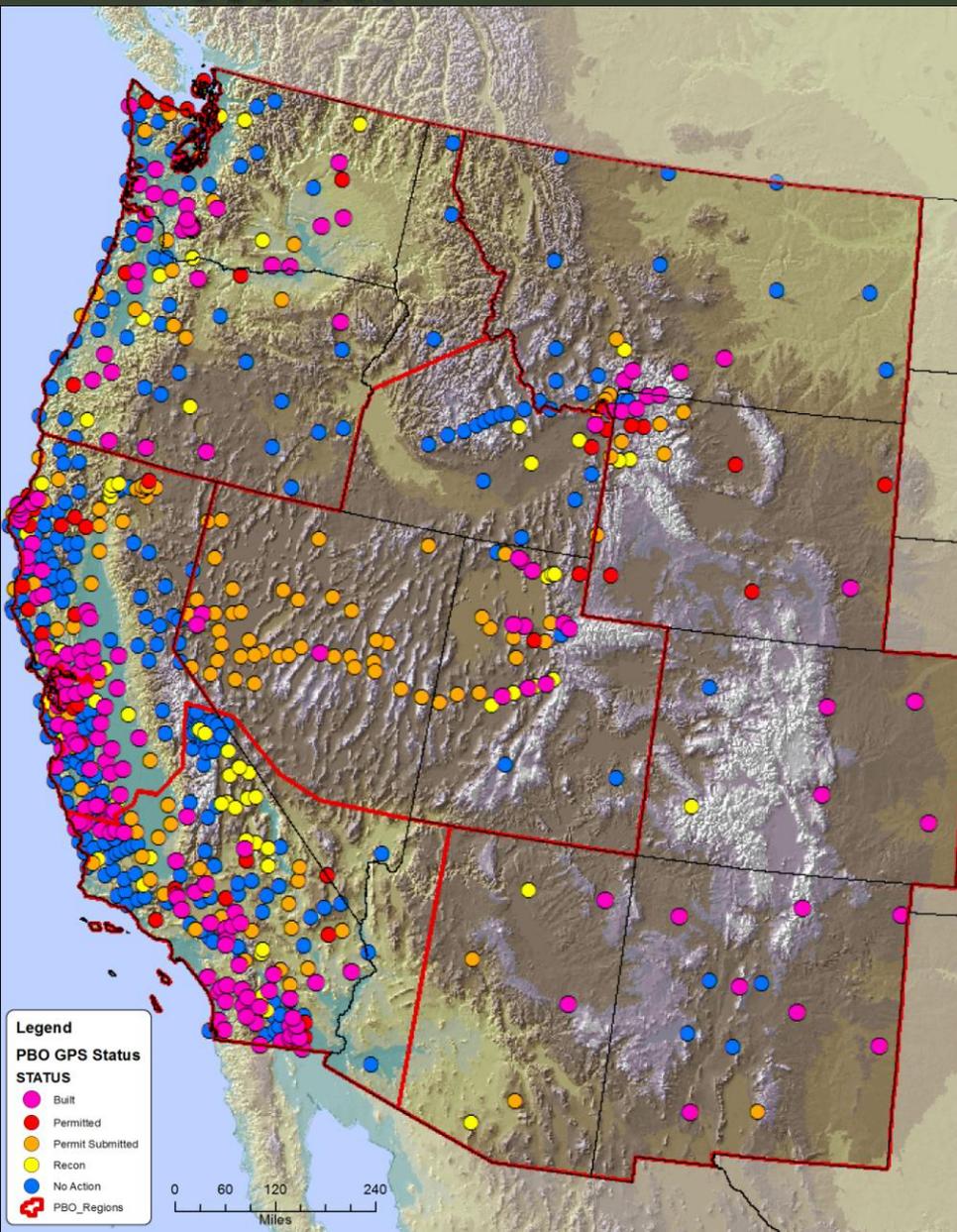
---

Final station locations identified	498
Permits submitted	419
Permits accepted	247
Monuments installed	211
Data available	182
Operating as expected	122
Routine archiving	105

---

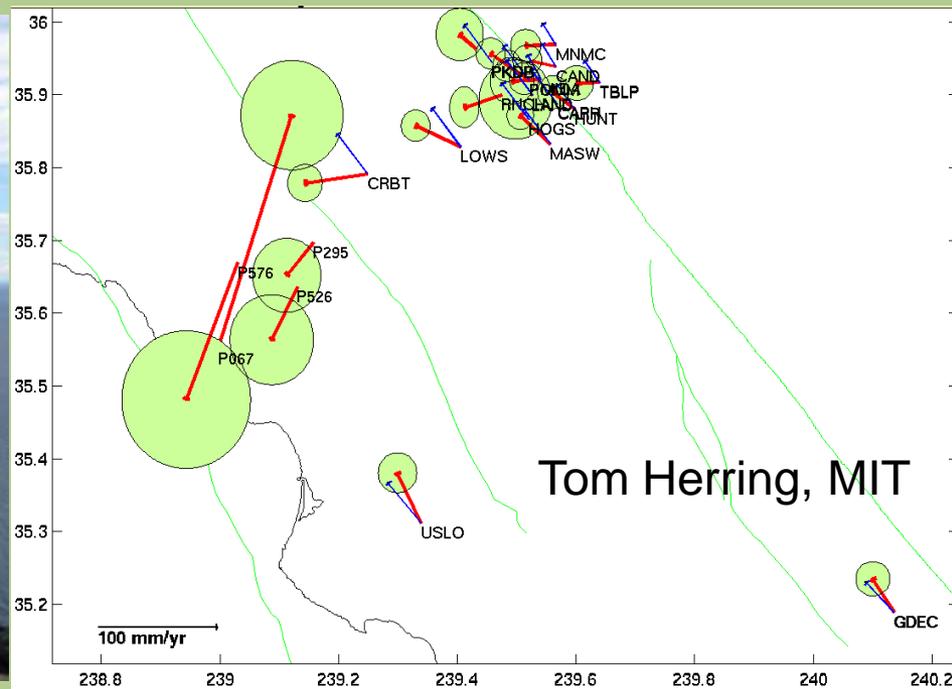


# Status Maps: 31 Aug 2005



# Topics

- What is the Plate Boundary Observatory?
- PBO GPS equipment
- Network operations/construction status
- Data management status/real-time progress
- Mt. St. Helens response





# GPS Data Management Overview

- Data Status
  - 182 of 211 stations have returned data
  - 105 stations archived routinely
  - Others lack comms or have various problems
  - Data for Jan 2004-Sep 2005 available via GPS archives
- Data Analysis
  - 2 Analysis Centers (CWU, UCB) & 1 GPS AC Coordinator (MIT)
  - Data products: position & velocity solutions, time series, etc.
  - All of 2004 and July 2005 forward have been processed
  - RMS ~1.5 mm horizontal, 4 mm vertical
  - Archived at GPS Archives at UNAVCO Facility and IRIS DMC
  - Products available from Archives by end of September 2005
- Data Management
  - Data Management web site: <http://pboweb.unavco.org/data>
  - Special data request tool available on PBO web site



# PBO Routine GPS Data Products

Less

P  
r  
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c  
e  
s  
s  
e  
d

## Level 0 (at least daily)

- 15-sec BINEX, routine download
- 5-sps BINEX, triggered download
- Survey-mode BINEX files

## Level 1 (automated QC @ PBO HQ)

- 15-sec, 5-sps, survey-mode BINEX

## Level 2 (1-, 15-day and 1-yr latencies)

- Individual AC position solution (CWU and UCB)
- Individual AC processing input and output files (CWU and UCB)
- Combined position & velocity solutions & time series (MIT)
- Combined baseline time series (MIT)
- Coseismic offsets (MIT)

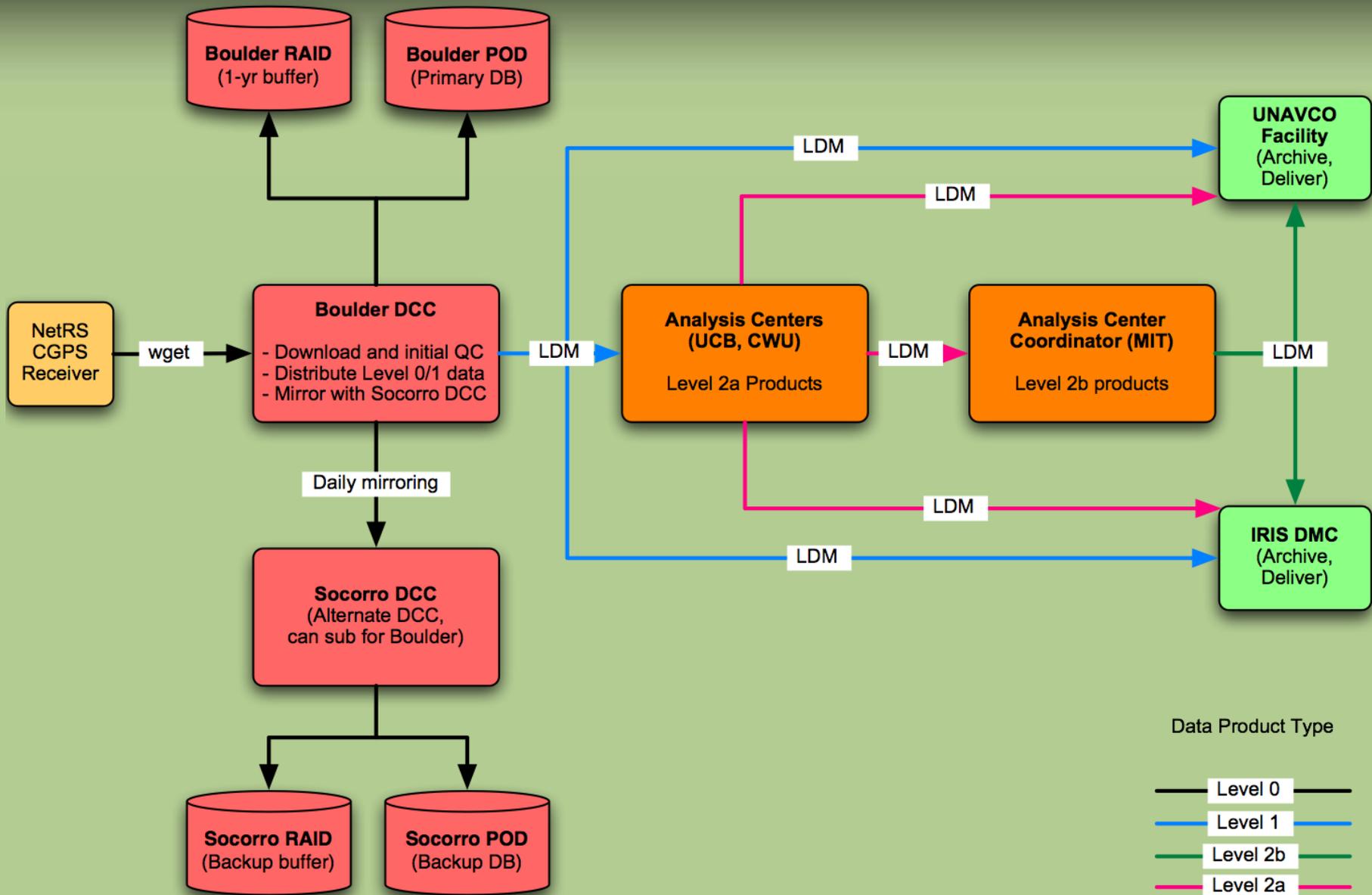
Archived at UNAVCO Facility, IRIS DMC

Level 0/1 data available now

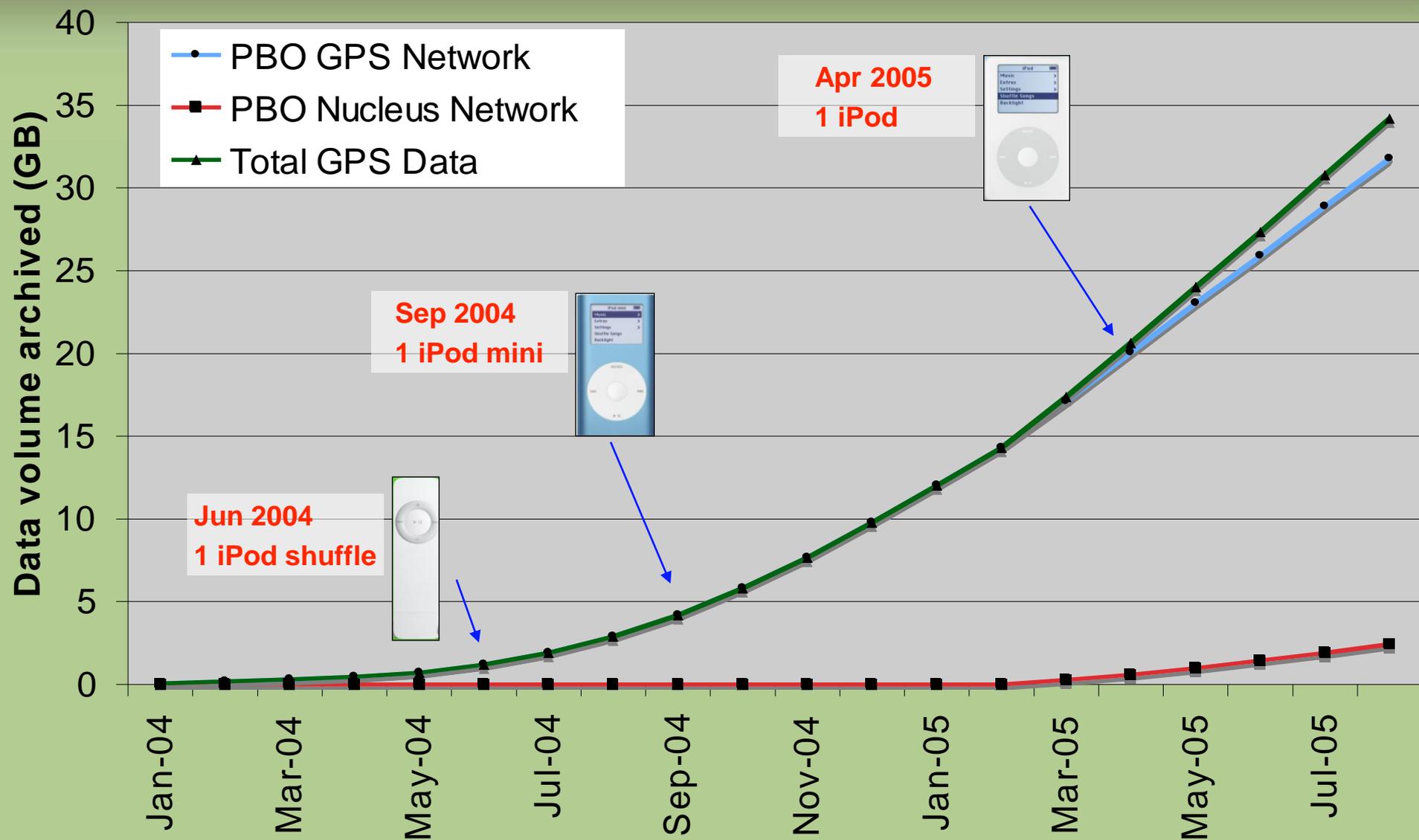
Level 2 data by end of September 2005

More

# Routine GPS Data Flow



# Archived Data Volume (as of 8/31)

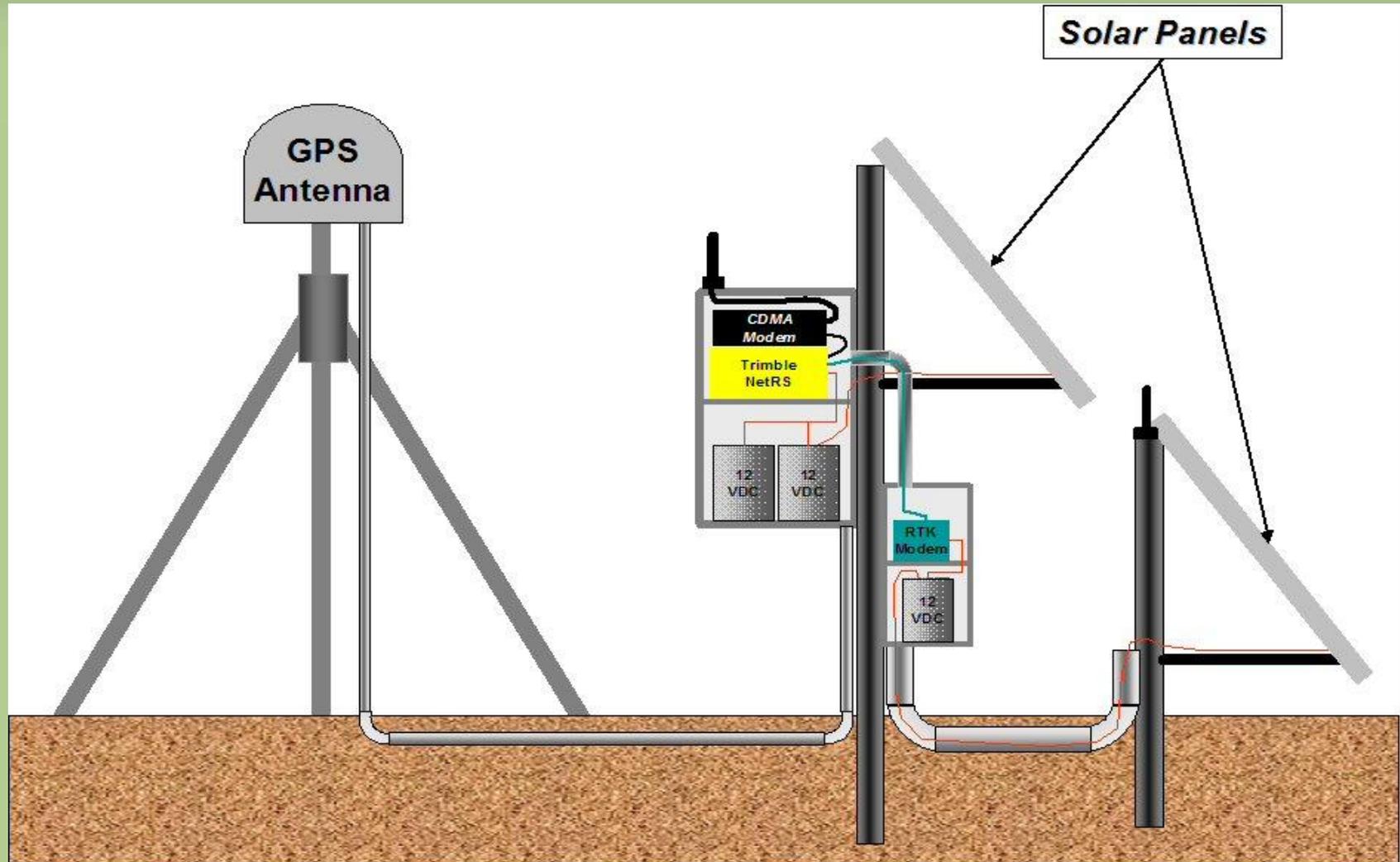




# Real-time GPS Plans

- RTK feeds
  - Landowners have access from NetRS
  - RTCM (v2.1, 2.2, 2.3), CMR, CMR+, RT17
  - Can grant to 3rd parties
  - Approximately 25 stations w/feeds as of 8/31/2005
  - Includes local surveyors, utilities, etc.
- IP-based data flow
  - Possibly using NTrip software (see Weber talk)
  - 2005: Test w/5 southern CA stations (w/SOPAC)
  - 2006: Test with about a dozen stations
  - 2007-2008: expand to selected other stations

# RTK Station Layout



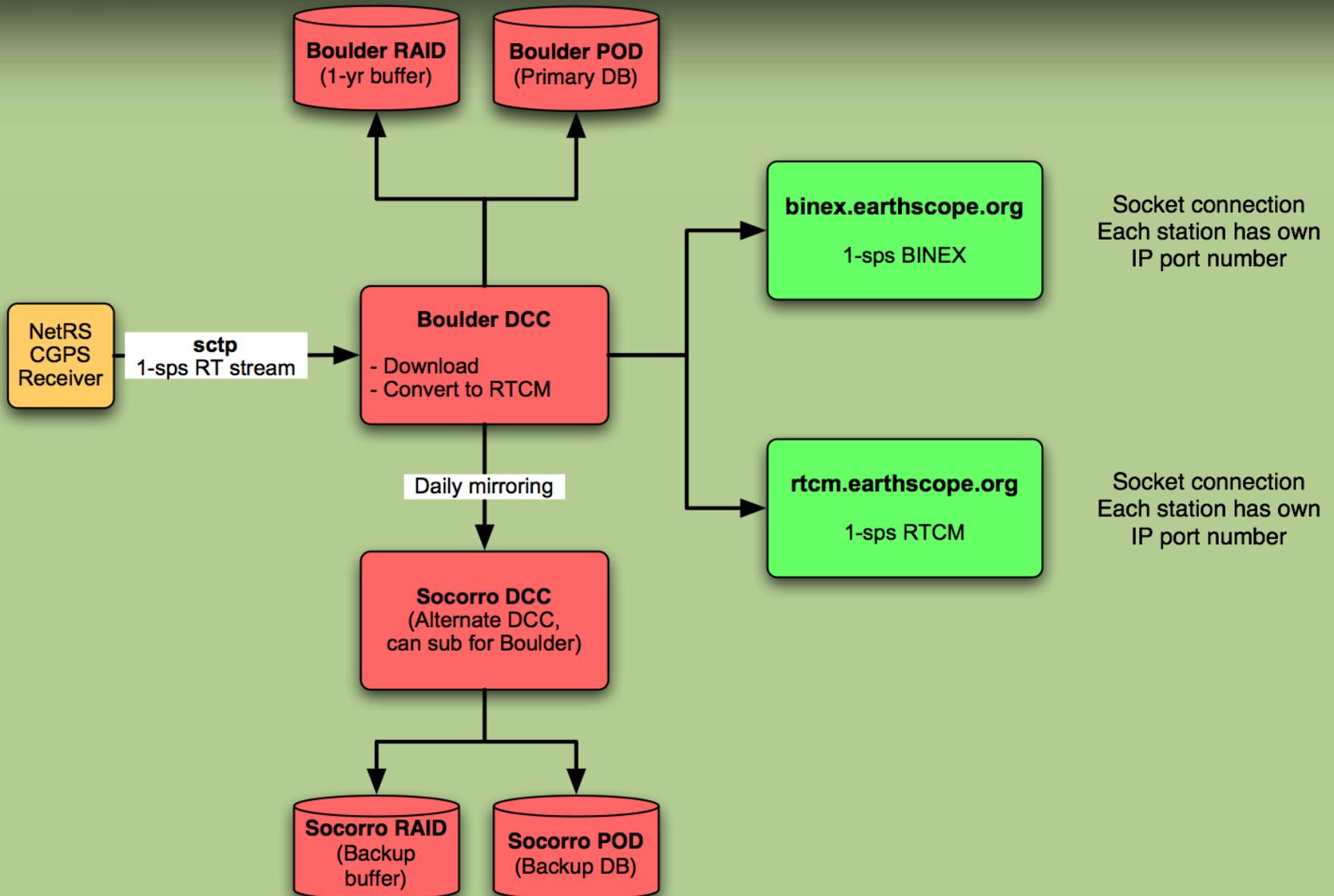


# Real-time GPS Plans

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# High-rate RT GPS Data Flow





# Special Data Request Tool

UNAVCO: Plate Boundary Observatory (PBO)

http://pboweb.unavco.org/shared/scripts/datarequests/

Janine UNAVCO Apple Weather News Morning CPR Webmail SCOUT Gmail

UNAVCO: Plate Boundary Observat...

and Tectonic Research

**DATA REQUESTS**

Use the following form to request data from the Plate Boundary Observatory (PBO).

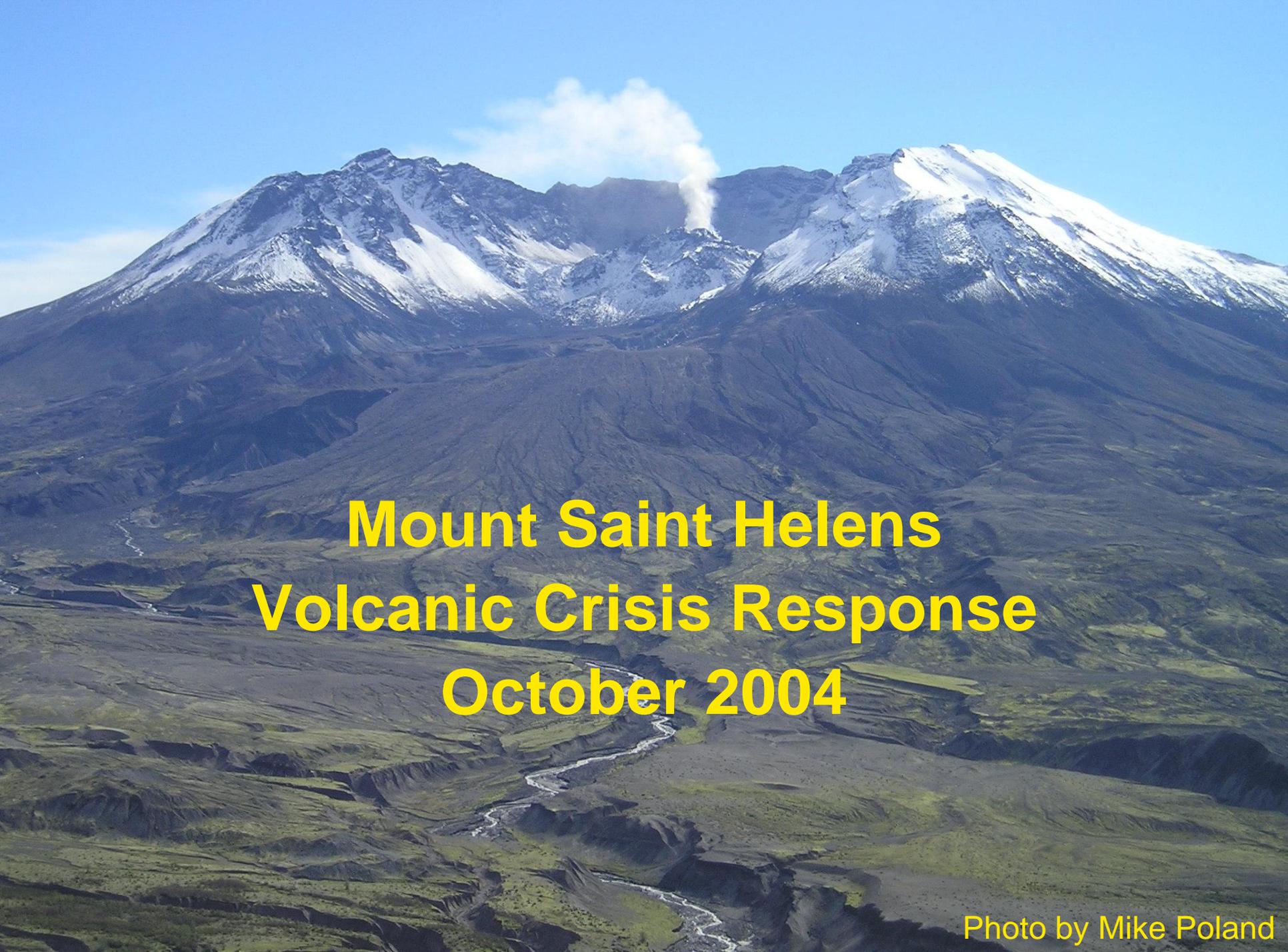
Name (First and Last):	Daffy Duck
Email Address:	d.duck@disney.com
Telephone:	888-555-1212
Role:	Project Principal Investigator Other Role: <input type="text"/>
Institution:	Disneyland
Data you are Requesting:	Quack!
Source of Funding:	Secret gold reserves
Data Start Date:	2005-10-02 <input type="text"/> YYYY-MM-DD
Data End Date:	2005-10-08 <input type="text"/> YYYY-MM-DD

Advanced Search  Site Map

UNAVCO - [About Us](#) - [Contact Us](#) - [Support](#) - [Search](#) | [Facility](#) | [PBO](#) Sponsored by National Science Foundation

Done Disabled

http://pboweb.unavco.org/shared/scripts/datarequests

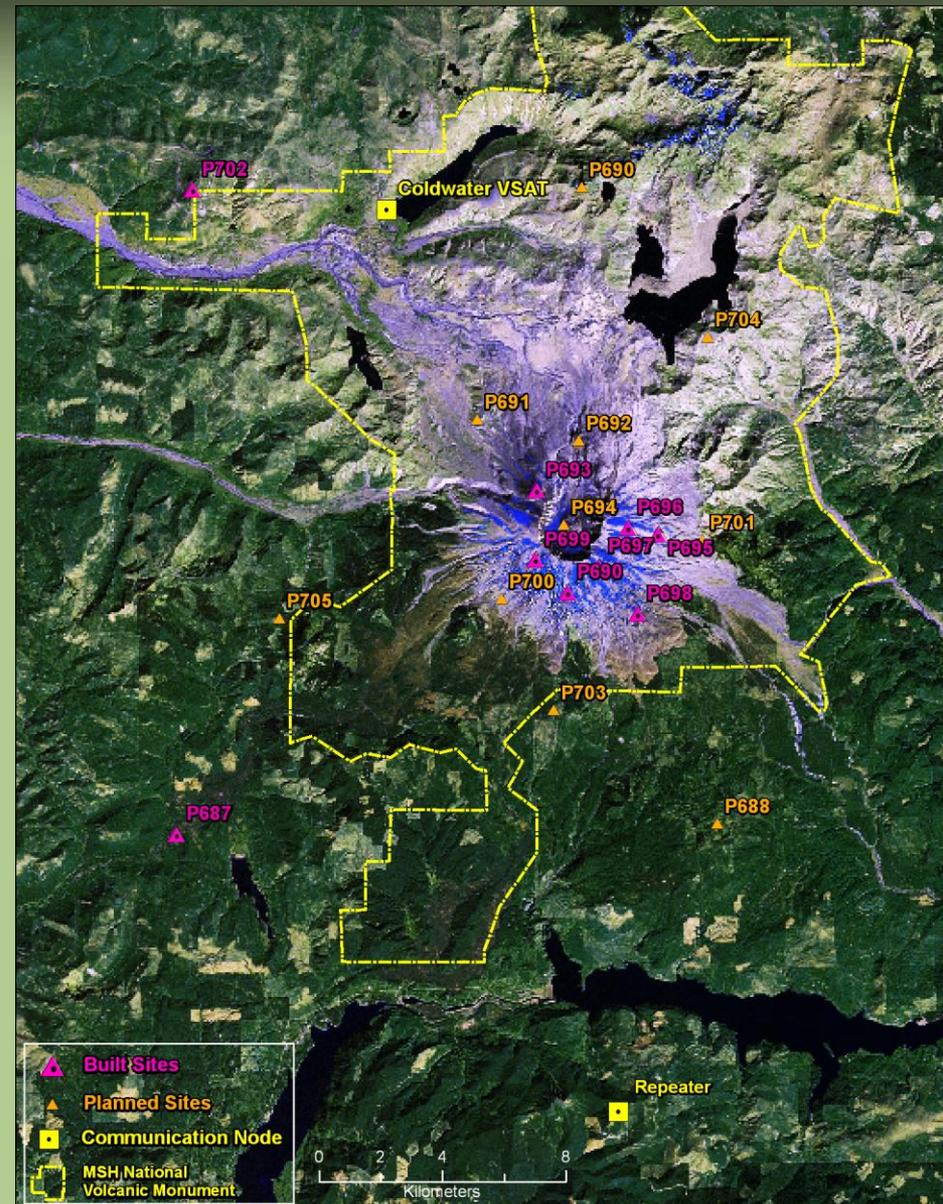


**Mount Saint Helens  
Volcanic Crisis Response  
October 2004**

Photo by Mike Poland

# Mt. St. Helens Response

- Stations recon'd Aug 2004
- Installations planned Summer 2005
- Magmatic systems committee recommended rapid response to Sept 23<sup>rd</sup> 2005 increased seismic activity and steam/ash eruptions
- Installed stations:
  - 2 in far field
  - 5 on flanks in 2 days
  - 2 more on flanks Feb 2005
- 9 more GPS planned
- 4 strain + 4 tilt planned
- Hourly data from 8 stations

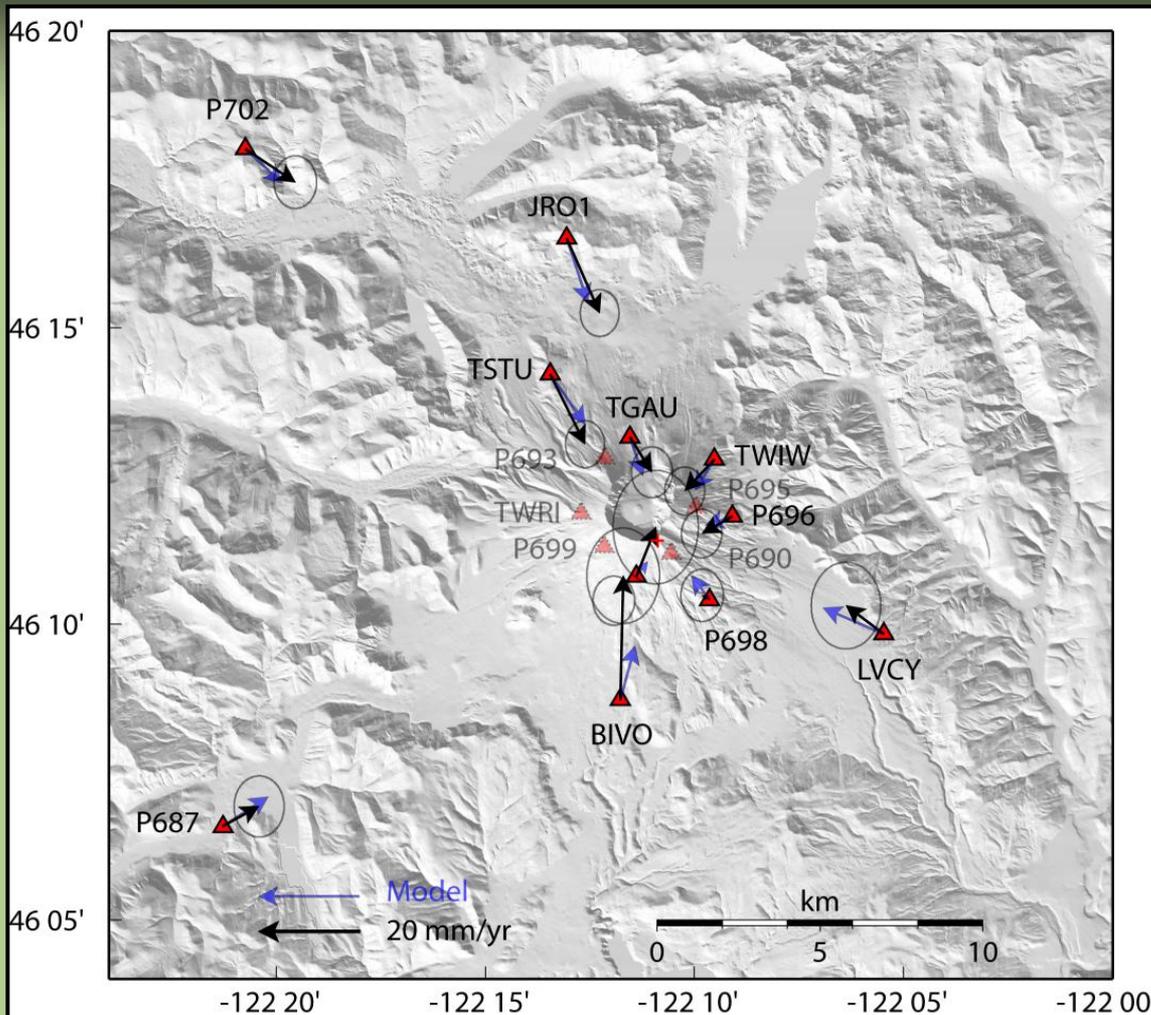




# Mt. St. Helens response



# Oct 04-May 05 Station Velocities



Model (preliminary) - Point pressure source, depth 13.3 km, equivalent volume change 26 M m<sup>3</sup> per yr, 16 M m<sup>3</sup> for 7.25 months. Surface loading by new dome not corrected.





# Summary

- PBO is geodetic component of EarthScope project
- Network Operations Status
  - 875 new CGPS stations over next 5 years
  - 211 new stations are installed
- Data Management Status
  - Data Management web site: <http://pboweb.unavco.org/data>
  - 182 of 211 stations have returned data
  - Data for Jan 2004-Sep 2005 available via GPS archives
  - Special data requests: <http://pboweb.unavco.org/shared/scripts/datarequests>
- Data Analysis
  - Analysis Centers (CWU, UCB) and AC Coordinator (MIT)
  - Data products: position and velocity solutions, time series, etc.
  - Available from Archives by Sept 2005
- Real-Time Data Progress & Plans
  - RTK feeds now available to landowners, about 25 active
  - 5 stations have IP-based real-time feeds as test
  - Will be expanding, making data available from Boulder in 2006
  - Possibly using NTrip software



# For more information...

<http://pboweb.unavco.org>

[www.earthscope.org](http://www.earthscope.org)

UNAVCO: Plate Boundary Observatory (PBO)

Janine UNAVCO Apple Weather News Morning CPR Webmail SCOUT

UNAVCO: Plate Boundary Observat...

UNAVCO About Us Contact Us Support Search Facility PBO

**UNAVCO** Plate Boundary Observatory Supporting EarthScope Geodetic, Seismic, and Tectonic Research earth scope

- About PBO
- PBO Operations
- PBO Strainmeters
- Data Management
- Publications and Reports
- Education and Outreach
- News and Announcements
- Procurement and Purchasing

**Extension Site Selection Working Group Convenes in Tucson to Discuss PBO Basin & Range GPS Site Locations**  
 Date Posted: Feb 08, 2005 Date of Activity: Feb 03, 2005 - Feb 04, 2005

A well defined and timely action plan recommendation is the result of a two-day Extension Working Group meeting held in Tucson, Arizona. Led by Rick Bennett, chair of the working group, the committee discussed the prioritization and possible re-location of planned GPS sites in the Basin & Range region. Made up of scientists familiar with the Basin & Range region, the group discussed where stations should be installed to capture the most significant and scientifically relevant data to best meet the EarthScope project goals. A formal statement summarizing the committee's recommendations will be submitted to PBO management. This document will be available online after it is released.



During the two-day meeting, the Extension Working Group came up with several recommendations for site relocations in order to best achieve EarthScope science goals. From left to right: Wayne Thatcher, Bill Hammond, John Oldow, and Geoff Blewitt.  
[\[ Click to Enlarge \]](#)

» [More Details](#)

» [Station Installation Updates](#)  
 » [News and Announcements](#)

**PBO Network Status Updates**  
 February 1, 2005

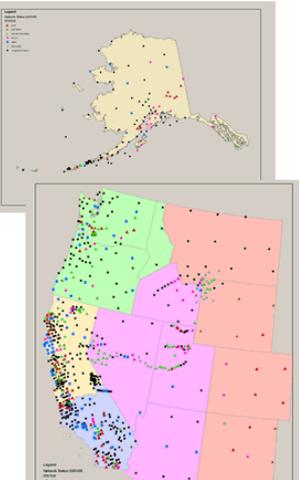
Click on the image to the right to see enlarged maps of the Alaska and Lower 48 regions.

» [More Network Status Updates](#)  
 » [PBO Internet Map Server \(ArcIMS\)](#)

**PBO Quick Contacts**

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- » [Operations](#)
- » [Information Technology](#)
- » [Website Questions/Comments](#)
- » [Education and Outreach](#)
- » [General PBO Questions/Comments](#)

» [More Contact Information](#)



EarthScope Homepage

UNAVCO Apple News Weather Yahoo! Morning

EarthScope Homepage

Exploring the Structure and Evolution of the North American Continent

What is EarthScope?

Current Status

Data Portal

Educational Opportunities

Meetings/Workshops

Instrumentation Systems

- Drilling (SAFOD)
- Geodetic (PBO)
- Seismic (USARRAY)

Image Gallery

News

Publications

Contact Information

**EarthScope Visits Augustine Volcano**



EarthScope is installing seven short-drilled braced GPS stations in and around Augustine Volcano to better characterize magma plumbing systems, dynamics of intrusive and eruptive processes, volcanic unrest, and eruption prediction.  
 Click here for [more information and daily updates](#).

**San Andreas Fault Drilling Update**



Drilling of the borehole into the San Andreas Fault began on June 11, 2004 and is currently about halfway through the activities planned for this year. Cuttings were collected and photographed at regular intervals; real-time mud gases were monitored; and distinct anomalies were observed in several shear zones. A number of other scientific activities have been going on at the site in real-time, including a seismic imaging experiment using drill-bit energy. On July 29th, an intermediate target depth of 4740' was reached with the planned hole diameter of 17 1/2". At this point a suite of scientific activities were carried out (geophysical logging, coring, fluid sampling and stress measurements). The hole has been cased with 13 3/8" casing and drilling has resumed.  
 Click here for daily updates and photos.

**Job Announcement: Education and Outreach Manager**

EarthScope invites applications for the position of EarthScope Education and Outreach Manager at the EarthScope Headquarters Office in Washington, DC. The successful candidate will be responsible for coordinating the development of a high-profile education program for EarthScope that emphasizes the integrated nature of the project and the importance of EarthScope's research initiatives.  
 Click here for additional information.

**Announcements & Events**

- Sept. 15-17, 2004: Rocky Mountain EarthScope Workshop I (Socorro County, NM)
- Oct. 8-9, 2004: EarthScope Workshop - SAFOD Sample Analysis (San Jose, CA)
- Nov. 7-10, 2004: EarthScope Exhibit Booth at Geological Society of America Annual Meeting (Denver, CO)

Project Management

- Project Change Request
- Internal Site (login required)

**NSF** National Science Foundation

EarthScope is sponsored by the National Science Foundation and conducted in partnership with the US Geological Survey.