New and adapted technologies for the Plate Boundary Observatory

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UNAVCO PBO

Topics

- What is the Plate Boundary Observatory?
- Some technologies PBO will use/is using:
  - ArcIMS
  - Trimble NetRS receivers
  - 3G cellular modems
  - Updated GSAC

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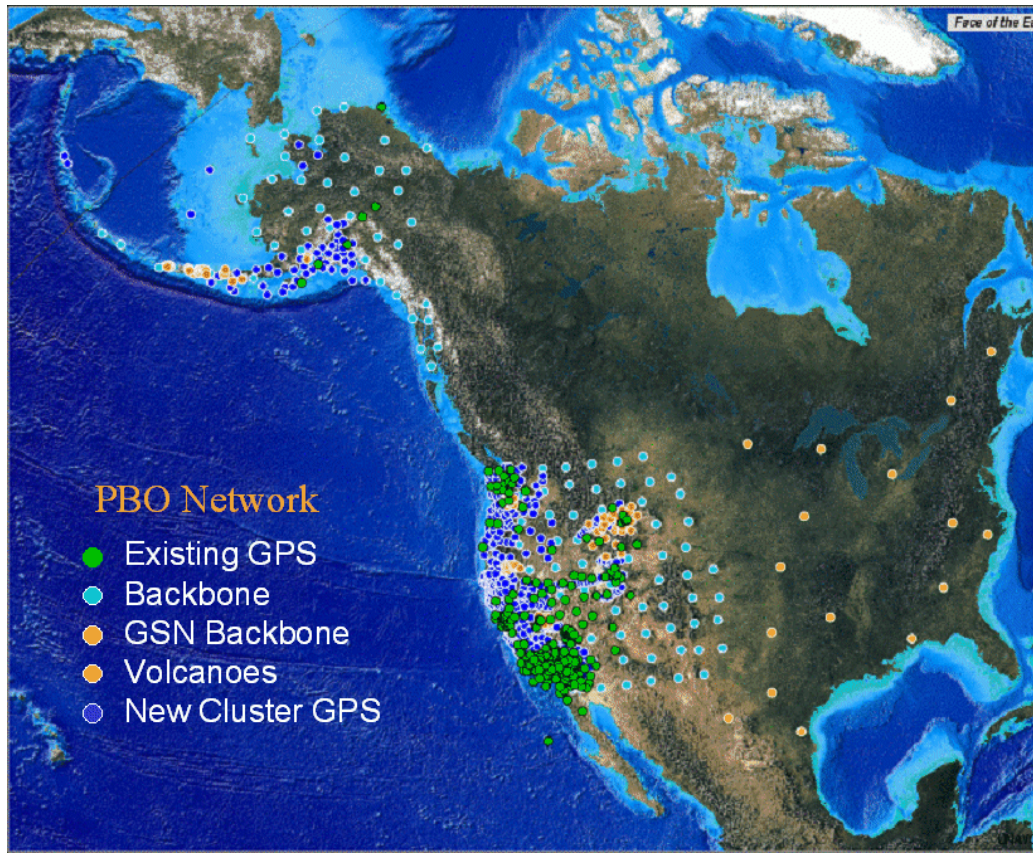
What is the Plate Boundary Observatory (PBO)?

- Part of US NSF-funded EarthScope project
- Install & run large geodetic network to study:
  - Earthquake processes & seismic hazards
  - Magmatic processes & volcanic hazards
  - Active deformation & tectonics
  - Continental geodynamics

PBO Network Design

- 891 CGPS stations
  - 775 clustered
  - W US: 100 backbone
  - E US: 16 backbone
- 100 portable GPS
- 175 borehole strainmeters
- 5 laser strainmeters
- Currently:
  - 56 CGPS stations sited
  - 18 permitted
  - Data available: 11 stations



PBO GPS Data Products

Less

Processed

More

- Level 0: Raw data & Metadata
- Level 1: Processed data
  - GPS station position time series
- Level 2: Derived quantities
  - GPS station velocities
  - Time series noise properties
  - Properties of periodic time series components
- Created by ACs/ACC, stored at Archives

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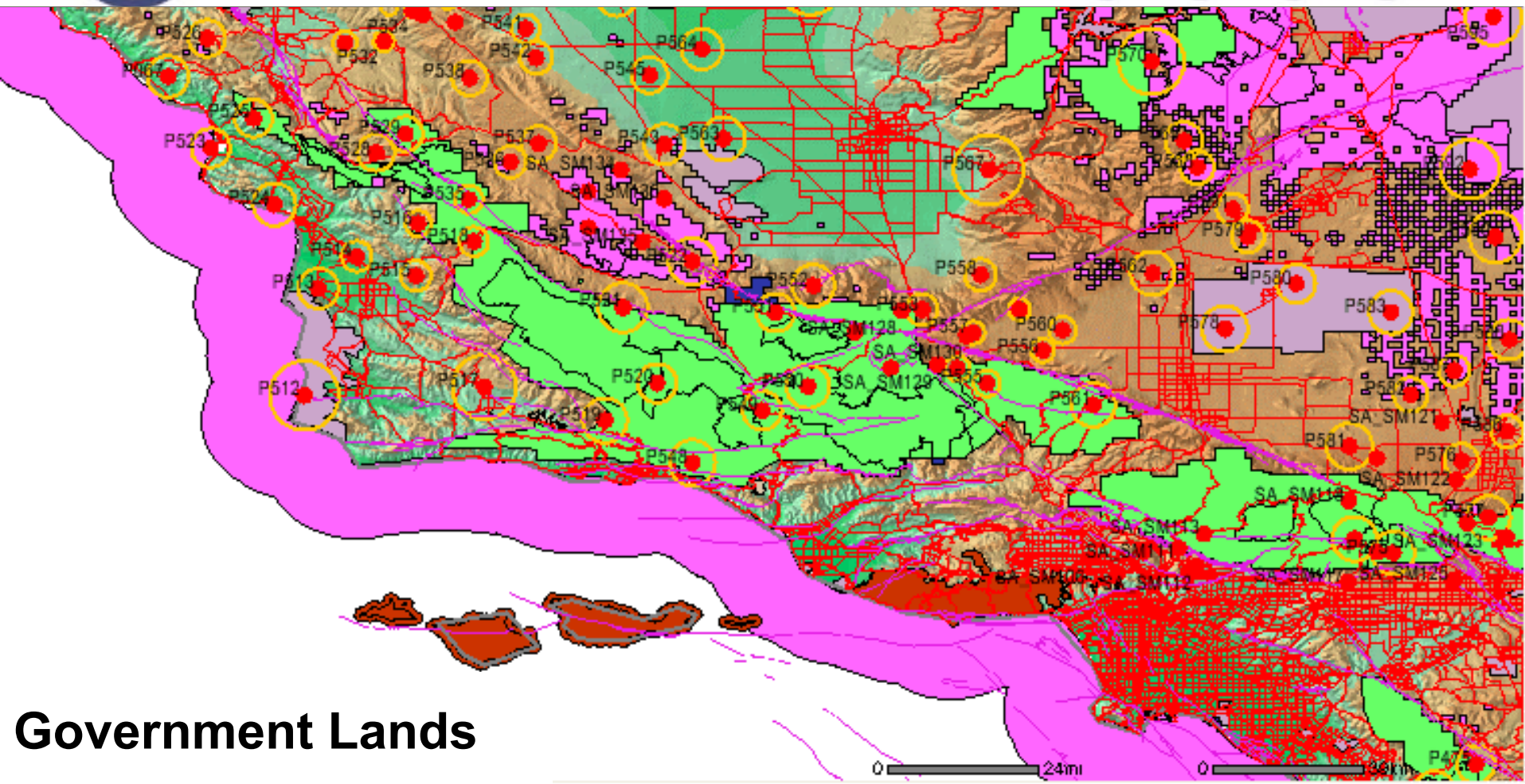
PBO Internet Map Server (ArcIMS)

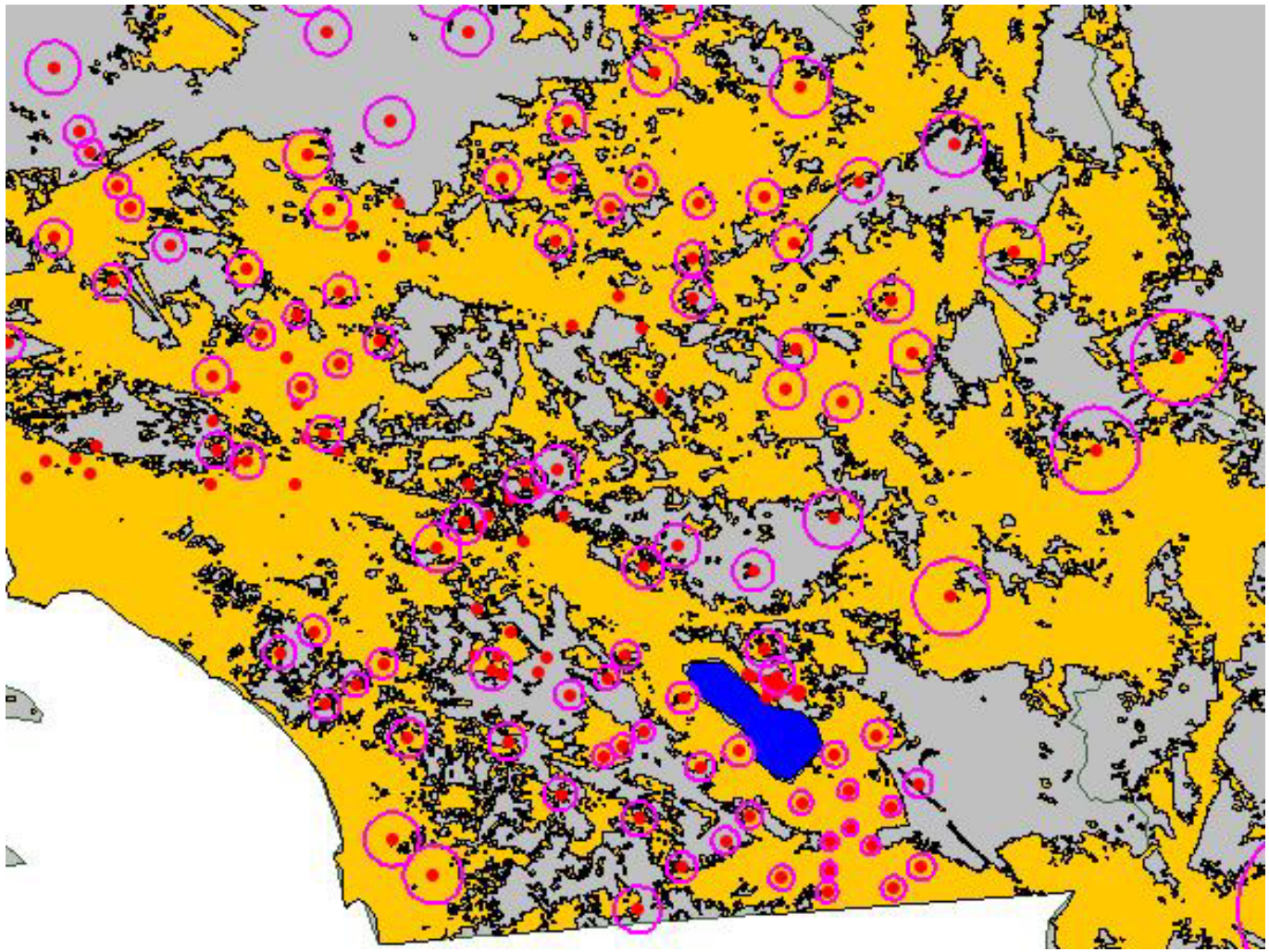
- Freely-accessible: http://arcims.unavco.org
- Provides geospatial data for PBO to:
  - Assist with site reconnaissance & permitting
  - Give rapidly-updated site maps and status
- Data include
  - 28.5-m LANDSAT & 1-m resolution aerial imagery
  - High-resolution DEM
  - Infrastructure: roads, power, aqueducts, etc.
  - Land ownership
- Basis for map-driven PBO data request tool

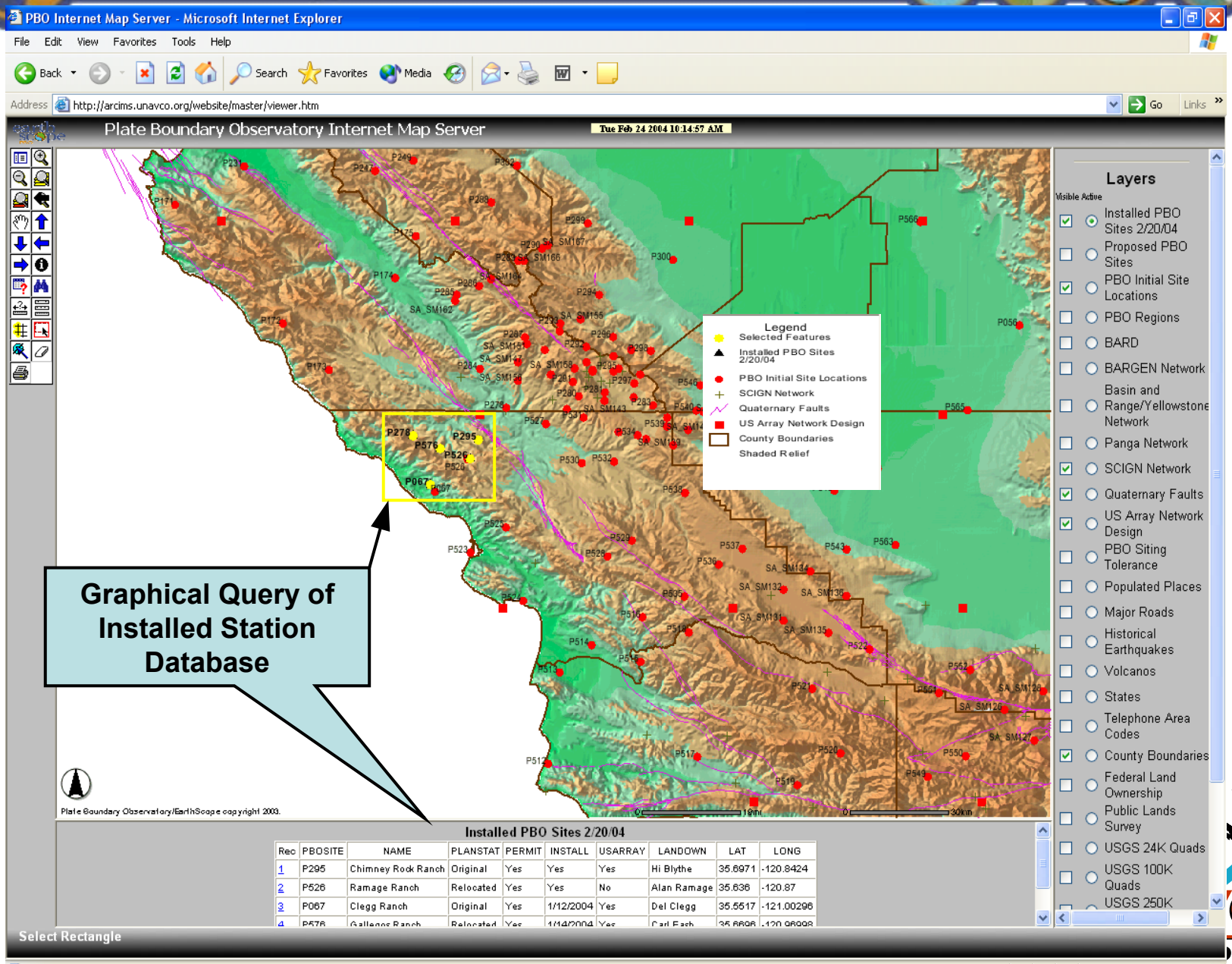
earthscope



Government Lands

http://arcims.unavco.org




PBO Internet Map Server - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://arcims.unavco.org/website/master/viewer.htm
Go Links
Plate Boundary Observatory Internet Map Server
Tue Feb 24 2004 10:14:57 AM
Legend
Selected Features
Installed PBO Sites 2/20/04
PBO Initial Site Locations
SCIGN Network
Quaternary Faults
US Array Network Design
County Boundaries
Shaded Relief
Layers
Visible Active
Installed PBO Sites 2/20/04
Proposed PBO Sites
PBO Initial Site Locations
PBO Regions
BARD
BARGEN Network
Basin and Range/Yellowstone Network
Panga Network
SCIGN Network
Quaternary Faults
US Array Network Design
PBO Siting Tolerance
Populated Places
Major Roads
Historical Earthquakes
Volcanos
States
Telephone Area Codes
County Boundaries
Federal Land Ownership
Public Lands Survey
USGS 24K Quads
USGS 100K Quads
USGS 250K
Graphical Query of Installed Station Database
Plate Boundary Observatory/EarthScope copyright 2003.
Installed PBO Sites 2/20/04
Rec PBOSITE NAME PLANSTAT PERMIT INSTALL USARRAY LANDOWN LAT LONG
1 P295 Chimney Rock Ranch Original Yes Yes Yes Hi Blythe 35.6971 -120.8424
2 P526 Ramage Ranch Relocated Yes Yes No Alan Ramage 35.636 -120.87
3 P067 Clegg Ranch Original Yes 1/12/2004 Yes Del Clegg 35.5517 -121.00296
Select Rectangle
Map: -122.12 , 34.47 -- Image: 43 , 679 -- ScaleFactor: 0.0031961337587677494
Internet

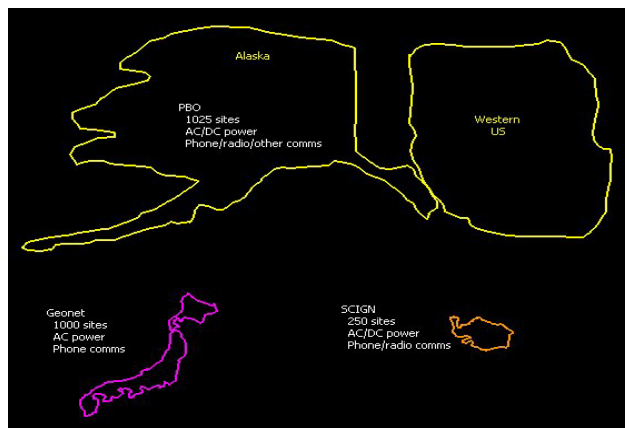
Trimble NetRS GPS Receiver

- Embedded Linux OS
- Native BINEX recording
- 1 GB internal storage
- Capable of multiple “sessions”
- Supports streaming
- Very Low Power (<4 W)
- Direct IP & serial communications

PBO Data Communications

- Challenge: reliably return data…
  - from >1000 sites…
  - spread over 7 million km^2…
  - with diverse accessibility, power, and telecommunications availability…
  - and on a limited budget

- Solution: use a variety of data paths
  - Direct Internet
  - 3G cellular modem
  - Low-power VSAT
  - Manual downloads



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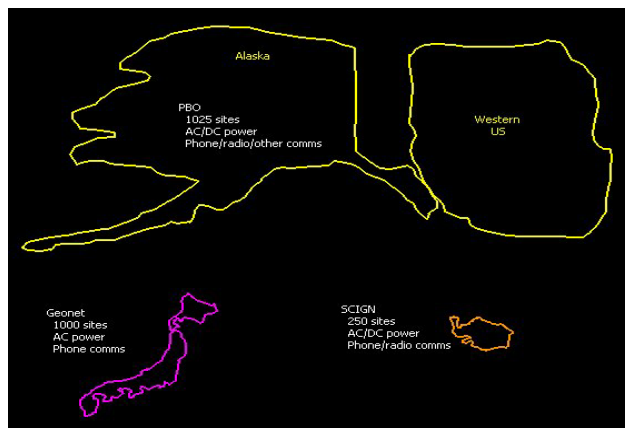
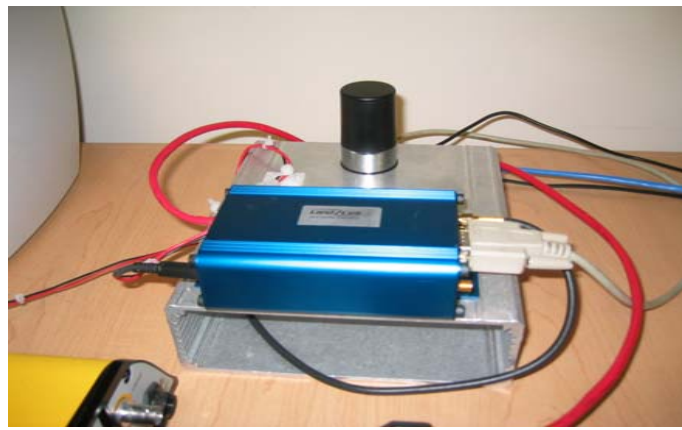


3G Cellular Modems

- Advantages:
  - Allow static IP-based communications
  - Widely available in US
  - Relatively low cost (< $700 US/€ 550)
- Problems:
  - Emerging technology
  - Longevity of modems & vendors?
  - Network congestion
- Typical bandwidth: ~70 kbps
- $75/month for up to 5 GB data

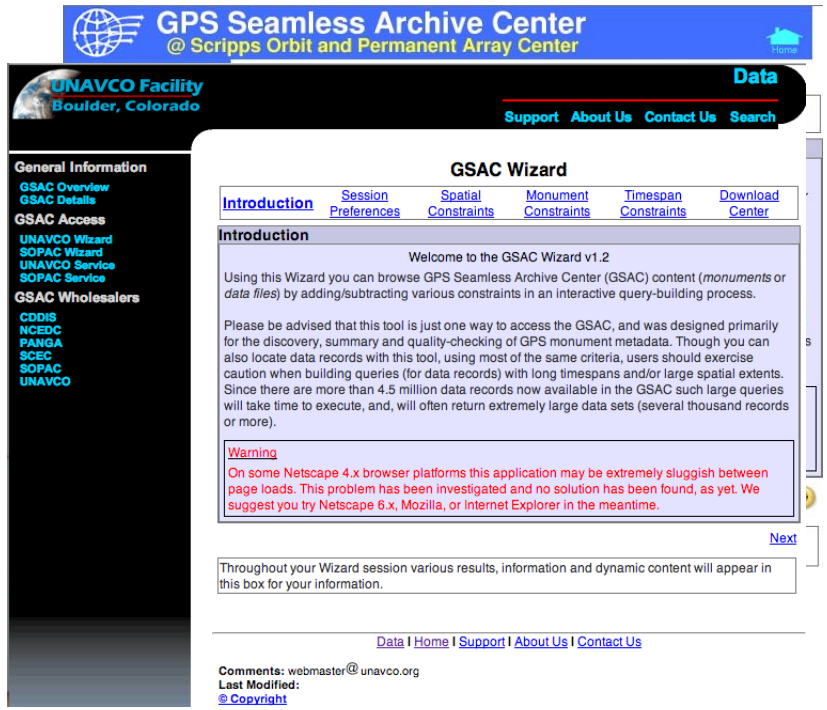


PBO GPS Data Analysis & Archiving

- Data sent via LDM to
  - 2 GPS Analysis Centers (ACs)
  - 1 GPS AC Coordinator
- Who produce derived products & send to…
- 2 GPS Archives
  - SOPAC
  - UNAVCO Facility
- Single data portal
  - Extracts data and derived products from Archives
  - Portal will deliver all EarthScope products

PBO GPS Data Archiving via GSAC

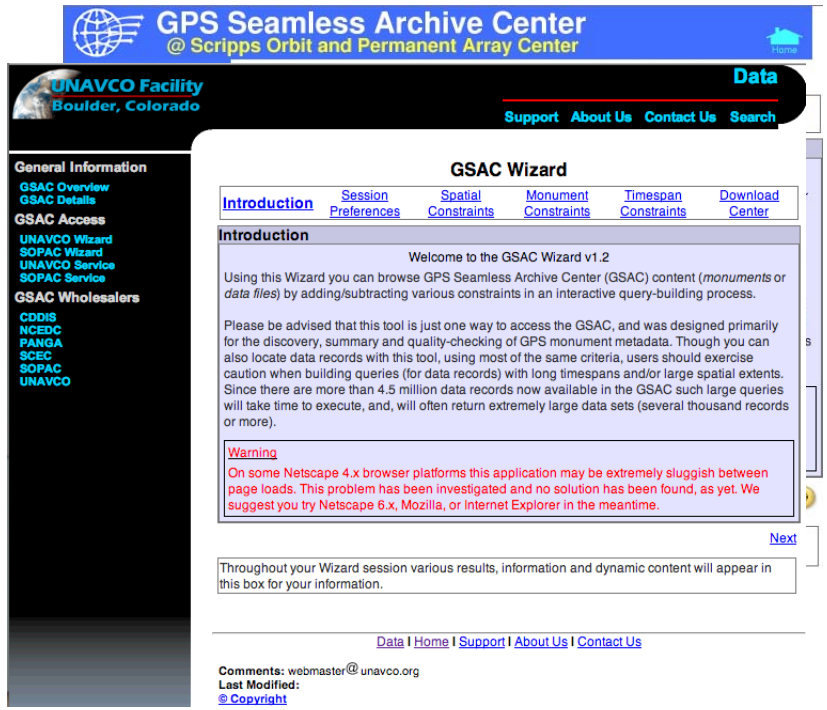
- 2 GSAC retailers
  - SOPAC
  - UNAVCO Facility



http://gsac.ucsd.edu
http://gsac01.unavco.org/GSACWizard

PBO GPS Data Archiving via GSAC

- 2 GSAC retailers
  - SOPAC
  - UNAVCO Facility
- Handles raw & RINEX data
- PBO Uses:
  - Keep archives in sync
  - Communicate w/PBO Data Portal
- Upcoming developments
  - Handle GPS derived products
  - Move to web services
  - More in Yehuda Bock's talk



For more info:

www.unavco.org/PBO/PBO.html

UNAVCO, Inc — EarthScope & PBO

About PBO | Contact PBO | PBO Help

Plate Boundary Observatory

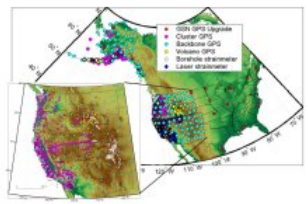
Paso Robles Earthquake Response
On December 22, 2003, a magnitude 6.5 earthquake occurred in coastal Central California. Since then, PBO has installed 5 stations using short drilled braced monuments south and east of the epicenter. Click here for more information.

First Deep Drill Installation
See pictures from the first PBO Deep Drill Installation. Click Here.

ArcIMS Server is up!
The PBO GIS server is running, click here to access

GPS Monument Overviews and Design
- Deep Monument Overview
- Short Monument Overview
- Design and Specifications

PBO Data and Data Products Plan
The PBO Data and Data Products Plan is on line click here to access



The proposed PBO network consists of 875 permanent GPS stations, 175 borehole strainmeters, five laser strainmeters, and a pool of 100 portable GPS instruments.
[Click image for larger map]

Network Operations
- Station siting

Personnel
- Organizational Chart
- Current UNAVCO, Inc. Job Openings

Related links
- EarthScope
- UNAVCO Facility

Data and Data Products
- PBO Data Management Plan

Related Publications
- PBO/EarthScope Publications
- PBO/EarthScope Presentations

PBO FAQs
- General Frequently Asked Questions

Request for Proposals
- Campaign GPS Receiver RFP

Education & Outreach
- Map Tools
- Classroom Resources
- Related Links
- Documents