

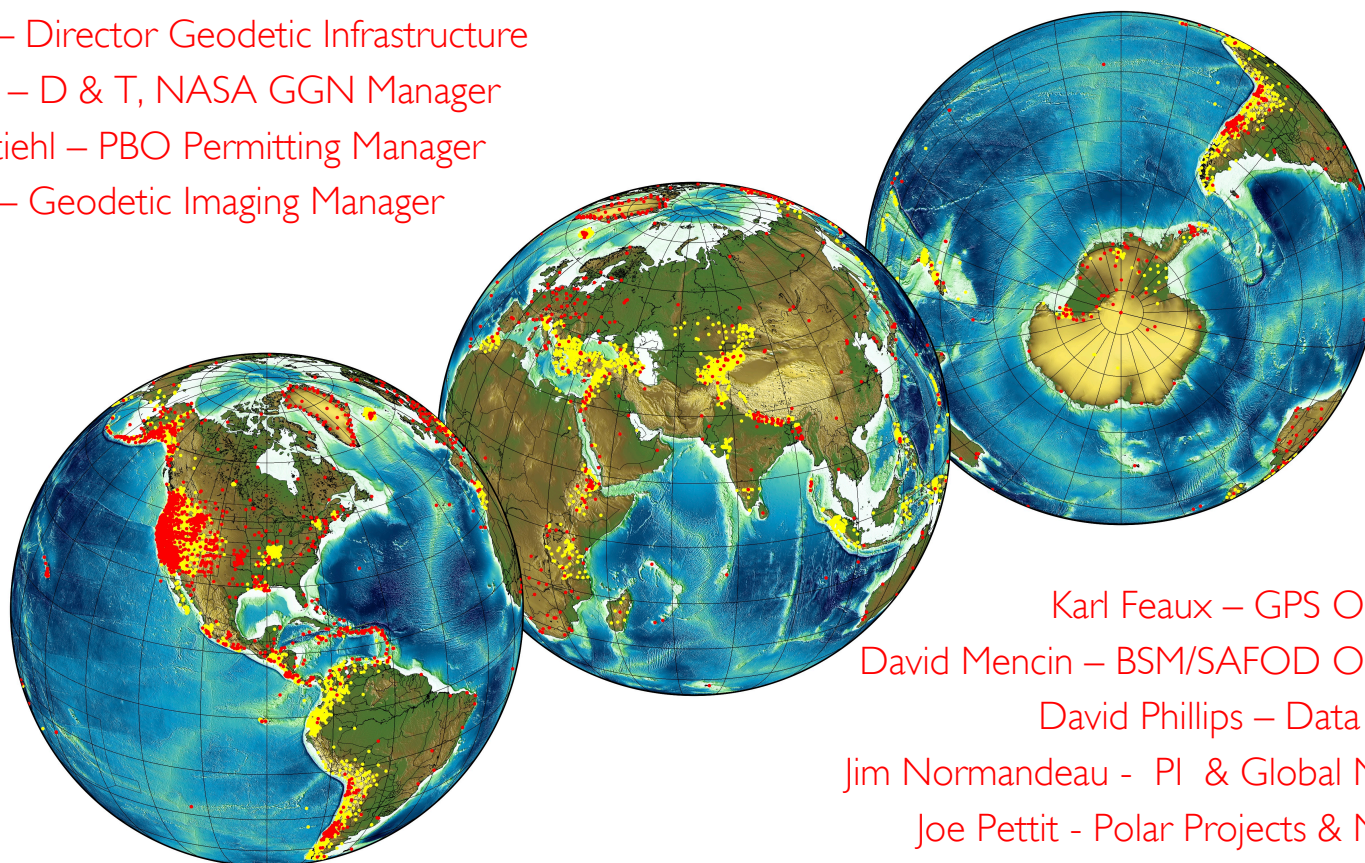
PBO/SAFOD Update – ESSC – F2F Oct. 2012

Glen Mattioli – Director Geodetic Infrastructure

Freddy Blume – D & T, NASA GGN Manager

Kyle Bohnenstiehl – PBO Permitting Manager

Chris Crosby – Geodetic Imaging Manager



Karl Feaux – GPS Operations Manager

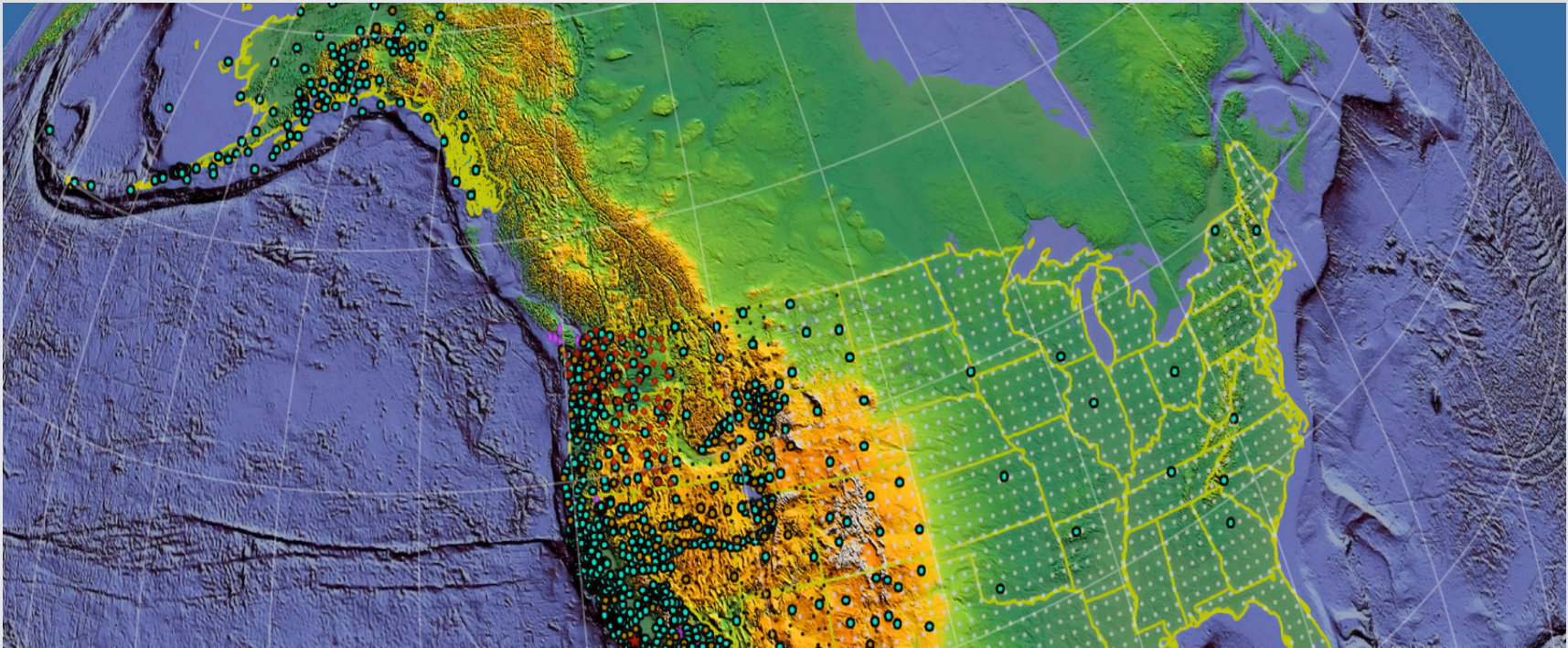
David Mencin – BSM/SAFOD Operations Manager

David Phillips – Data Products Manager

Jim Normandeau - PI & Global Networks Manager

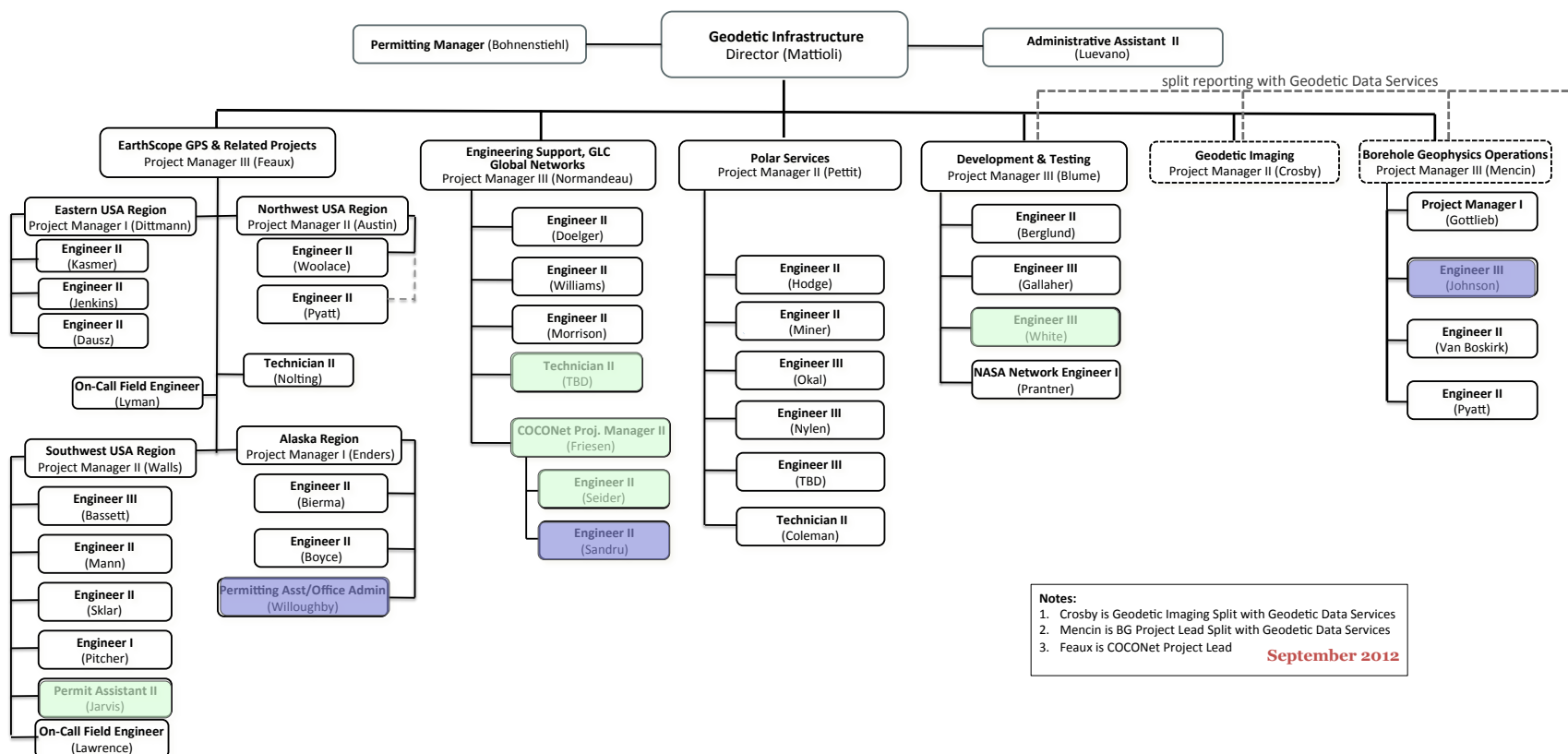
Joe Pettit - Polar Projects & Networks Manager

PBO Network: GPS, BSM, LSM, VSM, Met/Tilt



Geodetic Infrastructure Organization

UNAVCO Geodetic Infrastructure



PBO Highlights (GPS Network)

- **GPS network currently operating at 98%, PBO-Alaska holding steady at 95%.**
- Nucleus upgrades completed: Most of the 209 Nucleus stations required additional hardware to be in line with PBO specifications.
- Cascadia – ARRA RT upgrades change order accepted: Developed plan to upgrade 40-50 additional PBO stations to collect high-rate RT data streams, add 22 meteorological instruments, and add 3 BGAN fail-over systems. Status: Work in-progress.
- Monument testing change order accepted: Developed plan to install 2 additional monuments at 5 existing PBO deep monument sites to compare the long-term monument stability of various types of GPS monumentation. Status: First super-site scheduled for installation in mid-October, 2012.
- **7 new GPS stations added to PBO Network (5 Geopentech, 2 Solano County). Full cost recovery for installation and O&M activities; 6 additional sites planned near SONGS.**
- NOAA Phase 3 completed - Meteorological instruments have been installed at 27 existing PBO stations over the past 2 years.
- PBO-SW group facilitated the downloading of high-rate (5 Hz) data streams to support research related to the Brawley earthquake swarm that began in August 2012.
- **Plan for building 6 new PBO stations in the East Region approved by PBO AC. Status: 5/6 recons completed, equipment purchased, 4 stations scheduled for installation in October 2012; two sites already completed – more later.**

PBO Highlights Alaska 2012 Summer Field Season

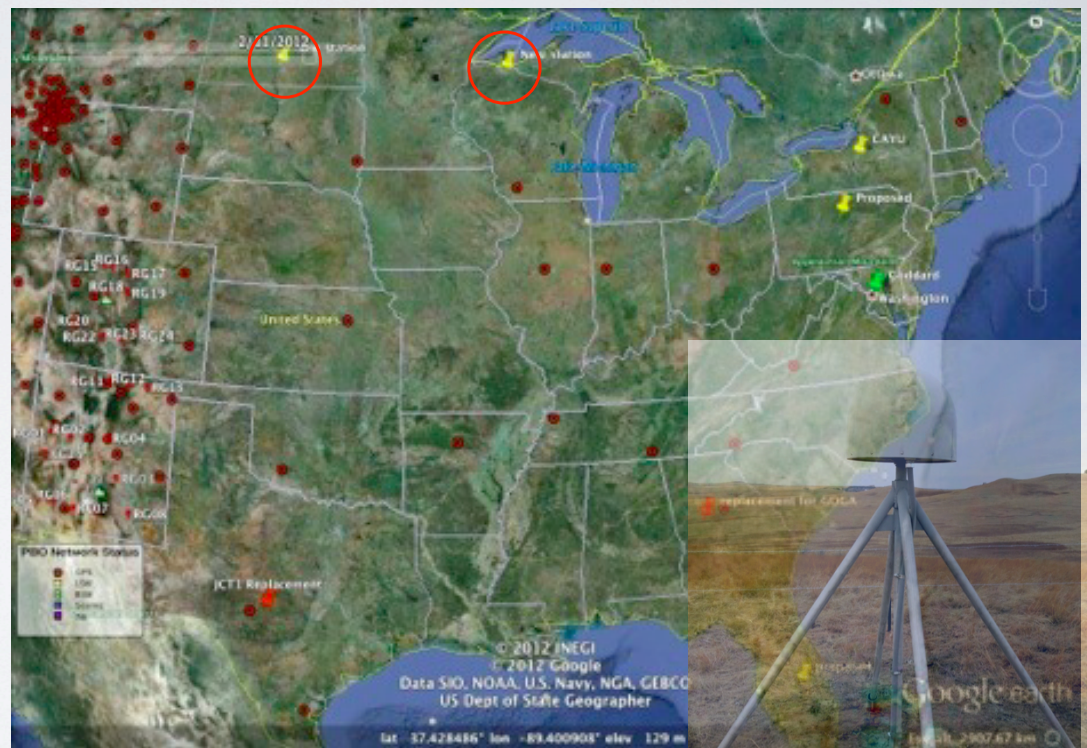
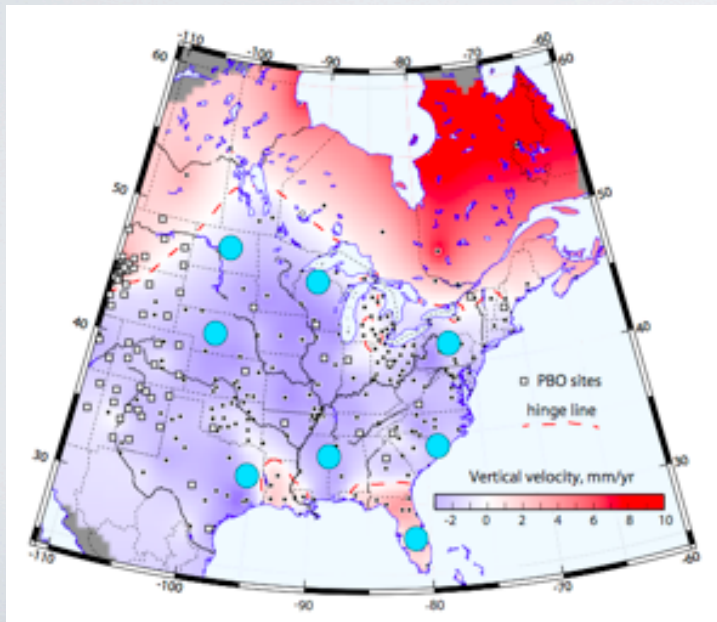
- 95 maintenance visits (48 by helicopter)
- All 5 year battery maintenance completed, except AV29 on Unimak Island
- Successful joint operations on Unimak Island with USGS engineers
- All tiltmeters functional and logging data
- Improved power system at AV35 WTUG (main repeater on Unimak Island), added methanol fuel cell.
- Solar power upgrades at 2 stations (2 60W to 3 80W)
- 3 DC VSATs replaced with more reliable BGAN data comms(AC50,AC19 and AC26)
- 95%+ PBO-Alaska stations operational on Oct 1, 2012



PBO Highlights – New Eastern Sites

PBO East - Science Objectives:

Glacial Isostatic Adjustment
Eastern US deformation - EQs



New PBO site – P802



PBO Highlights – New Eastern Sites

Six additional sites to be installed as part of PBO FY05 Change Order – Reviewed by EMT and PBO AC

Two Installs complete:

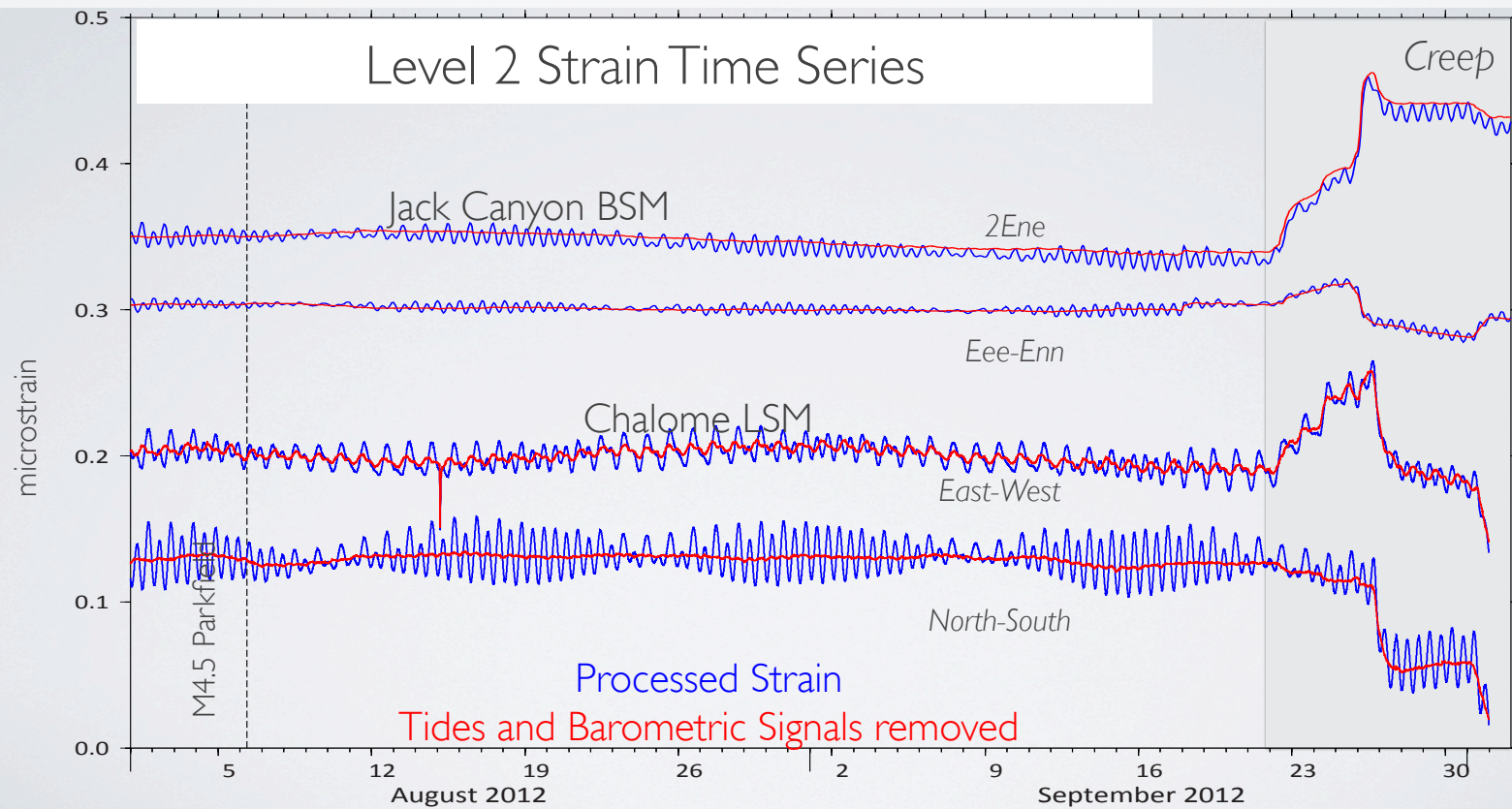
- 1) Mandan, ND (P802)
- 2) Mellen, Wisconsin (P803)



Borehole Strainmeter Network Status and Highlights

- Strain and seismic network 98% operational at end of FY2012.
- Completed hut upgrade/standardization project with final 3 stations in July.
- Finished fieldwork (surface broadband data collection) component of seismic orientations in August.
- A lightning storm damaged 3 Vancouver Island BSM stations in July. Repairs showed downhole instrument damage on 1 channel of each instrument. There are still 3 nominal channels at each of these stations, which will still allow monitoring strain.
- Installed new design of offset GPS borehole mount at B944, which allows access to tiltmeter instrumentation in borehole.
- Began observing 2012 ETS event on Vancouver Island and Olympic Peninsula BSMs in September.
- In permit negotiations with NPS for full replacement of the Norris Junction BSM station in Yellowstone.
- Negotiating with USGS to assume O&M and archiving activities for 16 strainmeters (CIW-DTM dilatometers) in California.
- Engineer (L. Van Boskirk) giving a colloquium at the University of Arkansas on 10/5/12.
- Strainmeter Science Workshop scheduled for week of 10/10 at SIO w/ D. Mencin, K. Hodgkinson, and G. Mattioli participating.

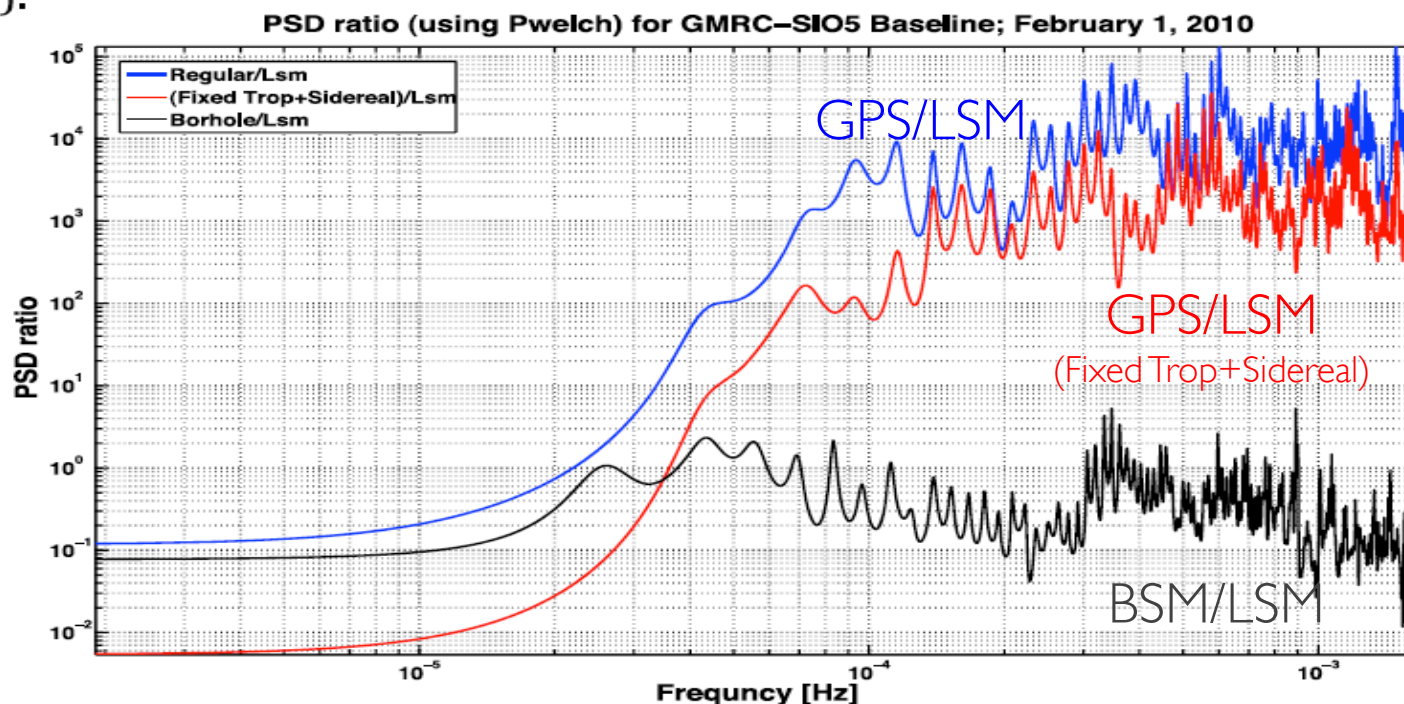
Creep In Parkfield recorded by PBO BSM and LSM



Plot by Kathleen Hodgkinson

PBO BSM ~2–3 orders of magnitude lower noise than GPS in period band of 1 hour to a day

b).

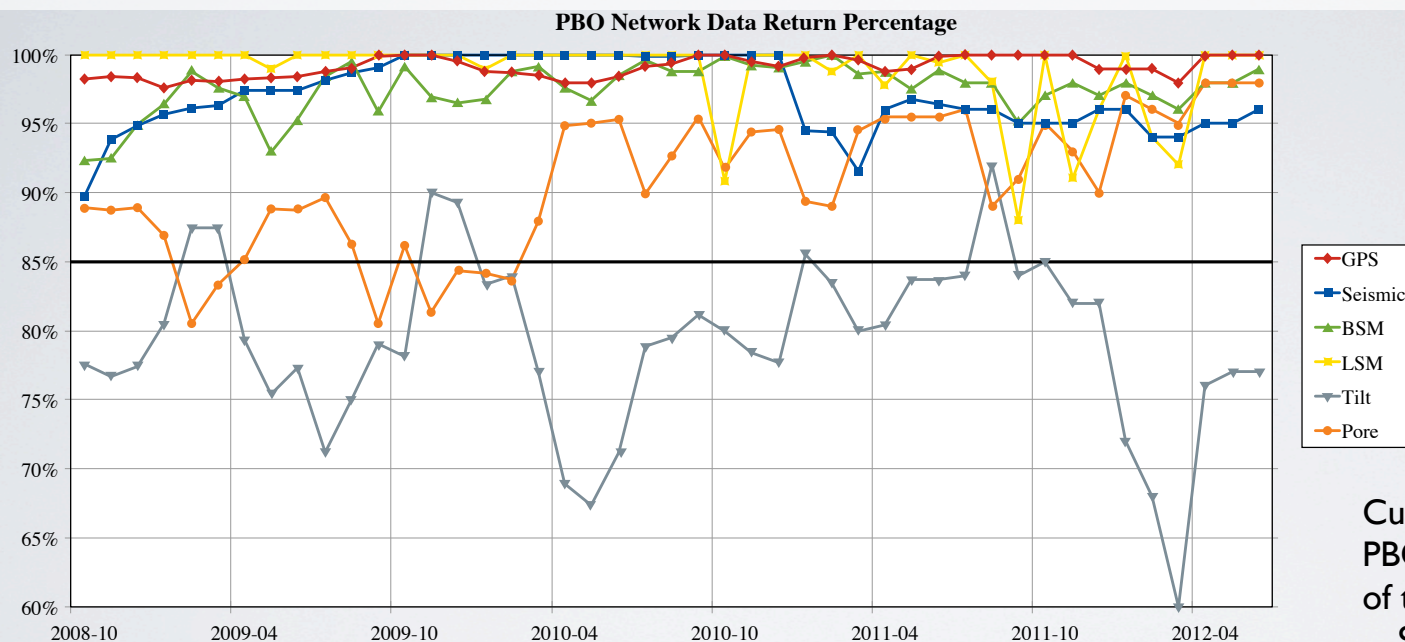


Reuveni, Y., S. Kedar, S. E. Owen, A. W. Moore, and F. H. Webb (2012), Improving sub-daily strain estimates using GPS measurements, *Geophys. Res. Lett.*, 39, L11311, doi:10.1029/2012GL051927.

Science Highlight from new publication using UNAVCO strain data

PBO Data Streams: Cumulative and Current Status

David Phillips
Kathleen Hodgkinson
Christine Puskas



- Cumulative tiltmeter data return since the beginning of the O&M period (FY2009) is at 79%, still below the target level of 85%. The roll-out of repaired tiltmeters is complete, but communication to tiltmeter sites tends to be difficult.
- Communications continued to be affected this period due to a downed T1 line in Cold Bay AK, which has taken the Unimak GPS and tiltmeters offline.

Cumulative data return for the PBO network since the beginning of the O&M period (FY2009) is:

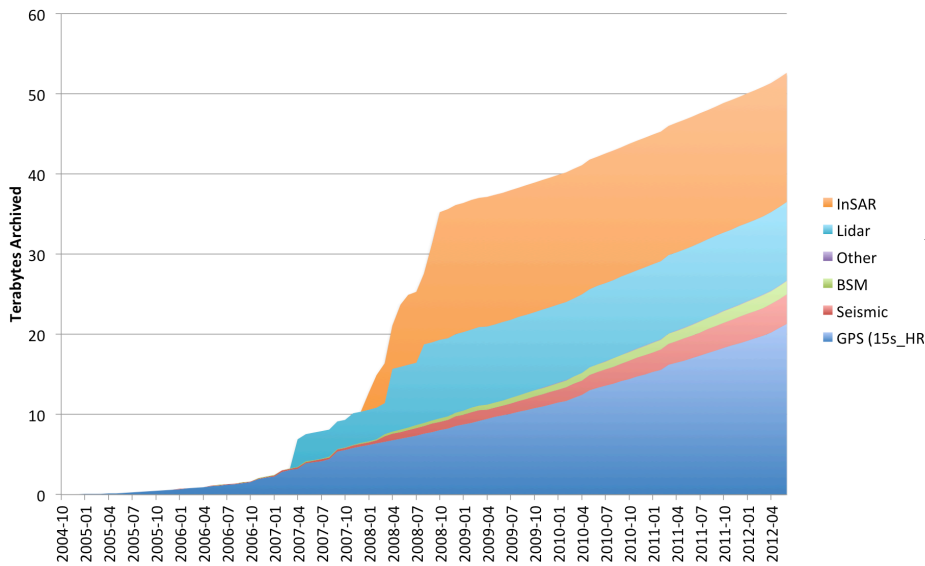
- 99% for GPS/Met
- 97% for seismic
- 98% for BSM
- 99% for LSM
- 91% for pore pressure
- 79% for tilt.



PBO Data Archived and Delivered

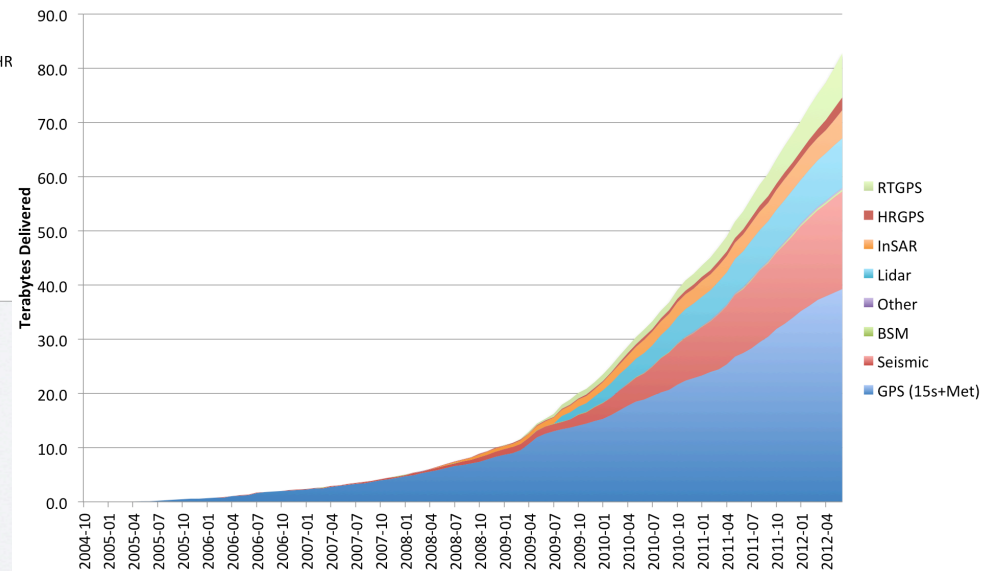
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Christine Puskas

PBO+GeoEarthScope Data Archived



- More than 1,028 unique institutions downloaded data from PBO in Y4Q3.
- Real-time data deliveries from PBO's GPS network have accounted for 8.1 TB of data usage since the beginning of the O&M period (FY2009). In the current quarter (Y4Q3), 36% of all PBO GPS data volume delivered was accessed in real time.

PBO+GeoEarthScope Data Delivered



PBO Data Outage – Late August 2012

- PBO dataflow outage occurred on 29 Aug 2012.
- Outage duration varied with data type – details will be discussed in GDS report.
- **No data were lost.**
- **All dataflow has been restored.**
- Significant hardware and software upgrades were implemented during the restoration process so that dataflow operations are now more secure and robust than before the outage. More details on following slides.
- UNAVCO is currently developing a master plan to further mitigate future disruptions and to enhance the overall performance and security of dataflow, metadata and archive operations. More details on following slides.
- UNAVCO is currently developing a policies and procedures plan (similar to science event response procedures plan) for responding to future dataflow disruptions. Will be based on sponsor requirements as well as input from PBO Advisory Committee and other sources.

PBO Analysis Centers Update

800+ additional stations being added to PBO Analysis Center GPS processing

- 500+ “Expanded PBO Analysis” stations (Change Order 38)
- 111 SCIGN-USGS stations
- ~115 COCONet stations
- 13 GAMA stations (Bob Smalley/USGS)

- AC's will integrate all stations into processing stream before GAGE.
- AC's will retrieve data from non-UNAVCO archives (e.g. NGS, SOPAC, DOT's, etc.) for most of the 500+ “EPA” stations.
- UNAVCO will help manage station metadata for AC's (but no QA/QC).
- UNAVCO is identifying stations to be processed. About 200 stations have been identified so far. Remaining 300 will be identified by end of October.
- ACC is about to commence major reprocessing run for all data back to 1996. Reprocessing will be completed before GAGE.



PBO Advisory Committee

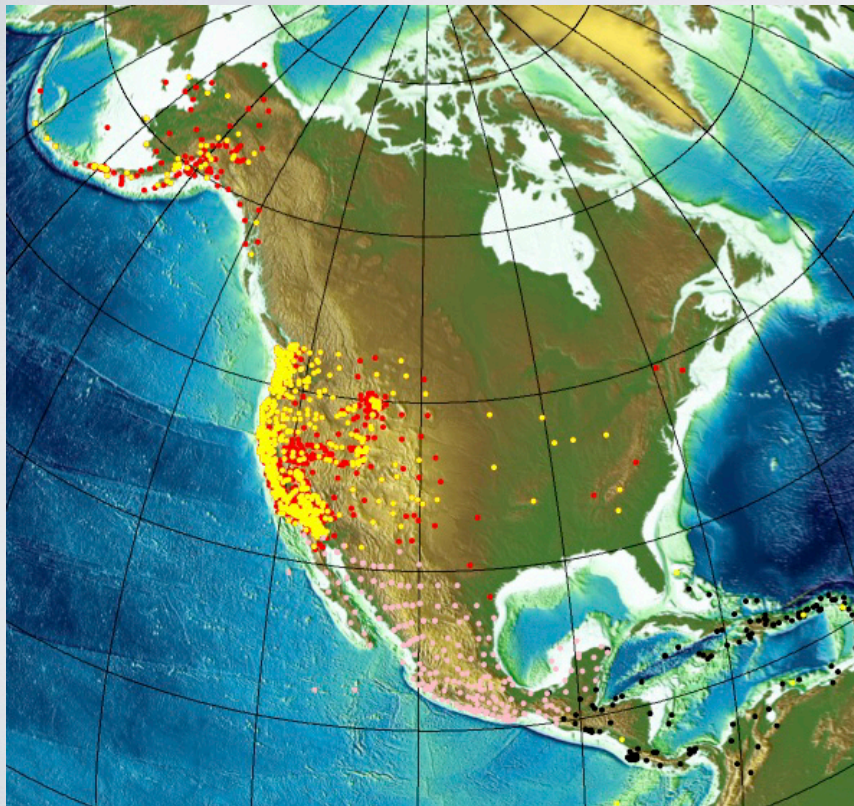
Name	Organization	E-Mail	Term End
Bill Hammond (Chair)	University of Nevada, Reno	whammond@unr.edu	Dec 2012
Rick Bennett (Board Liaison)	University of Arizona	rab@geo.arizona.edu	Dec 2012
Mike Brudzinski	University of Miami, Ohio	brudzimr@muohio.edu	Dec 2013
Lucy Flesch	Purdue University	lmflesch@purdue.edu	Dec 2014
Jeff Freymueller	University of Alaska, Fairbanks	jeff.freymueller@gi.alaska.edu	Dec 2014
Tom Heaton	California Institute of Technology	heaton@gps.caltech.edu	Dec 2014
Chuck Langston	CERI, University of Memphis	clangstn@memphis.edu	Dec 2014
Tony Lowry	Utah State University	tony.lowry@usu.edu	Dec 2012
Evelyn Roeloffs**	USGS	evelynr@usgs.gov	Dec 2013
**Non-Voting Observers			

PBO: RT-GPS status and plans

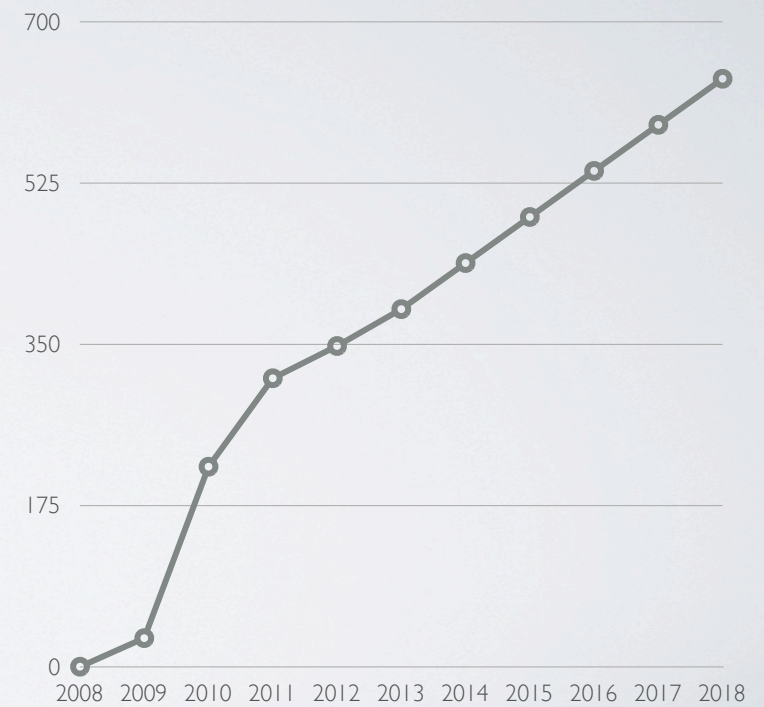
- Workshop successfully concluded on March 28th, 2012 with nearly 80 participants from multiple sub-disciplines.
- EOS Meeting Report submitted and accepted for publication.
- White Paper, with community review by end of 2012.



PBO: RT-GPS Upgrade Plan



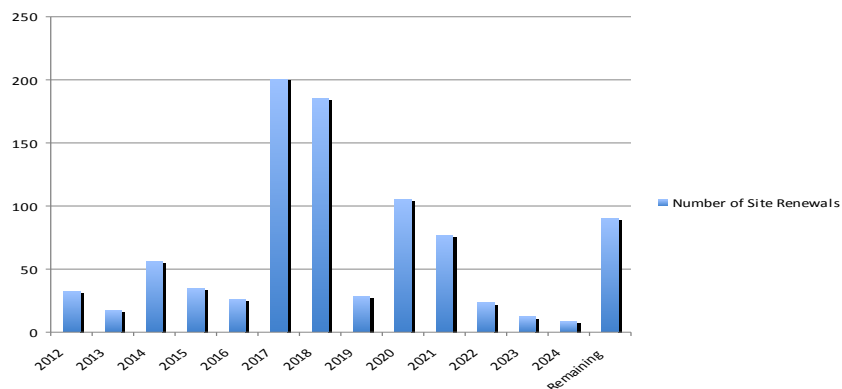
●
Real-Time
Stations



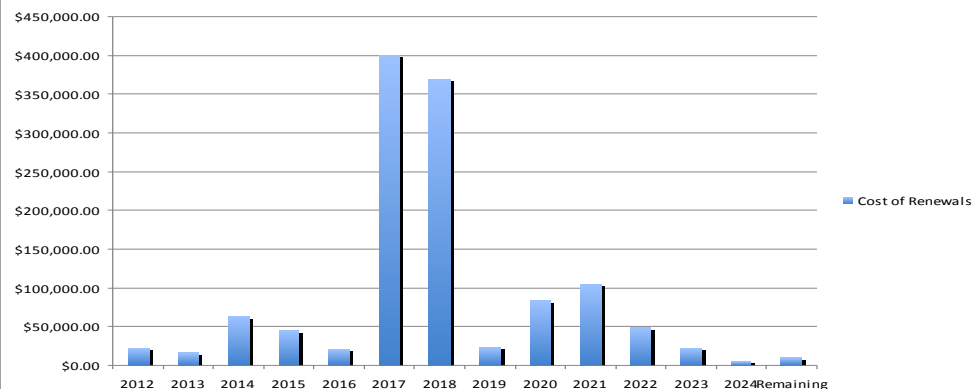
PBO Permitting Status and Concerns

- An experienced Permitting Assistant resigned in September, 2012; backfilled the position with a part-time staff member from AK. Training to occur over next year.
- Current permitting FTE level for PBO is 1.00 and 1.50 for all GI activities. Staff retention is a concern because of the legacy knowledge needed to maintain permits and relationships landowners.
- The average number of renewals during the period 2009-2012 has been about 35 per year. This will increase to near 200 per year during 2016-2018.
- Difficult to budget for some renewals: will landowners want to be paid again and at the same rate?
- It is difficult to spread renewal activity out as renewals need to be handled 3-9 months before expiration.

Number of Site Renewals



Cost of Renewals



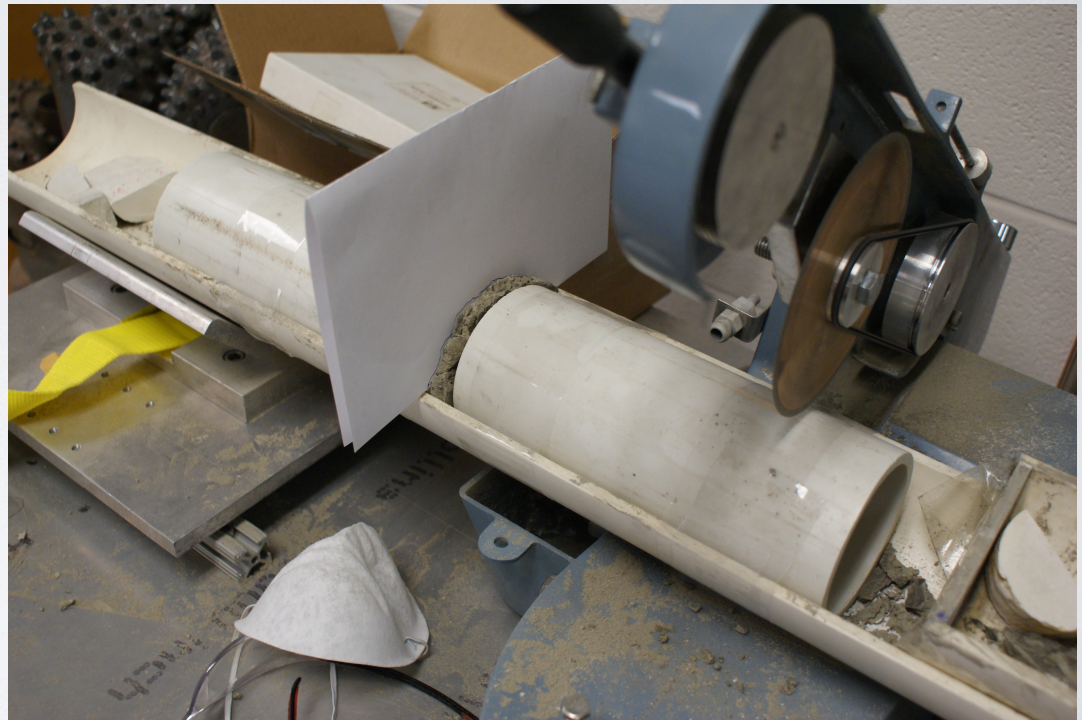
SAFOD Borehole Observatory

- EarthScope Change Order PBO-21 was requested by the NSF on June 17th, submitted on June 22nd, and approved on June 25th of 2010
- CO2I Directs UNAVCO/PBO, using \$483K of existing accumulated SAFOD funds and \$49K of year 3 SAFOD funds to remove the failed SAFOD observatory and conduct a preliminary failure analysis.
- Removal operations will begin on Oct. 4th, 2010 and successfully completed on Oct. 15th, 2010.
- Total cost for removal: \$456K
- Failure analysis conducted at Pinnacle in Houston in early December 2010 with sub-committee and Pinnacle.
- Final report issued from sub-committee to the NSF on April 14th, 2011. Multiple findings that could have contributed to failure but difficult to separate those that happened early and those that were a result of the two year deployment while inoperable.
- A change-order required for any further work. There are no allocated funds for work outside of SAFOD AC support.
- NSF released a solicitation, through a Dear Colleague letter, for the continued SAFOD management in late 2012. SAFOD will be transitioned from UNAVCO to a more aligned institution.
- Continued support for future SAFOD transition – W. Johnson new PM at UNAVCO.



SAFOD Core and CoSWoG

- The present status of sample distribution from Phase 3 requests has become divisible into two sections:
 - (a) G-2-7 requests – **problems still being addressed...**
 - (b) requests from other sections of the core
 - **12 of 15 requests sent**
 - **163 samples returned**
- The accommodation of the requests has been done at the core storage in IODP, College Station, TX.
- **The work is supervised by John Firth, a member of CoSWoG, with work done by Molly Chamberlin, a TAMU graduate student.**



Simulated SAFOD Core cuts

SAFOD Advisory Committee

Name	Organization	E-Mail	Term End
Chris Marone (Chair)	Pennsylvania State University	cjm38@psu.edu	Dec 2012
Brian Evans	Massachusetts Institute of Technology	brievans@mit.edu	Dec 2013
Michael Gross	Florida International University	grossm@fiu.edu	Dec 2013
Steve Hickman**	USGS	Hickman@usgs.gov	Dec 2013
Elizabeth Screatton	University of Florida	screatton@ufl.edu	Dec 2013
Jamie Steidl	University of California, Santa Barbara	steidl@crustal.ucsb.edu	Dec 2014
Seth Stein (Board Liaison)	Northwestern University	Seth@earth.northwestern.edu	Dec 2012
**Non-Voting Observers			