GeoPRISMS

Newsletter - Issue No. 32, Spring 2014

In this Issue

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The GeoPRISMS Newsletter is published twice a year and is designed to provide to the GeoPRISMS community summaries of recent GeoPRISMS activities and meetings, synthesis articles, editorials, and discussion of science opportunities. Archives of the Newsletter are available on the GeoPRISMS website.

From the Chair

It is a great pleasure for me to introduce you to the 2014 Spring issue of the GeoPRISMS Newsletter. As you will notice, we have made some changes to the layout and format. The production is principally in the hands of Anaïs Férot with help from Jeanne Bisanz. We'd like to thank Kacey Lohmann and Nathan Niemi from the Earth and Environmental Sciences Department of the University of Michigan for their insights and suggestions that helped form the new layout. We are also shifting the focus of the Spring issue towards science reports. The Fall newsletter will focus more on time-critical announcements related in part to the Fall meeting of the American Geophysical Union. It will be distributed in electronic format only.

The GeoPRISMS office has now completed its move from Rice University to the University of Michigan. The Office is now fully staffed with the arrival of Jeanne Bisanz as Administrative Coordinator. Welcome Jeanne! A short CV of the GeoPRISMS staff members is provided on the last page of this issue.

We have seen a fair bit of turnover on the GeoPRISMS Steering and Oversight Committee. This year we have Rob Evans (Spring), Bradley Hacker (Spring), and Susan Schwartz (Fall) rotating off. I would like to thank Rob, Brad and Susan for their hard work and significant input. Susan will remain closely associated with the committee in her new role as the Chair of the Amphibious Array Steering Committee. I would like to welcome four new members to the committee: Kerry Key (Scripps), Paul Wallace (Oregon), Jeff Freymueller (Alaska Fairbanks), and Tony Watts (University of Oxford) will join us for a three year rotation ending in Spring 2017. I look forward to working with you!

On the GeoPRISMS Education Advisory Committee we saw Andrew Goodliffe (Alabama) rotate off. In particular on behalf of Juli Morgan I'd like to extend a big "Thank You" to Andy for his positive contributions while taking on a Deanship back home and also for his continued involvement in the MARGINS mini-lessons project. Juli herself will continue on the committee as the MARGINS mini-lessons development (funded through a separate grant to Rice) continues.

On the research front we are continuing to work with the phased funding for big data acquisition proposals for the focus sites (page 3). An important outcome of discussions between NSF, GSOC, and numerous researchers interested in field research in the Aleutians (see also workshop report on page 27) has been the decision to provide logistical support (with some of the usual caveats) for field work in the 2015 and 2016 summer field seasons (see NSF announcement on page 3). This is an important development which should greatly leverage GeoPRISMS funding in the Aleutians. We owe a big thank you to all who were involved with this at NSF and in the community at large.

Peter van Keken
Chair, GeoPRISMS Program

Cover Photograph:
Co-located sesimic and MultiGas station on Mount Martin, Alaska with Mount Mageik in the background. Photo credit Taryn Lopez

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GeoPRISMS Program
[Program Solicitation NSF 14-556]
Deadline: August 1, 2014

http://www.nsf.gov/pubs/2014/nsf14556/nsf14556.htm

The phased funding model adopted by GeoPRISMS has defined "windows of opportunity" during which proposals will be accepted for given primary sites. Large and costly field experiments can only be supported in one site at a time, for up to two sequential years. Smaller studies such as preparatory work, data analysis, and synthesis, or thematic studies, requiring a lower percentage of the overall annual budget, will be considered for all sites each year. The windows of opportunity for large-scale data acquisition projects are thus defined, by site:

Cascadia: completed for GeoPRISMS, but will continue to be accepted in Core Programs
ENAM: completed for GeoPRISMS, but will continue to be accepted in Core Programs
Alaska/Aleutians: FY14-15 (July 2014 deadline)
EARS: FY15-16 (July 2014 and 2015 deadlines)
New Zealand: FY16-17 (July 2015 and 2016 deadlines)

In addition, workshop proposals for science or implementation and post-doctoral fellowship proposals relevant to the GeoPRISMS Science Plan will continue to be accepted to the GeoPRISMS Solicitation each year.

For more information, please visit:

http://www.geoprisms.org/research.html
http://www.geoprisms.org/program-announcement.html

Message from NSF

The GeoPRISMS Office at University of Michigan is off to a great start under the leadership of Peter van Keken and once again let us welcome the new office and its able staff to the family of GeoPRISMS community on behalf of the National Science Foundation. GeoPRISMS funding opportunities continue under the relatively new constraint of phased funding for large data collection efforts at the primary sites. This funding model was introduced to allow the distribution of limited resources fairly across the entire program and to schedule collection of basic data at selected primary sites in a practical and timely manner. The roll out of the phased funding and windows that are open for individual sites are provided in the box above, but as always we will remain flexible in implementing these windows as schedules, field conditions, or other unforeseen situations that might occur. Continued data collection efforts at primary sites is also envisaged to be supported through EAR or OCE Core programs or other programs such as Integrated Earth Systems, Interdisciplinary Research in Hazards and Disasters (Hazards-SEES) or the Partnerships for International Research and Education (PIRE).

For the next fiscal year the focus of phased funding is on Alaska-Aleutians and the East African Rift System (proposal deadline for that cycle of funding is August 1, 2014). There has been considerable interest from the community to organize logistical support in the Aleutians. Data collection efforts in this area are made difficult by a short field season, long distances with difficult transport options and potential for long periods of adverse weather. We are pleased to announce that the GeoPRISMS Program is planning to arrange logistical support for the summer seasons of 2015 and 2016. Pending clearances and permits we expect the availability of two vessels, one of which may able to provide helicopter support. These resources will allow the community to do their field work more efficiently and provide the potential for a much higher scientific return for the funding. Please see the updated program announcement above for more details. We thank the efforts of the large number of scientists who were involved in the Aleutians planning and those who will be involved in making it a reality over the next two fiscal years.

Bilal Haq, Jennifer Wade and Donna Blackman
GeoPRISMS Program Managers, National Science Foundation

A Geophysical and Hydrogeochemical Survey of the Cascadia Subduction Zone

H. Paul Johnson[1], Evan A. Solomon[1], Robert Harris[2], Marie Salmi[1], Richard Berg[1]

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Our 204 heat flow and 23 fluid flux stations survey along a single cross-margin profile is the highest resolution series of such measurements ever made on a subduction zone accretionary wedge. Combined with previous R/V LANGSETH multi-channel seismic data previously acquired along the same profile, these measurements reveal a wealth of detail of active fluid pathways, tectonic complexity, and diverse thermal environments for the previously unstudied accretionary prism off the Washington coast. Processing of these rich data sets is just beginning but preliminary analysis of the results reveals several unexpected findings. These include the inflow of seawater into at least the uppermost sediment layers above the deformation front and first anticlinal ridge, higher temperatures (~225°C) of the sediment-basement interface at the deformation front than previously recognized and methane-rich fluid flux with a geochemical signature indicating that these fluids originate from a deep source at temperatures greater than 80°C within the accretionary prism.

The Cascadia Subduction Zone (CSZ) that dives beneath the North American continent is relatively quiescent but poses a great seismic hazard to the NE Pacific coast. Although the northern and southern portions of the CSZ off-shore the Vancouver Island and Oregon coasts have been studied over the past 50 years, detailed geophysical studies of the section off the Washington State margin have been limited until recently due to its proximity to sensitive U.S. Navy access routes. With the lifting of the ban on high resolution multi-beam bathymetry maps of the area and the recognition that the CSZ is a quiet but active fault zone, the 250 km length of the Washington portion has received new attention, which included its election as a focus site for the National Science Foundation GeoPRISMS Program, a target area for the Cascadia Initiative Expedition Team Ocean Bottom Seismic array, and the focus of two multi-channel seismic surveys using the R/V LANGSETH in 2012.

In August, 2013, we conducted a 30-day detailed heat flow and fluid flux survey along a single across-strike profile of the Washington margin from the abyssal plain west of the deformation front of the accretionary wedge at 3000 meters depth to the continental shelf at 160 meters water depth using the R/V ATLANTIS and the ROV JASON II. The scientific goals of this cruise were to:

1. Determine the temperatures along the décollement of the CSZ megathrust fault, since temperature is an important influence on the locked portion of the fault.
2. Identify and quantify both shallow and deep-seated fluid flow within the accretionary sediment wedge that overlies the megathrust fault zone.
3. Test the hypothesis that active hydrothermal circulation within the subducting oceanic crust is occurring and if so, whether this oceanic plate aquifer is mining heat from deep within the subduction zone and serving as a 'cold-finger' for thermal processes beneath North American margin.

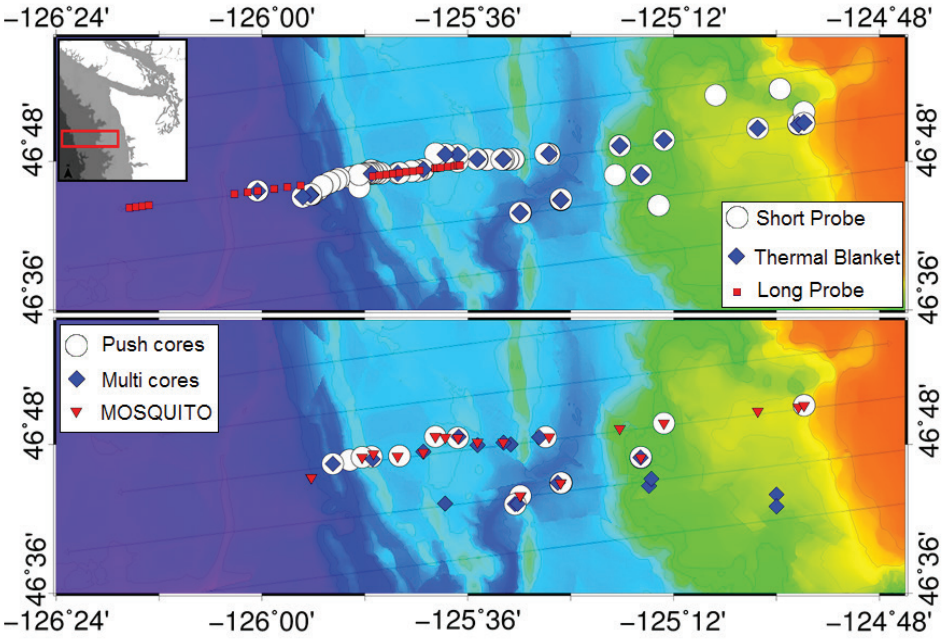


Figure 1. Top Image shows heat flow instrument sites from August 2013 GeoPRISMS cruise, including Jason short-probe, thermal blanket deployments, and OSU long-probe sites. Light grey lines are LANGSETH MCS 2012 survey lines. Insert shows general location of survey area. Lower map shows fluid flow sampling sites, including Mosquito flow meters, Jason push cores and multi-corer sediment coring sites.

The R/V Atlantis

Although designed as a stand-alone research experiment, our field program is integrated with other recent and continuing GeoPRISMS and Department of Energy Hydrate Programs on Cascadia Subduction Zone. This integration is both a benefit and a necessity given the complex interdisciplinary scientific processes that are presented on the Washington margin. For example, we took advantage of the LANGSETH 2012 Multi-Channel Seismic (MCS) lines to identify sub-surface structures in our survey area and conducted heat flow and fluid flux measurement profiles over Line 4 from that cruise. Our data will also be eventually linked to the Cascadia Initiative Expedition Team (2011-2014) Ocean Bottom Seismometer data to help understand CSZ seismic behavior and hazards and to the planned Department of Energy cruise on the R/V THOMPSON (Solomon and Johnson) that focuses on understanding the response of upper slope gas hydrates to the observed warming of intermediate depth water temperatures off the Washington margin. In order to construct a single high-resolution profile of heat flow and fluid flux measurement across the Washington accretionary prism and adjacent abyssal plane we employed the entire suite of geophysical and hydrological tools available in order to approach the above scientific problems with a comprehensive program.

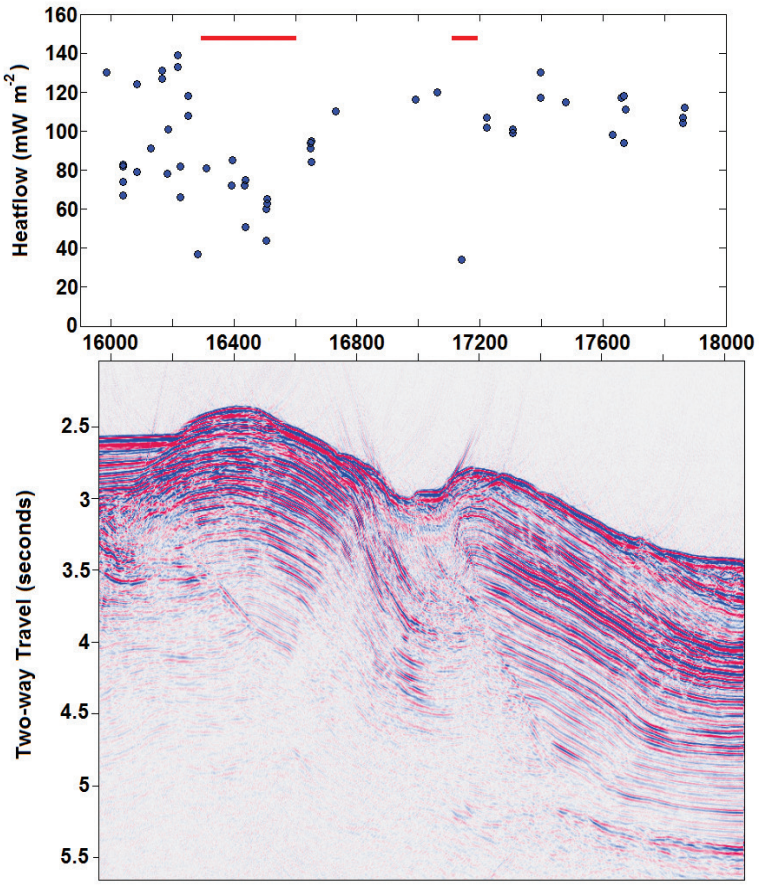


Figure 2. Top panel shows JASON short-probe heat flow data over the Deformation Front and First Anticlinal Ridge shown in Figure 1. Red bars show locations of reduced heat flow areas hypothesized to be areas of fluid inflow into the upper sediment layers. Lower LANGSETH seismic profile is co-registered with the heat flow stations and shows the Juan de Fuca plate entering the CSZ from the right and the deformation front and First Anticlinal Ridge. The x-axis is MCS Common Depth Point where 400 CDPs represents 2700 meters.

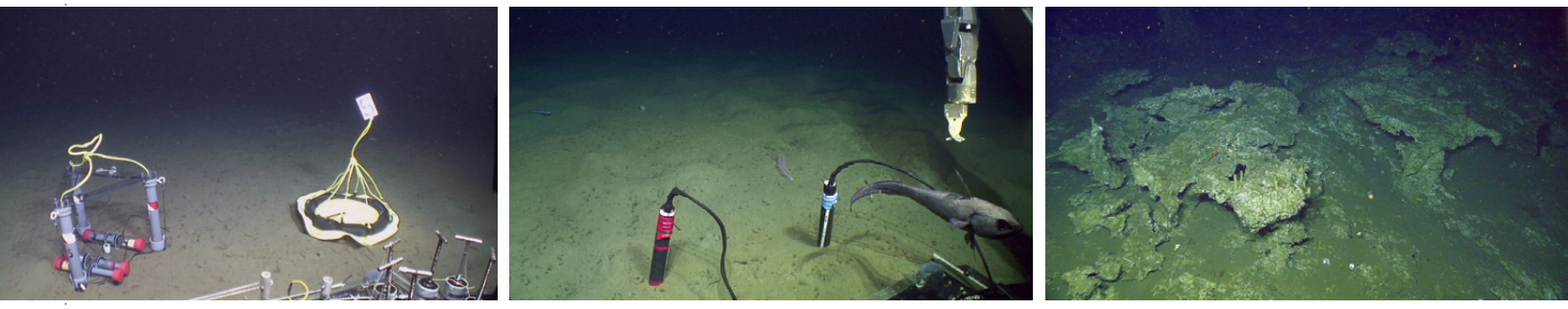


Figure 3. (left) JASON photo of Mosquito flow meter (left) and thermal blanket (right). (middle) Deployment of dual JASON short probe heat flow instruments, used for redundant measurements at a single heat flow site. (right) Frame grab of JASON video image of actively-forming authigenic carbonate deposit at a methane bubble emission site at 1000 meters water depth. Vertical dimension of photo is about 3 meters.

Using the ROV JASON II, we deployed short heat flow probes (204 measurements), 28 thermal blankets, 23 Mosquito flow meters, and took 20 push cores to sample near-surface sediments for pore water chemistry. From the ATLANTIS surface ship we conducted EM122 detailed bathymetry and acoustic backscatter images from the abyssal plain to the shallow continental shelf, 9 CTD casts, 15 multi-core sediment recoveries, and 36 Oregon State University long-probe heat flow insertions.

Figure 4. UW graduate student Marie Salmi showing the aftermath of an unsuccessful recovery of sediments from a multi-corer deployment. Photo Credit Una Miller, UW/ Oceanography student.

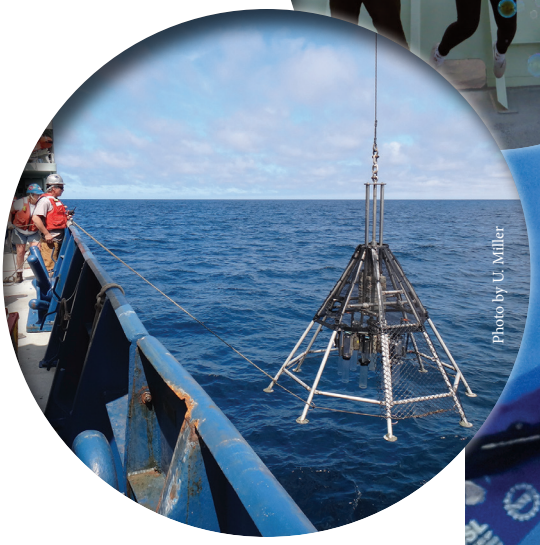
While these data sets are still being analyzed some results reveal the potential for preliminary interpretation. At the Juan de Fuca oceanic plate approach to the Washington CSZ heat flow data from all three applied methods (JASON short-probe, thermal blankets, OSU long-probe) yield a consistently high heat flow average value of near 100 mW/m^2. When this value is downward continued through the incoming sediment column using in situ near-surface thermal conductivities combined with deeper values derived from LANGSETH seismic velocities it yields a basement-sediment interface temperature just west of the deformation front of 225°C. This newly estimated temperature substantially exceeds the canonical values of 100-150°C for fluid production from the smectite-illite transition previously used to define the up-slope boundary of the locked portion of megathrust faults.

As our survey moves eastward across the deformation front and up-slope over the 'second anticlinal ridge', the closely-spaced heat flow measurements illuminate high spatial variability. This is caused by fluid flow that previously could not be resolved with widely-spaced surface ship measurements. These data show two narrow zones of dramatically decreased heat flow values over the summits of the two westernmost structures that can be interpreted as the inflow of seawater into the dilated uppermost sediment layers. Seismic profiles from the LANGSETH 2012 MCS survey also show structures resembling keystone graben faults at the summits of these western anticlinal ridges, which is consistent with a dilating upper sediment section. Ongoing processing of data from our Mosquito flow meters, sediment cores, and additional heat flow stations will further test this hypothesis.

The Washington margin has been recognized for over 50 years as a methane-rich accretionary prism and recent studies have strongly reinforced this view. Our initial EM122 profiles of the survey area at the beginning of the cruise prior to launching our first JASON dives located several active methane emission sites with active bubble plumes rising hundreds of meters into the water column. During the course of the deployment of heat flow and fluid flux stations along the profile we encountered extensive areas of calcium carbonate pavements at the seafloor which in some areas resisted penetration of our heat flow probes and sediment coring instruments. At a thousand meters water depth we discovered several areas of active methane gas emissions and actively forming authigenic carbonate deposits, with delicate aragonite precipitation structures currently forming on the edges of massive carbonate slabs that were several meters thick and hundreds of meters in horizontal dimension.

The basic heat flow and fluid flux work are the central data sets for two University of Washington PhD theses (M. Salmi and R. Berg). Processing of the abundance of diverse data collected over our 30-day field program is in progress and will be a fertile data set upon which to base future studies of the Cascadia Subduction Zone. An extension of the original NSF proposed work is a high resolution video survey as an experiment-of-opportunity of three of these methane emission sites and carbonate formation zones with the JASON video camera during the 2013 cruise. These video data and returned carbonate samples are now the core of a previously unplanned UW undergraduate (U. Miller) research project. ■

Modified from H.P. Johnson, E.A. Solomon, R.N. Harris, M.S. Salmi and R.D. Berg, Heat Flow and Fluid Flux in Cascadia's Seismogenic Zone, Eos, Nov 2013.



Funding was through the NSF GeoPRISMS Program with grateful acknowledgement to the crews of R/V ATLANTIS and ROV JASON II. Scientific Party Team listed alphabetically consisted of Rick Berg, Tor Bjorklund, Rick Carlson, Dan Culling, Rob Harris, Casey Hearn, Kira Homola, Paul Johnson, Peter Kalk, Alex Mesher, Una Miller, Brendon Pratt, Adrian Rembold, Marie Salmi, Evan Solomon, and Jon Yang. The cruise investigators subscribe to the NSF Open Access policy and after initial processing the full suite of data will be available via the GeoPRISMS web site http://www.marine-geo.org/tools/new_search/index.php?funding=GeoPRISMS

Remotely Operated Vehicle Jason II deployment operations during the R/V Atlantis cruise off the Washington Coast. Photo Credit Una Miller, UW/Oceanography student.

September 5, 2012 Mw=7.6 Nicoya Earthquake Occurs at the Bull's Eye of a MARGINS Seismogenic Zone Experiment (SEIZE) Focus Site

Susan Schwartz[1], Tim Dixon[2], Jeff Marshall[3], Andy Newman[4], Marino Protti[5], Víctor González[5]

[1]University of California, Santa Cruz, [2]University of South Florida, [3]Cal Poly Pomona, [4]Georgia Tech, [5]Universidad Nacional, Costa Rica

More than a decade of MARGINS SEIZE research on Costa Rica's Nicoya Peninsula came to fruition on 5 September 2012 when a Mw7.6 megathrust earthquake ruptured the locked Nicoya seismogenic zone, fortunately causing no fatalities.

The Nicoya Peninsula's favorable observation geometry close to the trench, its frequency and apparent regularity of large earthquakes, and its position very late in the earthquake cycle led to the geoscience community's 1997 selection of Central America as a focus site for the NSF MARGINS Seismogenic Zone Experiment (SEIZE). For the following 15 years the Nicoya Peninsula has been the location of intense field studies of seismicity, velocity structure, geodesy, seafloor bathymetry, coastal geomorphology, and fluxes of heat and fluid to address fundamental questions about slip behavior during major subduction zone earthquakes. The September 2012 earthquake is a fitting capstone occurrence for the SEIZE initiative. It provided an important opportunity to advance our understanding of a wide spectrum of seismogenic zone behaviors over time scales from seconds (earthquakes) to months (slow slip events) to decades and longer that are now central to the GeoPRISMS Subduction Cycles and Deformation (SCD) initiative.

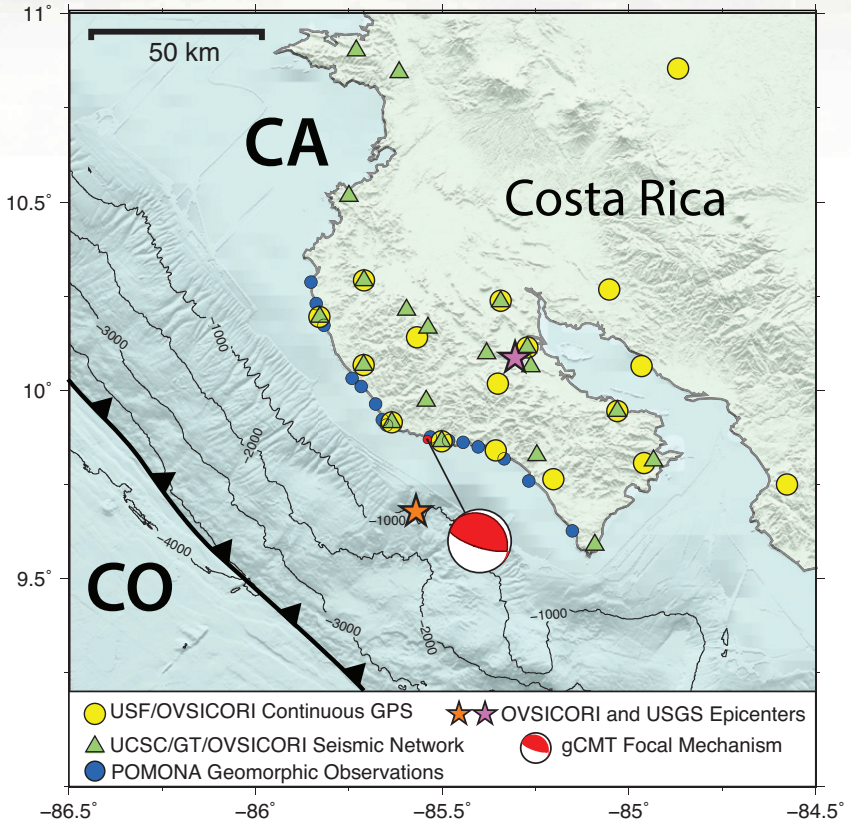


Figure 1. Distribution of GPS and seismic stations on the Nicoya Peninsula. The epicenter of the 5 September 2012 (Mw 7.6) earthquake as determined by the USGS (orange star) and OVSICORI-UNA (red star) is indicated along with the centroid moment tensor location and focal mechanism. CO: Cocos Plate, CA: Caribbean Plate.

The 2012 Nicoya earthquake occurred directly beneath a long operating network of seismic and GPS stations (Fig. 1). Dense seismic and GPS observations on the Nicoya Peninsula started in 2000 with the MARGINS funded CRSEIZE project and continued with installation of NicPBO, a continuously operating network of seismic and GPS instruments that was also partially supported by the MARGINS program. Presently UC Santa Cruz (UCSC), University of South Florida (USF), and Georgia Tech (GT) together with our international collaborators at OVSICORI-UNA continue to operate this network (Fig. 1). The existence of this network years before the earthquake provides a unique opportunity to study the entire earthquake cycle including any preparation processes, coseismic, and postseismic slip behavior in unprecedented detail. Work prior to this event revealed that the Nicoya seismogenic zone displays diverse slip behavior including regions accumulating strain (Lundgren et al., 1999; Iinuma et al., 2004; Norabuena et al, 2004; Feng et al., 2012) and others experiencing normal earthquakes (Newman et al., 2002), slow slip (Outerbridge et al., 2010; Jiang et al., 2012), tremor, and low and very low frequency earthquakes (Walter et al., 2011, 2013). Along strike variations in seismic coupling (Ghosh et al., 2008; Schwartz and DeShon, 2007; Stankova-Pursley et al., 2011) and physical characteristics of the subducting and overlying plates (Audet and Schwartz, 2013) were also documented.

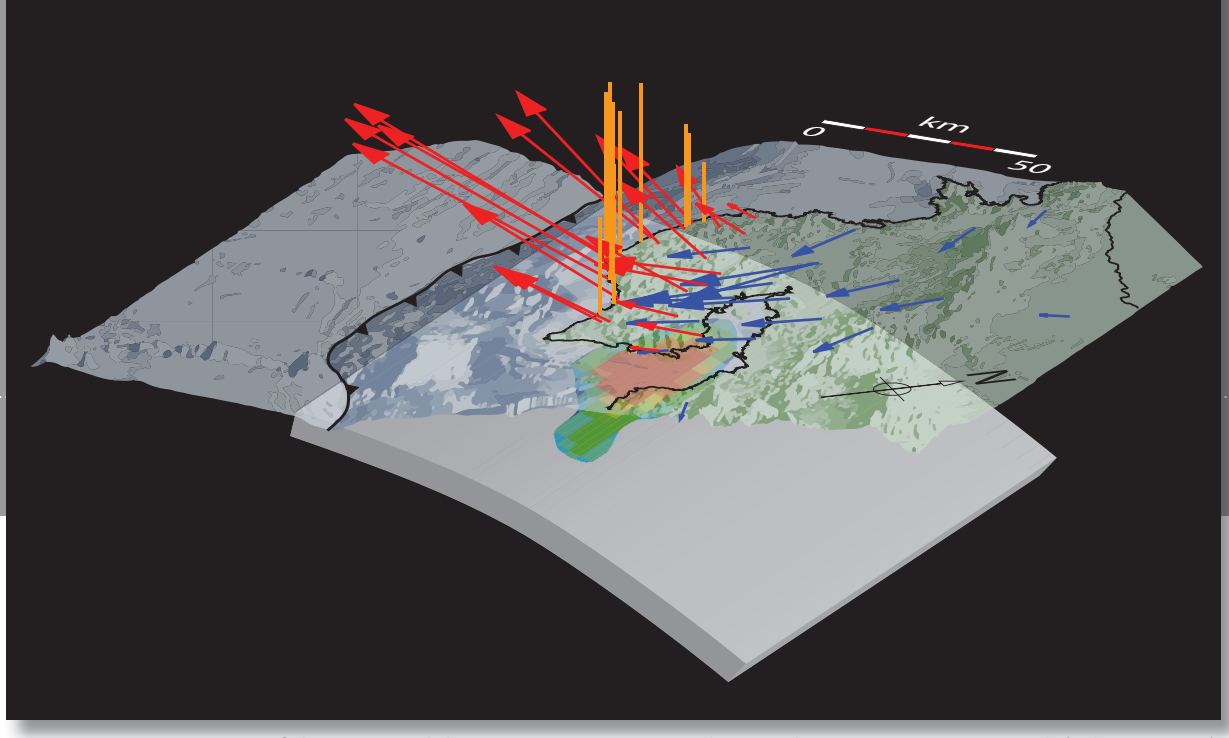


Figure 2. Perspective view of the Nicoya Subduction zone environment showing the coseismic rupture patch (color contours), and surface deformation as observed by GPS (arrows) and geomorphic changes along the coastline (orange bars). GPS data that show regional subsidence (blue) are differentiated from those points that show uplift (red). The maximum coseismic displacement is 85 cm.

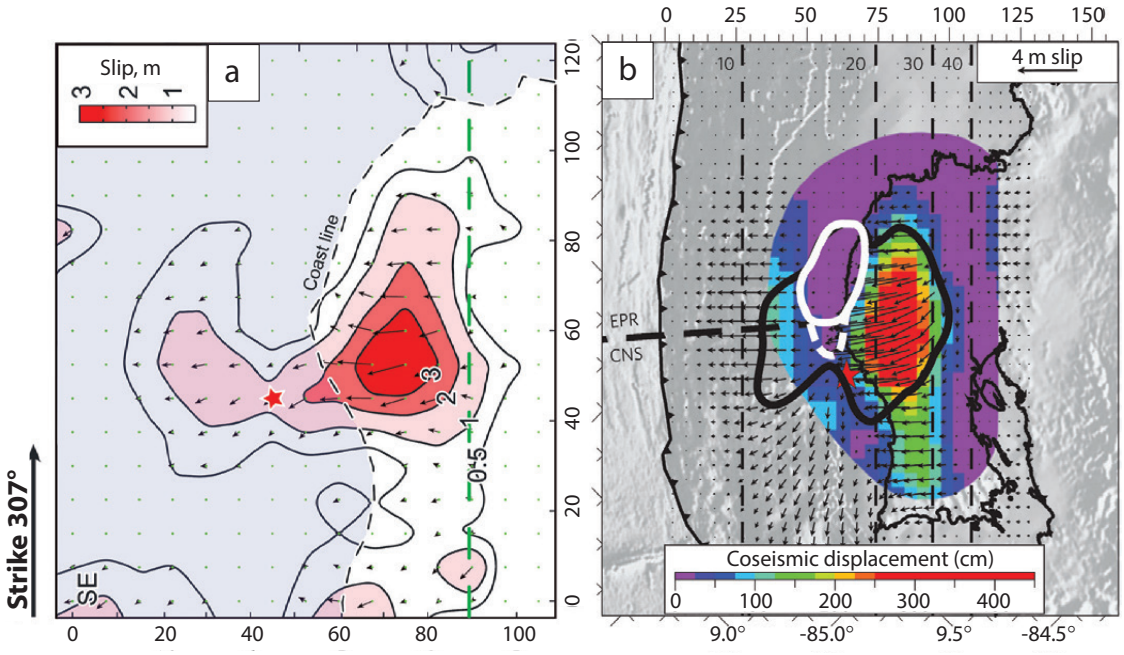


Figure 3. Slip distribution during the 2012 Nicoya earthquake determined from a) inversion of high-rate GPS, strong ground motions and teleseismic P waves (Yue et al., 2014) and b) from inversion of static horizontal GPS offsets (Protti et al., 2014). There is excellent agreement in the regions experiencing the largest slip (> 2 m).

Data from geodetic networks monitoring surface deformation above subduction can be used to estimate whether or not portions of the plate interface are presently locked and accumulating strain. This information is important for assessing hazard for future large earthquakes. Determining the precise regions that are locked and most likely to rupture in the next large megathrust event is, however, very difficult in most environments due to the location of the plate interface that is normally below the seafloor and relatively far from the onland observing networks. Whether or not regions of maximum interseismic strain accumulation end up rupturing in peak slip during major earthquakes is therefore not well established in most places. In contrast, the location of most of the Nicoya Peninsula's seismogenic zone is directly underneath land, which allows detailed imaging of the locked interface (Feng et al, 2012). The occurrence of the 5 September 2012 megathrust earthquake was captured by the network and provided an unprecedented picture of the event's coseismic deformation (Fig. 2). These and available seismic data allowed for the unique determination of the spatial extent of the coseismic slip distribution (Yue et al., 2014; Protti et al., 2014) for direct comparison between the regions of strain accumulation and coseismic slip (Fig. 3). On shore, where the patterns are extremely well-determined, the match between the two is remarkably good.

In the last decade, six slow slip and tremor events have been identified and characterized in this section of the Middle America Trench (Walter et al., 2011; Jiang et al., 2012). Figure 4 shows the location of slow slip and tremor superimposed on the strain accumulation pattern and region of maximum coseismic slip in the 2012 earthquake. The onshore locked patch that ruptured in the 2012 earthquake is surrounded by slow slip and tremor. This is consistent with observations at other subduction zones where aseismic slip, afterslip and seismic slip occurring during a large earthquake are located in complementary regions. The Nicoya Peninsula region provides the best support for a model of the plate interface that consists of distinct mechanical behaviors, regions accumulating strain in the interseismic period and hosting coseismic slip versus areas both up and downdip that release strain in slow slip. ■

Modified from M. Protti, V. Gonzalez, A.V. Newman, T.H. Dixon, S.Y. Schwartz, J.S. Marshall, L. Feng, J.I. Walter, R. Malservisi, S.E. Owen, Nicoya Earthquake Rupture Anticipated by Geodetic Measurement of the Locked Plate Interface, Nature Geoscience, Dec 2013.

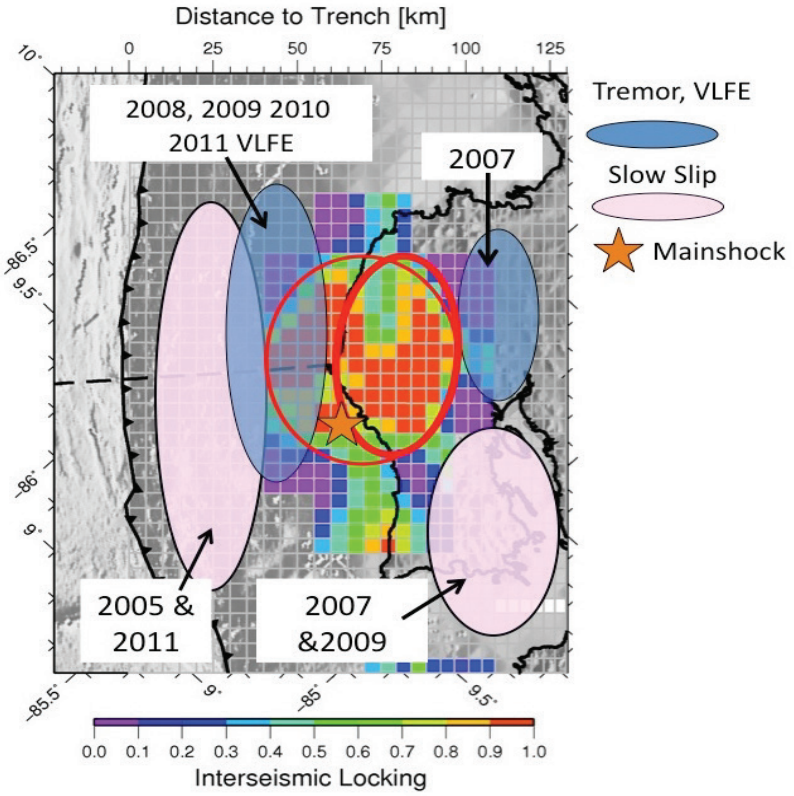


Figure 4. Spatial comparison of coseismic slip in the 2012 Nicoya earthquake (red circle), region of interseismic strain accumulation (colored contours), and areas experiencing slow slip tremor (pink and blue ovals) demonstrating segregation of portions of the plate interface experiencing different mechanical behaviors.

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Distinguished Lectureship Program

2014 - 2015

The GeoPRISMS Office is happy to announce the annual Distinguished Lectureship Program for academic year 2014-2015 with an outstanding speakers list. Distinguished scientists involved with GeoPRISMS science and planning are available to visit US colleges and universities to present technical talks and public lectures on subjects related to GeoPRISMS science.

Want to host a speaker? Apply before August 1!

Any US college or university wishing to invite a GeoPRISMS speaker may apply via the GeoPRISMS website before August 1, 2014. Institutions that are not currently involved with GeoPRISMS research are strongly encouraged to apply, including those granting undergraduate or masters degrees, as well as those with PhD programs. Institutions may request a technical and/or public lecture. The GeoPRISMS Office will cover airfare for speakers' travel and will coordinate travel and off-site logistics. Host institutions are responsible for local expenses for the duration of the visit.

Heather DeShon in Georgia Southwestern State University in February 2013.

RICHARD ALLEN
Berkeley University

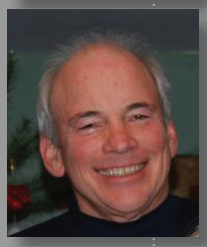
REBECCA BENDICK
University of Montana

ELIZABETH COTTRELL
Smithsonian Institution

BRADLEY HACKER
UC Santa Barbara

ANDY NYBLADE
Penn State University

JOSH ROERING
University of Oregon



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Another day on the field. Francesco Capecchiacci, (from National Reseach Council, Italy) hikes along Mount Martin's crater rim. Mount Mageik can be seen in the background. The photo was taken in July 2013 by Taryn Lopez during a two-week field campaign conducted in the Katmai Volcanic Cluster in Alaska.

Report from the Field - Katmai, Alaska

Taryn Lopez , GeoPRISMS Posdoctoral Fellow - University of Alaska Fairbanks

Fluid movement in the subsurface of active volcanoes is frequently thought to produce abundant seismicity, but the actual type of fluid, including magma, volcanic gases, or hydrothermal waters, cannot yet be constrained from seismic data. Knowledge of the type of fluids in the subsurface can be determined through chemical and isotopic analysis of volcanic gases. In this project, we aim to combine high temporal resolution measurements of volcanic gas composition and seismicity to help constrain the type of fluid associated with these unique seismic signatures. A two-week field campaign was conducted between July 10 – 24, 2013 at three persistently degassing and seismically active volcanoes within the Katmai Volcanic Cluster (KVC), Alaska, to address this problem. The aims of this work were to collect samples of volcanic fluids for chemical and isotopic analyses and to install campaign instruments to measure gas composition, seismicity, and SO_2 flux at high temporal resolution at Mount Martin, Mount Mageik and Trident Volcano.

Part 1:

Volcanic gas and seismic instrument installation

July 10, 2013 - After months of planning, the field campaign for my NSF GeoPRISMS postdoctoral fellowship project was about to get underway. Things were off to a reasonably smooth start with both my field partners Bo Galle (Chalmers University Sweden) and Francesco Cappechiacci (National Research Council, Italy) having arrived safely to Alaska and our team en route to King Salmon, Alaska, the closest town to the KVC. We were met in King Salmon by my Alaska Volcano Observatory (AVO) colleagues Dane Ketner and Max Kaufman, who would be conducting maintenance on the AVO Katmai seismic network and assisting with the instrument installations that were critical to my project. After making some last-minute purchases at the local store, my team headed to the hangar of Egli Air Haul, the local company that has provided helicopter and fixed wing service to AVO for fieldwork in Katmai for over 20 years. Our plan was for Francesco, Bo and I, along with our 600+ lbs. of instruments, food, and field gear to get transported to the famous Valley of Ten Thousand Smokes (VTTS), the site of the largest volcanic eruption of the 20th century, the 1912 Katmai-Novarupta eruption. We would set up our base camp at the USGS Research station on Baked Mountain. Dane and Max would be staying in King Salmon for the next six nights and would fly in each day with Sam Egli, our helicopter pilot. Due to weight restrictions my team would be shuttled to the VTTS on a fixed-wing airplane in two shifts and would then have to hike our gear two horizontal miles and 400+ vertical feet from our landing spot to our base camp. We decided that Francesco and I would go in the first shift and start shuttling our most critical assets to camp. The trip to the VTTS was beautiful and we were lucky to have fantastically clear skies allowing for impressive aerial views. Francesco and I began the first of three slow slogs to camp, while our pilot returned for Bo. By 11:00 PM (or approximately 7 hours after departing King Salmon) we had finally transported ourselves and all our gear to camp. We were exhausted, but happy to be there, and had arrived just in time for a beautiful sunset!

July 11, 2013 - We awoke to beautiful clear skies, low winds and open-summits at both Martin and Mageik (Fig. 1). Favorable weather conditions like this are atypical of the Alaska Peninsula and we were feeling optimistic that we would complete our field objectives. It was our first of seven days of helicopter support (shared with AVO) during which time we aimed to complete the following tasks: (1) Install MultiGas instruments for measuring volcanic plume composition (CO_2, SO_2, H_2S, and H_2O) and broadband seismometers on the summits of Mount Martin, Mount Mageik, and Trident's southeast fumarole field; (2) Install scanning NOVAC instruments for measuring continuous SO_2 flux downwind from Mount Martin and Mount Mageik; and (3) Directly sample the fumarolic emissions from Mount Mageik, Mount Martin and Trident Volcano. Additionally, our USGS colleagues also needed to service several seismic stations. Our plan was ambitious but if the weather cooperated it would be achievable.

At 8:00 AM I made my morning check-in call to Dane, who reported that the weather was also clear in King Salmon and he hoped that they would be flying soon. While much of the first day was spent shuttling batteries, instruments, and station enclosures from King Salmon to the Baked Mountain Camp, by 7 PM that evening, Dane and I finally arrived on the summit of our first target, Mount Mageik. With help from Sam, our pilot, we managed to get much of the hardware for our co-located seismic and MultiGas station installed by 9 PM.

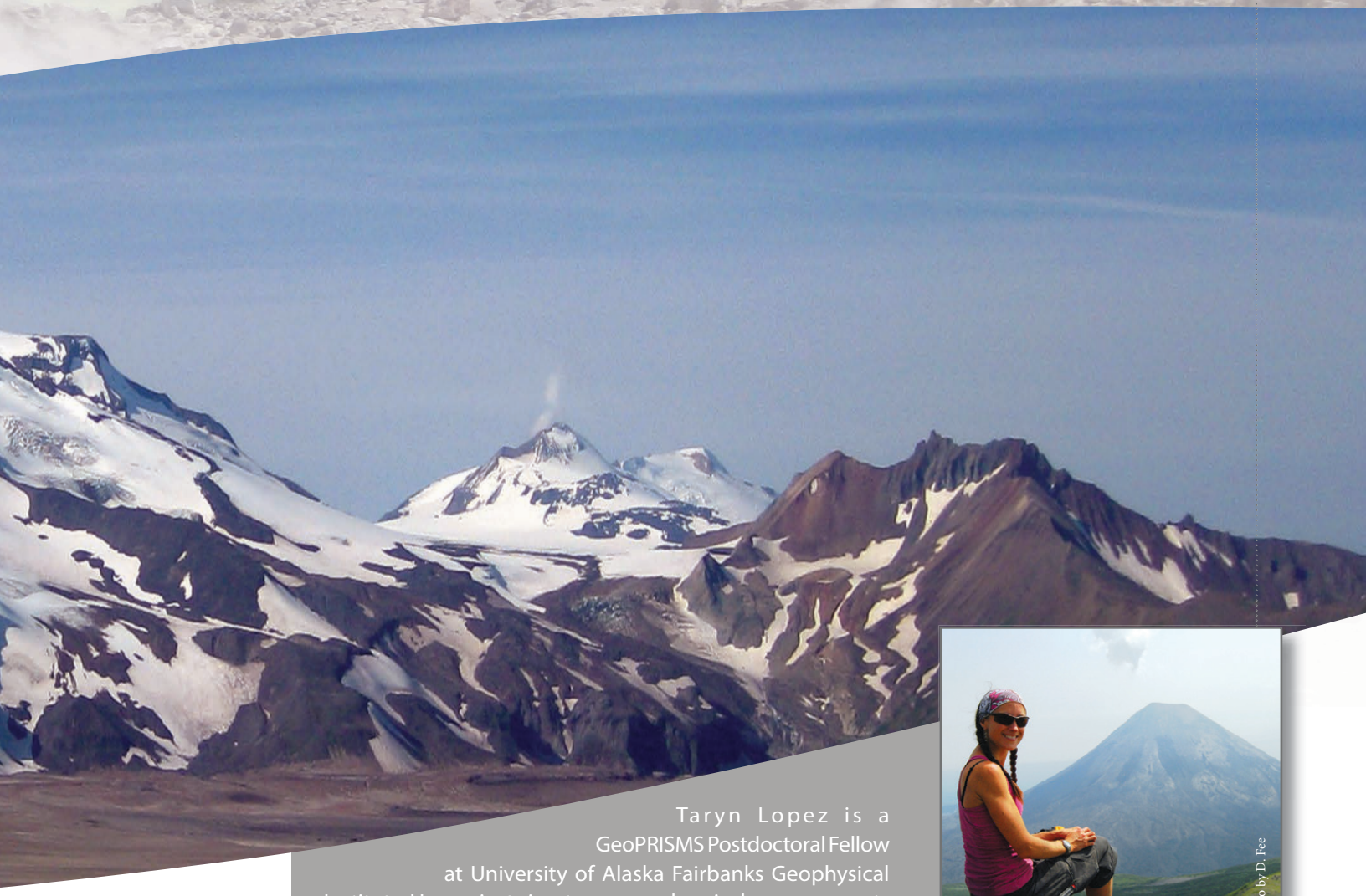
July 12, 2014 - The next morning, we awoke to similarly glorious conditions! By noon, Sam had dropped Dane and I off at Mageik's summit to complete our work. While we continued working on the installation, Sam shuttled Max and Bo to the proposed site for installing the Mageik NOVAC station and then brought Francesco to join us at the summit. Francesco and I were hoping to hike down into the crater of Mount Mageik to sample the fumarolic gases and crater lake water. Working on active volcanoes can be a hazardous job, especially for gas geochemists who often need to spend time within active craters to get the most useful samples. Mageik's steep-sided crater walls and abundant gas emissions which could eliminate visibility with the slightest wind-change, induced what I hoped was just the right amount of caution to allow us to be successful and stay safe. The wind was blowing the plume to the south, which meant that we had good visibility and access to the fumaroles on the north crater wall. We scrambled fairly easily down the soft, highly altered volcanic rock that comprised the crater walls and set up to begin sampling the gas and steam condensate from a boiling point temperature fumarole (Figs. 2a, 2b). Two hours later we had completed sampling of two fumaroles and took advantage of a brief parting of the plume to scramble down to the crater floor and quickly sample the quite warm and acidic crater lake water. At 5:30 PM we rejoined Dane on the crater rim who had much of the instrument installation completed. After configuring and acquiring the first test data from our instruments, we headed back to camp. Bo and Max had been equally successful and installed the NOVAC instrument in under three hours. It was a good day!

July 13, 2013 - We woke up on our third helicopter day to another beautiful day. The summit of Mount Martin, our next target, was open providing nice views of its persistent plume, and we were eager to begin our work. We adopted the same plan as the previous day and were almost as successful. The one major disappointment of the day was that Francesco and I were unable to sample the vigorously degassing and audibly jetting fumaroles within Mount Martin's steeply sided crater. We scouted our options from multiple vantage points along the crater rim. Unfortunately most of the crater walls were nearly vertical and comprised of highly weathered, unconsolidated material, with regular outcrops of overhung volcanic rock. We realized that rock falls would be a hazard for all viable routes. With much disappointment, we decided that sampling the Martin fumaroles was not feasible. We were successful in installing the summit seismometer and MultiGas instrument as well as the down-wind NOVAC station and concluded that it was still a very successful day (Figs. 2c, 3)!

Figure 1. View of Mount Mageik (center) and Mount Martin (right, with plume) as seen from Baked Mountain on 11 July 2013. Photo credit T. Lopez

July 14-18, 2013 - The weather conditions over the next several days deteriorated, with high clouds covering most of the summits, and a dense cloud build-up behind Katmai Pass – the gate to our last field target, Trident Volcano's southeast fumarole field. Bo, Francesco and I spent much of this time at camp, downloading data from the NOVAC stations, and allowing Max and Dane to work on AVO seismic network maintenance. Luckily we had a few nice windows of opportunity during this time period and were able to install the MultiGas sensor and collect fumarole samples at Trident Volcano before having to say goodbye to Bo, Max, Dane, and Sam on July 18. Francesco and I had four more days to hike around the VTTS and collect water samples.

At the end of the July field campaign we had completed 7/8 of our proposed instrument installations and collected gas samples at 2/3 of the proposed volcanic fumarole fields. This was the most ambitious volcanic gas geochemistry effort to take place in Alaska since the 1990's and we felt very happy with our accomplishments! Our plan was to leave the campaign instruments running over the next two months of summer and then to retrieve the instruments and data before fall arrived in September.



Taryn overlooking Karymsky Volcano, Kamchatka, Russia on July 2012.

Taryn Lopez is a GeoPRISMS Postdoctoral Fellow at University of Alaska Fairbanks Geophysical Institute. Her project aims to use geochemical measurements of volcanic fluids and complimentary seismic data from three historically-active Alaskan volcanoes within the Katmai Volcanic Cluster to determine the source and flux of volcanic gases, identify proportions of magmatic and hydrothermal fluids within the subsurface, and distinguish trends in gas composition and/or flux that correlate with seismic signatures or fluid movement.

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From top to bottom: Figure 2. (a) Francesco Capecchiacci samples volcanic gases in the crater of Mount Mageik. (b) Francesco Capecchiacci hikes up from the crater of Mount Mageik. (c) Sam Egli and Taryn Lopez on the crater rim of Mount Martin. Photos credit T. Lopez

Part II:

Two days stranded on Mount Mageik

September 4, 2013 - I was back in King Salmon with my AVO colleague, John Paskievitch, who had offered to help me retrieve the instruments that my team had installed earlier that summer and who would also conduct some additional AVO maintenance on the Katmai seismic network. It was our first of three scheduled helicopter days to conduct this work and, unfortunately, the weather forecast for this field campaign was not encouraging. After running a few errands around town, John and I headed to Egli Air Haul to meet Sam and to weigh and organize our field gear. By early afternoon, the fog had thinned and we decided to fly to the VTTS to see if any fieldwork would be possible. To our surprise, the valley was clear and Mount Mageik's summit was open (Fig. 4). After a quick stop at the Baked Mountain Huts to drop off any unnecessary weight and to get into our warmest clothes, we flew to Mount Mageik's summit, arriving at ~3 PM.

Our station was located on a small hill between Mount Mageik's four summits, on the rim of the actively degassing crater and surrounded on three sides by heavily crevassed glaciers. Upon our arrival to the station, John and I found that the station enclosure had become unlatched, was open, and the instruments and the station antenna mast were completely covered in thick rime ice (Fig. 5). We had blue skies above us but a dense wall of clouds was building up on the south side of Mount Mageik, and we knew that we had to watch the weather closely, as conditions could change very quickly. Sam stayed in the helicopter and watched the weather while John and I began to extract the instruments from the frozen ground. Approximately 30 minutes later Sam told us that the weather had deteriorated and we needed to leave NOW!

Figure 3. Mount Martin co-located seismic and MultiGas station with Mount Mageik in the background. Photo credit T. Lopez

John and I grabbed our equipment and helmets and were back in the helicopter in less than four minutes. Unfortunately, in those few minutes the clouds had rolled in, bringing with them freezing rain. Sam powered up the helicopter and we sat ready to take off at the first sign of improved visibility, while the helicopter blades were gradually accumulating ice. Approximately 15 minutes later, having had no improvement in visibility, Sam realized that the rotor blades had too much ice to fly. Sam powered down the helicopter and John and I made several futile attempts to scrape ice off the rotor blades. Conditions continued to deteriorate, and we realized that we would have to spend the night on the mountain and we would likely require rescue as our helicopter would probably not be flyable due to ice accumulation. We called Egli Air Haul and the AVO duty scientists to inform them of our situation and to ask them to notify the Alaska State Troopers.

In any survival training course you will learn that the first thing you should do in an emergency situation is to secure shelter. We were lucky to have brought our shelter with us, but with the high winds our helicopter was at risk of being blown down into the crater. Therefore, with Sam and I sitting in the helicopter to keep it weighed down, John spent several hours securing the helicopter with "dead-men" snow-anchors (Fig. 6a). By 9 PM our shelter was secure. Our next priority was simply to stay warm and dry, conserve energy, and wait for rescue. Thankfully we were well prepared for an emergency situation and had sufficient clothing, sleeping bags, sleeping pads, bivy-sacks, food, water, and communication supplies to keep us comfortable, at least in the short term. We also had a combination of ~55 years of experience doing field work in Alaska and I was very grateful for my highly experienced and resourceful comrades!

Figure 4. Summit of Mount Mageik as seen flying in on 4 September 2013. Figure 5. (left) The Mount Mageik MultiGas station as found on 4 September 2013. Photos credit T. Lopez

Clockwise from top left: Figure 6. (a) John Paskievitch as seen on 4 September 2013 after securing the helicopter with snow anchors in preparation for spending the night. (b) Helicopter covered in thick rime ice after ~16 hours on the summit of Mount Mageik (5 September 2013). (c) Alaska Air National Guard Rescue team and Pavehawk helicopter on Mount Mageik. Photos credit T. Lopez

September 5, 2013 - After a fitful night of sleep with strong winds peaking at 75 mph, we woke to similarly dismal conditions, with continued freezing rain and poor visibility. We also found that the entire helicopter was covered in ~8 inches of rime ice, making it difficult to open the doors and even causing the helicopter's frame to distort under the excess pressure (Fig. 6b). We passed the day quietly, dozing a lot, talking some, going outside as infrequently as possible, and looking forward to our regular satellite phone check-in calls with Egli Air Haul. By 5:00 PM that day, there was no improvement to the weather and no external rescue efforts had been planned. We realized that our situation could easily go from uncomfortable to life threatening if we were not rescued soon, especially considering that our shelter was at risk of being compromised with the increasing ice-load. At that point Sam turned on the helicopter's Emergency Locator Transmission. Within an hour we received word that the Alaska Air National Guard (AANG) was mobilizing rescue teams. At 9:00 PM that evening we first heard the comforting sounds of our rescue aircraft nearby. The AANG had deployed two rescue teams to assist us. One team based on a C-130 airplane was flying over our position, looking for any potential breaks in weather, while the second aircraft, a Pavehawk helicopter, contained our ground-support team. Using our helicopter's radio we were able to directly speak with the AANG pilots and set up regular check-in times to communicate with them in case of potential weather breaks. Unfortunately, a thick layer of clouds continued to keep us trapped through the night. We spent a second night in the helicopter, colder and less comfortable than the first, but encouraged by the regular sound of our rescue aircraft nearby.

September 6, 2013 - By 8:00 AM the next morning, the winds had dropped significantly and the temperature was rising. Most encouraging of all was that visibility had increased to ~20 m and the sky was brighter indicating a thinner cloud deck. By noon, the ice on the helicopter frame had begun to melt. Over the next three hours the Pavehawk helicopter flew back and forth over our location hoping to catch a break in the clouds and sweep in to rescue us. Using our hand-held USGS radios and the sound of their rotors, we helped them narrow in on our position. The clouds continued to thin and we were finally rewarded with the welcome sight of their massive helicopter! Minutes later, the Pavehawk had landed on the glacier below us and two of our rescuers, tethered to the Pavehawk, quickly crossed the glacier to meet us and escorted us back to safety (Fig. 6c)!

Our experience on Mount Mageik went about as well as it could have thanks to Sam's resolve to not fly in unsafe conditions, John's resourcefulness in anchoring the helicopter, our preparation with survival gear and training, an excellent support/communication team at home, and the competency and bravery of the AANG rescue team. I feel very lucky that all of these things came together so that I have the opportunity to share my story today. While I learned many important life lessons during this experience, I would like to share two of them here: (1) Spend as much time as possible with your loved ones as you never know what day will be your last, and (2) Fieldwork in Alaska should never be taken lightly, so ALWAYS carry your survival gear and have proper training! ■

"Report from the Field" was designed to inform the community of real-time, exciting GeoPRISMS -related research. Through this report, the authors expose the excitement, trials, and opportunities to conduct fieldwork, as well as the challenges they may have experienced by deploying research activities in unique geological settings. If you would like to contribute to this series and share your experience on the field, please contact the GeoPRISMS Office at info@geoprisms.org. This opportunity is open to anyone engaged in GeoPRISMS research, from senior researchers to undergraduate students. We hope to hear from you!

Panoramic view from the North of the Katmai Volcanic Cluster. Photo credit T. Lopez

2014

NSF Awards 1347192, 1347282

Collaborative Research: Active kinematics of lithospheric extension along the East African Rift

Rebecca Bendick (bendick@mso.umt.edu), Robert King (rwk@chandler.mit.edu)

This 1-year, collaborative proposal is aimed at creating a community solution for tectonic velocities throughout the East African region. This region hosts the foremost example of continental rifting, where Africa stretches and splits into a two pieces, Somalia and Nubia in the East African Rift and beyond. Observations of the speed and pattern of continental break-up serve as a framework for other geosciences research on continental rifting, including in volcanology, petrology, geochemistry, and solid earth-climate interactions. They also offer the possibility of general results for the material properties of continents and the basic physics of how plates are formed, move, and change. Beyond the science, mapping patterns of surface deformation in East Africa informs earthquake and volcano hazard assessments and development of geothermal energy and water resources. A final contribution of this project is to foster data sharing and community model building among academic institutions throughout the U.S. and East Africa.

Specific initiatives we propose include: 1) formally combine GPS results from all available prior studies, along with any other available GPS data in the region for a fully self-consistent, continent-scale solution and to identify future needs and data acquisition strategies, 2) maintain existing geodetic assets developed over the past 6 years to extend GPS time series to reduce rate uncertainties, 3) extend or establish agreements (Memoranda of Understanding) with host-country partners (Ethiopia, Eritrea, Kenya, Tanzania, Mozambique, Zambia, and Malawi) for future joint initiatives, 4) measure a first epoch on nine campaign GPS sites in the Turkana Depression, and 5) develop a framework for data sharing and data product development to serve the broader African Rift scientific community.

NSF Awards 1347377, 1347248, 1347330

Collaborative Research: The role of oxygen fugacity in calc-alkaline differentiation and the creation of continental crust at the Aleutian arc

Matthew Jackson (jackson@geol.ucsb.edu), Elizabeth Cottrell (cottrelle@si.edu), Katherine Kelley (kelley@gso.uri.edu)

This proposal seeks to examine the role of oxygen variations in the origin of the calc-alkaline magmas that erupt at subduction-related volcanoes (arc volcanoes). In particular, the PIs seek to determine how oxygen varies during differentiation and degassing, and see how it varies along strike of the Aleutian arc as a function of material derived from the subducted slab. The work will also include an experimental study of the relationship and interplay between H_2O and fO_2 during magma formation, a critical question with implications for the formation of continental crust. The PIs note that the Aleutian arc features local and regional variations in numerous geochemical features, but lacks the complexities introduced when magmas move through continental crust. The proposed work includes novel (micro XANES) analysis of the ferrous/ferric ratio in glasses (a proxy for oxygen content), especially glass inclusions in mineral. Water, CO_2 and major and trace elements (including Cl and S) will also be analyzed. The PIs also propose an experimental program in which fO_2 is varied at constant water content. The experimental glasses will be analyzed using the same techniques as described for the natural glasses. Broader impacts include a new interactive exhibit at the Smithsonian that will include an on-line component. Material from the exhibits will be incorporated into undergraduate curricula. There will be undergraduate mentoring through REU and/or senior thesis, as well as mentoring of grad students and a post-doc.

NSF Awards 1347262, 1347312, 1347343

Collaborative Research: The Aleutian megathrust from trench to base of the seismogenic zone; integration and synthesis of laboratory, geophysical and geological data

Kathleen Keranen (keranen@cornell.edu), Donna Shillington (djs@ldeo.columbia.edu), Demian Saffer (dsaffer@geosc.psu.edu)

Earth's largest and most destructive earthquakes and tsunamis are generated along subduction megathrusts. The portion of these plate tectonic boundary faults that ruptures in earthquakes is known as the seismogenic zone. Recent observations of high slip that propagates to the near surface, and new discoveries of anomalously slow slip events, have raised fundamental questions about widely held hypotheses that explain seismogenic zone behavior. In particular, the seismogenic zone of many subduction faults appears to be 'patchy', with some regions that fail suddenly in large earthquakes and others that slide by stable, aseismic creep. Additionally, in certain depth ranges, typically at the shallow and deep fringes of the seismogenic zone, slow slip events and earthquakes with anomalous low frequency energy have been observed at many margins. Current knowledge of the fault zone conditions and processes that cause these different modes of slip is limited, largely because quantitative constraints on in situ conditions in the subsurface are scarce. As a result, the associated earthquake and tsunami hazards are similarly poorly constrained. This project will combine high quality regional geophysical studies from the Aleutian subduction margin with laboratory experimental measurements on relevant rock and sediment, to calibrate the geophysical data and quantify in situ pore fluid pressure and stress along the subduction megathrust. Ultimately by providing quantitative estimates of the subsurface conditions along the plate boundary from the trench through the seismogenic zone, this study will test hypothesized mechanisms for the wide range of earthquake behavior.

Status Report on the GeoPRISMS Data Portal: March, 2014

Andrew Goodwillie and the IEDA Database Team

Lamont-Doherty Earth Observatory, Columbia University

The GeoPRISMS Data Portal (*www.marine-geo.org/portals/geoprisms*) was established in 2011 to provide convenient access to data and information for each primary site as well as other data resources. Since the last newsletter report, the database group participated in the EarthCube workshop for the DEFORM/Compress communities, worked with Jim Gill on a data rescue effort to compile decades of geochemical analyses for the Izu arc, released the version 2.7.0 of PetDB which includes enhanced data access functionality, and expanded the on-line GeoPRISMS bibliography that now offers 730 citations, many linked to data. Highlighted below are other recent contributions of data sets and field program information of interest to the GeoPRISMS community.

Cascadia

Open-access cleaned CTD data from AT26-04, the summer 2013 Atlantis heat flux cruise run by Paul Johnson, Evan Solomon and Rob Harris, was added to the portal. For Cascadia Initiative Year 3 operations, ocean bottom seismometer deployment & recovery information, and other field details are now available. Instrument tables for Years 1, 2 and 3 of OBS operations have also been updated in GeoMapApp, where they are listed under the Focus Site menu. Using more than a thousand stations including EarthScope USArray TA instruments, Haiying Gao and Yang Shen generated a shear wave velocity ambient noise tomographic model of Cascadia, now linked from the portal (Fig. 1).

ENAM

Covering the magma-starved West Iberia-Galicia passive rifted margin, site of last year's Langseth 3-D seismic experiment (cruise MGL1307 led by Dale Sawyer, Donna Shillington, Tim Reston, Cesar Ranero and Juli Morgan), a new 500 m EMODnet bathymetric grid compilation of European data was added to GeoMapApp (Fig. 2a). The grid is available under the Base Maps > Bathymetry > North Atlantic menu.

Central America

Spectacularly-detailed gridded data sets of bathymetry and acoustic backscatter were contributed by investigators Jared Kluesner, Nathan Bangs, Cesar Ranero, Kirk McIntosh and Eli Silver who, as part of the CRISP imaging project (Langseth cruise MGL1106), acquired high-quality 3-D seismic data across the Costa Rica shelf and slope in 2011. Novel range-angle data processing techniques that took advantage of a close line spacing and overlapping swaths allowed the EM122 multibeam sonar data to be gridded at an unprecedented 10 m interval for bathymetry and 5 m for backscatter (Fig. 2b). The grids have been added to GeoMapApp, under the Focus Site > Central America menu, and are available for download from the Langseth cruise web page: *http://www.marine-geo.org/tools/search/entry.php?id=MGL1106*

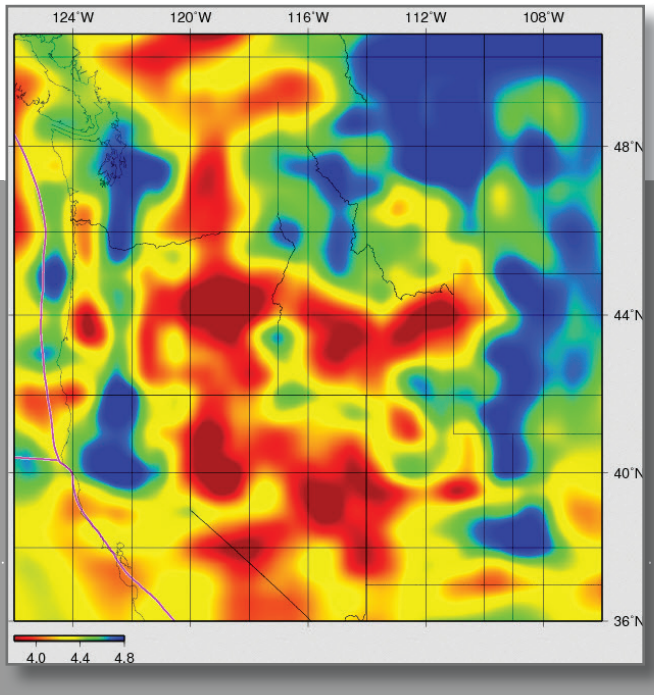


Figure 1. The Gao and Shen 2014 shear wave velocity model of the upper mantle from full-wave ambient noise tomography reveals low-velocity anomalies (dark reds) along the Cascade back-arc. This horizontal slice was generated using the IRIS visualisation tool, for a depth of 94 km (V_s in km/s). The seismic velocity model is linked from the GeoPRISMS Data Portal and is tied to references.

The GeoPRISMS Data Portal team is here to serve the community. Please contact us at info@marine-geo.org

Gulf of California

As part of a collaborative data curation effort with the Hawaii Mapping Research Group towed IMI30 bathymetry and sidescan data (grids, images and underlying data files) are now available through the portal for Dan Lizarralde's 2009 Atlantis cruise AT15-54 to the Guaymas Basin area, part of the MARGINS Gulf of California focus site.

GeoPRISMS Data Portal Tools and Resources

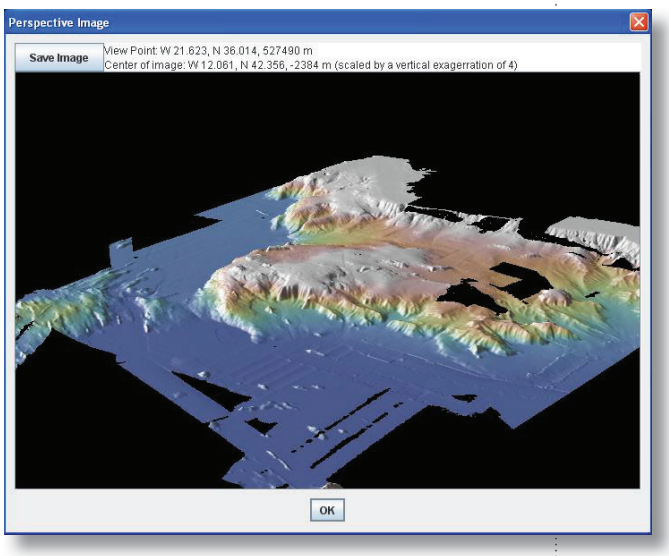
Search For Data - The customised GeoPRISMS search tool (*www.marine-geo.org/tools/new_search/index.php?funding=GeoPRISMS*) provides a quick way to find GeoPRISMS data using parameters such as key word, NSF award number, publications, and geographical extent.

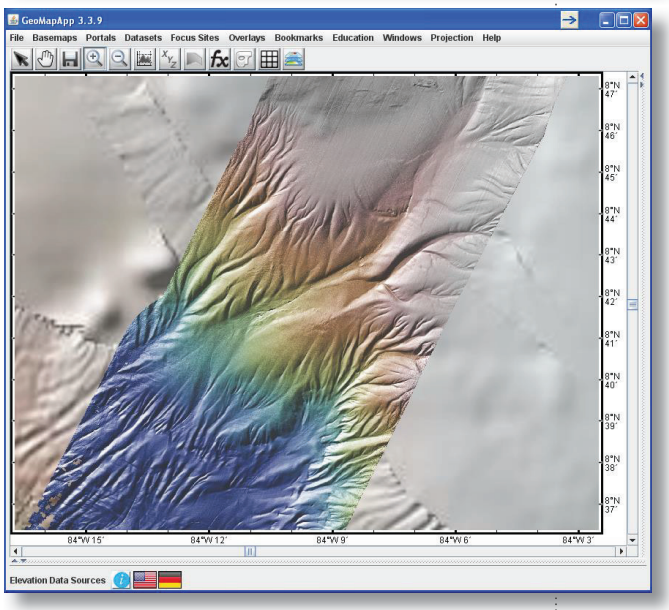
Data Management Plan tool - (*www.iedadata.org/compliance*) generate a data management plan for your NSF proposal. The on-line form can be quickly filled in, printed in PDF format, and attached to a proposal. PIs can use an old plan as a template to create a new plan. We also have developed a tool to help PIs show compliance with NSF data policies.

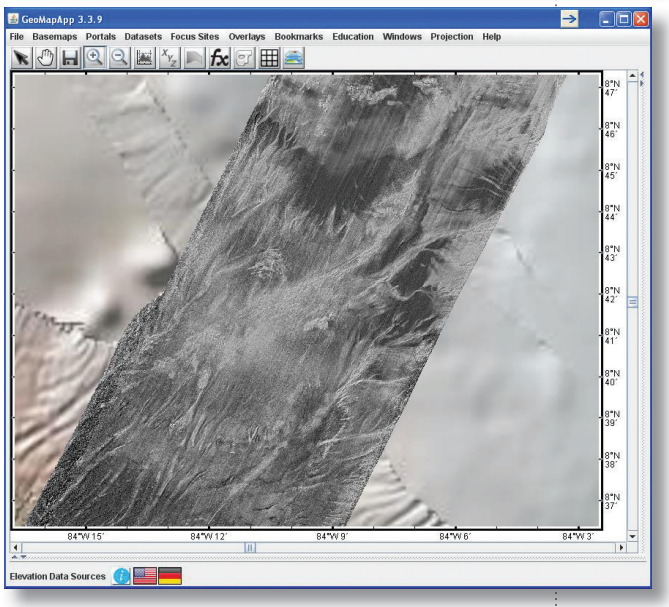
GeoPRISMS Bibliography - (*www.marine-geo.org/portals/geoprisms/references.php*) with more than 700 citations, many tied to data sets, the references can be searched by primary site, paper title, author, year, and journal. The lists of publications can be exported to EndNote™. Submit your papers – just the DOI is needed – for inclusion in the bibliography!

GeoMapApp - (*www.geomapapp.org*) a free map-based data exploration and visualization tool was updated with the release of version 3.3.9 in February 2014. Enhancements include default caching of the multibeam portal, improved handling of imported and exported Excel™ spreadsheets, an updated Earthquake Focal Mechanisms portal that now contains data up to August 2013, a Projection menu that allows users to switch map projection without leaving the interface, an expanded FAQ web page, and a modified grid manipulation window. Version 2.5 of the GMRT base map includes swath bathymetry for Cascadia and other areas. A GeoPRISMS-focused webinar is available on the YouTube GeoMapApp channel and shows how to generate custom maps, how to explore built-in data sets of interest to the GeoPRISMS community, and how to import your own data.

Contribute Data - (*www.marine-geo.org/contribute.php*) this updated web tool provides a simple way to submit grid files, tabular data sets, spreadsheets, and shapefiles. Once added to the GeoPRISMS database, these data sets become available to the broader community immediately or can be placed on restricted hold. ■







From top to bottom: Figure 2 (a). Conjugate to the Newfoundland margin, the Galicia margin is shown in this perspective view of the new EOMDnet 500 m bathymetric compilation from http://portal.emodnet-hydrography.eu/ North is to the upper left, with the Iberian shelf in the upper right. The displayed area measures about 700 km across. (b) A dense spacing of track lines was laid down for Langseth cruise MGL1106 – the CRISP 3-D multi-channel seismics Costa Rica experiment. With 4-5 overlapping sonar swaths, new processing methods were used by Kluesner and colleagues to generate highly-detailed bathymetry (medium) and backscatter (bottom) grids. The data sets were used to identify previously undocumented sites of potential fluid seeps associated with normal faults, and with bathymetric features such as pockmarks, mounds, ridges as well as with areas of high backscatter reflectance. In the GeoPRISMS/ MARGINS integrated Data Portal, the data sets are linked to the Kluesner et al., 2013 G cubed paper. The map displays an area about 25 km across.

GeoPRISMS Steering and Oversight Committee Highlights

Spring 2014

March 20-21, 2014, NSF Headquarters, Arlington, VA

Edited by Anaïs Férot, GeoPRISMS Science Coordinator & Peter van Keken, GeoPRISMS Chair

Introduction

The Spring 2014 GeoPRISMS Steering and Oversight Committee (GSOC) meeting provided an opportunity for a detailed discussion between representatives of the community and NSF program managers. The meeting as usual provides updates on the research at focus sites, an evaluation of impact of the phased funding model, and a discussion of new opportunities. Of specific interest this year were the plans for sharing logistics at the Aleutians and the future of the Amphibious Array.

NSF Update

Debbie Bronk (Acting Director for OCE) welcomed the committee and thanked them for their efforts. Bilal Haq provided updates for NSF. EAR and OCE are both considering applicants for the Division Director positions. A new ice-capable vessel, the R/V Sikuliaq, will be available starting 2015. It is owned by NSF and will be operated by the University of Alaska – Fairbanks.

The budget for FY14 has been released and will remain flat at about 90% below the 2012 budget. The previously large mortgage in the program is down to a more manageable level but pay down on the mortgage partly induced the moderate success rate (15%) of proposals in this round. It is important for students to consider the GeoPRISMS Postdoctoral Fellowship program as well as opportunities for postdoc positions funded through EAR and OCE.

The windows of opportunity for submission of proposal for large data acquisition efforts with budgets exceeding $1M remain defined as two year periods for specific focus sites. This year the program welcomes such large proposal submissions for Alaska-Aleutians and the East African Rift System. Funding for further data acquisition at other focus sites may still be obtained through core or other specific funding opportunities, which include Integrative Earth Systems (focusing on large multidisciplinary projects with a deadline in November), Interdisciplinary Research in Hazards and Disasters (focusing on extreme events and sponsored through GEO with a deadline in August), and the broader Partnership for International Research and Education.

Eastern North America (ENAM) Community Experiment Update

Harm van Avendonk provided an update for the planning of the ENAM community experiment, which will combine marine and on-land seismic data acquisition following a GeoPRISMS/Earthscope-sponsored planning workshop in 2011. The community focused on targets near Cape Hatteras. The experiment includes active seismics (with the R/V Langseth), a few legs on the R/V Endeavor for ocean bottom seismometer deployment and recovery, and additional seismic lines on land. The community experiment will conclude with training workshops on data processing (planned for Spring 2015 at Lamont and the University of Texas at Austin).

Cascadia Initiative (CI) and Cascadia Open Access Seismic Transects (COAST) project updates

Susan Schwartz provided an update on the Cascadia Initiative. This is an amphibious effort that followed a 2010 workshop to continue Earthscope and GeoPRISMS efforts at the Cascadia margin, with 27 seismic stations that reoccupied Transportable Array sites, upgrade of 232 GPS stations, and a deployment of 70 ocean bottom seismometers (OBS). The goals are to get better coverage over the margin and higher density deployments near the coast. The experiment is overseen by the Amphibious Array Steering Committee (AASC), Cascadia Initiative Team, GSOC, and the Earthscope Steering Committee. The CI includes past and future workshops discussing data quality and array deployments.

GeoPRISMS Data Portal

Visit the GeoPRISMS Data Portal to find information for each Primary Site:

- Pre-existing data sets and field programs
- Data sets ready for download
- Links to partner programs and resources
- References database with papers tied to data

GeoPRISMS references database of relevant publications is now available: *http://www.marine-geo.org/portals/geoprisms/references.php*

To submit missing data sets, field programs or publications to the GeoPRISMS portal, contact info@marine-geo.org

The CI will wrap up in the fall of 2015 with the final OBS pickup. The CI uses the Amphibious Array Facility (AAF; made possible through the American Recovery and Reinvestment Act - ARRA) and several growing pains have been identified, which should be taking into account when planning the future of the AAF. These include the duplication of effort and increased cost due to the participation of three institutional instrument centers (operating out of Lamont, WHOI, and Scripps), the lack of funding for quality control, and the overly complex oversight and coordination of effort.

Harm van Avendonk provided an update on the Cascadia Open Access Seismic Transects project. The R/V Langseth cruise was completed in 2012 to collect geophysical data included multichannel seismics, multibeam bathymetry, gravity, and magnetic data in a corridor off central Washington. The open participation cruise was popular and allowed the exposure of many participants to their first marine expedition. All data (including migrated stacks) are now available through Lamont and the University of Texas.

Aleutian Logistical Support Planning

A number of proponents who are interested in field work in the Aleutians have been in discussion with the wider community and NSF to consider possibilities for sharing logistics and ship and helicopter resources. A GeoPRISMS-sponsored workshop was held just before the 2013 Fall AGU (see report on page 27) and was, with 90 participants, extremely well attended. The goals of this effort are to maximize the scientific impact of funded projects, reduce their logistical cost, and, as a consequence, maximize the number of projects that can be funded. The workshop participants included a strong representation of partners from the Plate Boundary Observatory, the Alaska Volcano Observatory, USGS, and the German GeoMAR. Outcome of the workshop included a focusing of the potential region where support can be provided due to limitations of helicopter flight time and fuel constraints, the strong recommendation to NSF to provide such logistical support, and a strong indication of the interest of submissions of projects that would make use of these shared resources.

Program Manager Jenn Wade provided at the GSOC meeting the exciting news that, with some of the usual caveats, NSF is planning to provide logistical support for field work in the Aleutians for part of the summer seasons of 2015 and 2016. The plan is to have marine vessels available with shipboard helicopter support. The new program solicitation (page 3) provides the details of the arrangements and the important advice to PIs to discuss any plans that may involve these resources with NSF ahead of proposal submission.

Amphibious Array Facility and Steering Committee

The Amphibious Array Facility (AAF) was made possible by ARRA funding via EAR and OCE in 2009. A Steering Committee (AASC) was formed in 2010 to provide oversight and Susan Schwartz has started as Chair of the AASC in early 2014. Susan led a discussion about the future of the AAF as the Cascadia Initiative is getting into its final stage. The discussion included current restrictions regarding the locations the equipment can be deployed to and potential models for distributed use or continued colocation of the instrumentation. A community workshop principally organized by IRIS is planned for mid- to late October which will help define the future and new directions for the deployments of the equipment.

AGU and workshop summaries

The GSOC discussed the GeoPRISMS-related sessions at AGU 2013 and the outcome of the mini-workshops. There was a large number of well attended mini-workshops this year, with the highest participation ever for the Aleutian logistics mini-workshop. This Sunday afternoon workshop had the principal goal to discuss whether shared logistical support would be feasible during the upcoming field seasons. On Sunday morning a workshop focused on international opportunities at the Kermadec-Le Havre Trough that builds on significant work that already has been done in this region. Separate evening workshops discussed opportunities in the East African Rift System (EARS) and potential for collaboration for research on the interactions between solid Earth and Surface Dynamics. The first part of the EARS discussion focused on logistics, capacity building, infrastructure development, and training opportunities. Many countries are involved and there is a great opportunity for significant expansion of research activities, but significant logistical difficulties exist. The second part of the EARS workshop focused on the potential for synoptic studies, database integration, and future data collection efforts, potentially under the umbrella of a community experiment. The final evening workshop focused on Earth Surface Dynamics with a focus on modeling and opportunities for collaboration between

The NSF GeoPRISMS Solicitation has been revised

NSF has just released the new GeoPRISMS solicitation:
http://www.nsf.gov/pubs/2014/nsf14556/nsf14556.htm

Following significant community input and a great response from NSF we are pleased to announce that there will be likely logistical support for fieldwork in the Aleutians.

The deadline for proposals has been adjusted to **August 1** (for 2014 only).

GeoPRISMS, the Community Surface Dynamics Modeling System (CSDMS), and the Computational Infrastructure for Geodynamics (CIG). For more detail on the mini-workshops see the reports on page 26.

GeoPRISMS at other meetings

The studies of Exhumed Terranes (ExTerra) was highlighted at a workshop that was funded by EAR and organized by Sarah Penniston-Dorland and Maureen Feineman before the 2013 Florence Goldschmidt. The workshop provided an opportunity to highlight research activities and opportunities to an international group of scientists and students. A white paper detailing these opportunities came out of this workshop and is available through the GeoPRISMS website.

Partner Organization Update

EarthScope

Program director Greg Anderson provided an update on the NSF perspectives on Earthscope. The Earthscope National Office is looking for a new host for 2015. Former GSOC and GEAC member Maggie Benoit has joined NSF to work on Earthscope projects. Budget expectations for Earthscope are flat and at 2005 levels. The discussion further focused on the current status of the Earthscope instrumentation efforts, including the Flexible Array projects on the East Coast and Transportable Array deployments in Alaska (expected to be completed by summer 2015).

IODP

Program directors Tom Janacek and Jamie Allen provided overviews of the new directions that have been taken in the International Ocean Discovery Program (IODP), where the US participates with 25 other countries to develop research targets for the JOIDES Resolution, Chikyu, and mission-specific platforms. The proposal evaluation process has been streamlined with a single science evaluation panel. Planning for approved projects partly follows geographical clustering to avoid long voyages in between missions. The deployments for the JOIDES Resolution during FY15-18 are principally in the Indian and southern Pacific Oceans with potential overlap only with the GeoPRISMS New Zealand focus site. The Chikyu may visit the MARGINS focus sites in Costa Rica and Izu Bonin. Suggestions as part of the Chikyu+10 meeting in Japan that are relevant for GeoPRISMS also included the Nankai seismogenic zone, slow slip at the Hikurangi Margin, and drilling to the Moho.

The GSOC also discussed the suggestion for a Subduction Zone Observatory which would initiate a multi-disciplinary, large-scale and amphibious observatory along the length of the Eastern Pacific (from the Aleutians to Tierra del Fuego).

Planning for Theoretical and Experimental Institutes (2015, 2016)

The current three year plan for GeoPRISMS meetings include two Theoretical and Experimental Institutes (TEI) which are MARGINS-style meetings to allow for taking stock of ongoing efforts, highlighting critical gaps in discovery, and planning for further research efforts. A SCD TEI is scheduled for Spring/Summer 2015 followed by one for RIE in Spring/Summer 2016. Each TEI will be a 2.5-3 day meeting with a separate one day student symposium with an expected participation of 100-150 researchers. The preparations for the 2015 TEI will need to be started this summer guided in part by GSOC.

Initiative Updates and New Projects

Based on input from the community, the GSOC members discussed updates and outcomes of projects that are either funded through MARGINS/GeoPRISMS or are closely aligned with its scientific goals. This included new projects in the Mid-Atlantic and Eastern US, Eastern Africa, Nicaragua, Cascadia, Alaska-Aleutians, and a few synoptic studies. Maureen Long (with input from the Earthscope National Office) also provided a focused update on Earthscope activities.

GeoPRISMS & MARGINS Data Portal

Andrew Goodwillie provided an update to the Data Portal efforts in GeoPRISMS and MARGINS. This effort aligns with the Integrative Earth Data Applications (IEDA) initiative which disseminates geophysical and chemical data/samples. He discussed GeoPRISMS-related activities which included workshops and AGU Town-halls, improvements in the GeoPRISMS database, and results from Data Rescue awards to convert analogue to digital data. Andrew highlighted various new data sets in the GeoPRISMS Data Portal including high resolution bathymetry, heatflow, and seismic data. He also showcased a 3D printed model of Mount St. Helens and suggested 3D printing may become a standard option in GeoMapApp.

Education and Outreach

The current office has seen a reduction in funds dedicated to E&O in particular due to the cut of the requested E&O staff position. The Office will continue to support well-established outreach activities but new projects will be limited. With the help of the GeoPRISMS Education and Advisory Committee (GEAC), the Office will continue to explore opportunities to acquire additional funding for E&O activities.

Distinguished Lectureship Program

The Distinguished Lectureship Program continues to be popular with 66 applications in 2013 (up by 14 from 2012). Each year, a group of 8 scientists provides 3-4 lectures across the country to discuss GeoPRISMS-related science or talks geared to a more general audience. Deadline for applications for the 2014-2015 season will be August 1, 2014.

AGU Student Prize

The $500 awards for best poster and oral presentation went to James Muirhead and Megan Newcombe for their presentations at the 2013 AGU, with honorable mentions to Suzanne Birner, Ryan Gallacher, Stephanie Grocke, and Jiyao Li. The winners were selected out of more than 80 applicants whose presentations were evaluated by judges from the GeoPRISMS and MARGINS community.

MARGINS Mini-Lessons

Juli Morgan provided an overview of the MARGINS mini-lessons project for which she received funding from the NSF through TUES (Transforming Undergraduate

Education in Science, Technology, Engineering, and Mathematics). The project has led to the development of four groups of scientists and educators who have initiated the development of webinars and mini-lessons that are attractive for undergraduate institutions. The mini-lessons use new insights gained and data obtained by MARGINS and GeoPRISMS funded research and provide important updates and extensions to textbook material. The Science Education Resource Center (SERC) at Carlton provides invaluable advice in the development of the mini-lessons and provides an archive for the lesson materials (*serc.carleton.edu/margins/collection.html*).

Website and Social Media

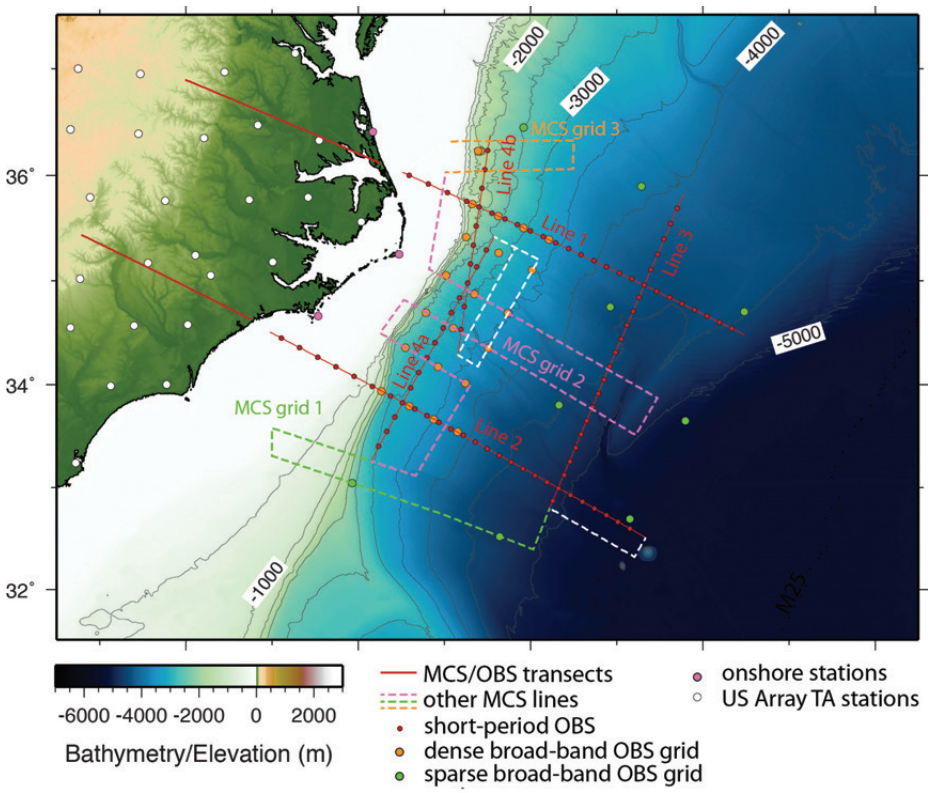
GeoPRISMS continues to be active on Facebook and Twitter with posts regarding student and early career opportunities, AGU and other meeting activities, and job opportunities. The Office maintains a listserv and provides logistical support to various initiatives for registration and dissemination of reports and white papers. The website has moved from Rice to a new service provider and over this summer the Office will implement a full overhaul of the website with changes in design, format, and layout.

Newsletter

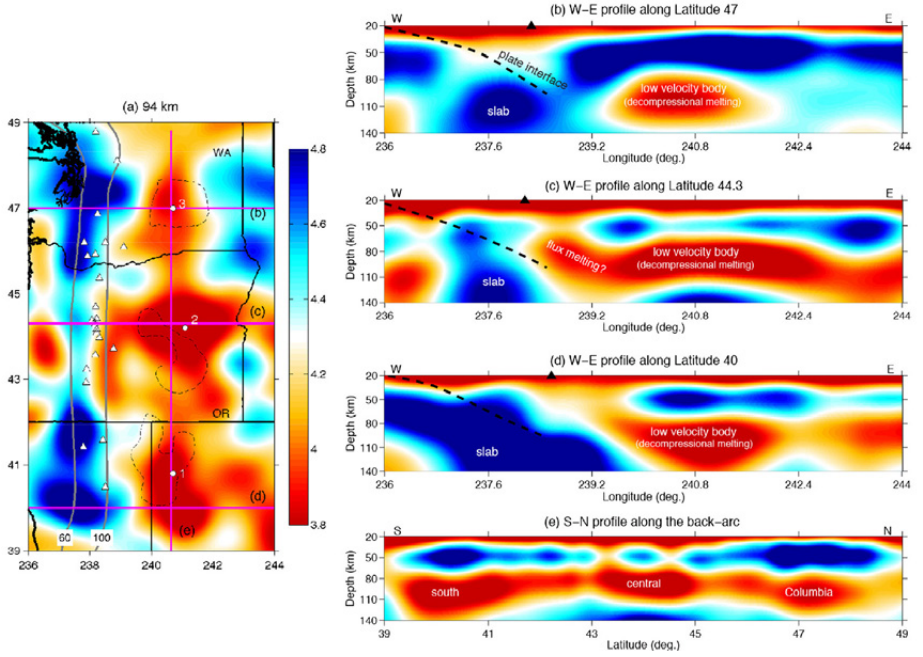
The Spring newsletter (which you are reading now!) was briefly discussed. The newsletter layout has seen major changes and there will be a change in distribution of the newsletters: the Spring issue will be science-heavy and distributed by regular mail. The Fall issue will be more focused on announcements leading up to the Fall AGU Meeting and will be distributed in electronic format only.

GSOC and GEAC rotations

Rob Evans, Bradley Hacker, and Susan Schwartz are rotating off the GSOC this year and are thanked for their considerable input over the last three years. Andrew Goodliffe is rotating off the GEAC and is thanked for his continued positive contributions to the GEAC and the Mini-lessons project even while taking on a Deanship back home. The GSOC discussed potential candidates for the GSOC and GEAC, as well as the importance of members from the international community and industry.



ENAM Community Seismic Experiment data acquisition map. The data acquisition involves the offshore and on land deployment of seimometers that will record land and marine seismic sources and gathering of marine multi-channel sesimic data with the R/V Marcus Langseth. More information about the objectives and design of the ENAM CSE can be found on the GeoPRISMS website at www.geoprisms.org/enam/community-seismic-experiment.html



Segmented Low velocity anomalies along the Cascadia back-arc that correlate with volcano centers (marked by triangles). (a) Horizontal slice at depth of 94 km (V_s in km/s). The magenta lines mark the profile locations in (b), (c), (d), and (e), respectively. (b–d) W–E profiles across the back-arc anomalies. The y-axis has the approximate same length scale as the x-axis. The Juan de Fuca plate interface at depths of 20–100 km from the model of McCrory et al.(2004) is projected. (e) S–N profile along the back-arc low-velocity anomalies. The length scale of y-axis is exaggerated two times of the x-axis. All data used in this study are available on the GeoPRISMS Data Portal. From Gao and Shen (EPSL, 2014).

GeoPRISMS at AGU Fall Meeting - Mini-Workshop Reports

December 9-13 , 2013 AGU Fall Meeting, San Francisco

As every year, GeoPRISMS provides the opportunity for groups of researchers to meet and discuss GeoPRISMS Science or planning activities at the AGU Fall Meeting. Here are the reports from the topical Mini-Workshops organized at AGU Fall Meeting 2013.

Kermadec Arc-Havre Trough Planning Mini-Workshop Report

Conveners: Adam Kent (Oregon State University), Mark Reagan (University of Iowa), Laurent Montési (University of Maryland), Kaj Hoernle (GEOMAR, Germany)

On Sunday December 8, 2013 a diverse group of international researchers gathered at the Grand Hyatt, San Francisco for a GeoPRISMS-sponsored Mini-Workshop aimed at advancing collaborative science within the Kermadec-Havre Trough system (KAHT), part of the SCD New Zealand Focus Site. This followed from the successful New Zealand Planning Workshop held in Wellington in April 2013. The primary goal of this Mini-Workshop was to bring representatives of international groups together to discuss recent results, review ongoing science plans, and to identify area for future work under the aegis of GeoPRISMS.

Attendees of the Kermadec Arc - Havre Trough Mini-Workshop on Sunday morning.

Following an introduction from the organizers and short presentations by NSF and GeoPRISMS representatives, a keynote presentation by Ian Smith, University of Auckland, provided background on the KAHT system as a classic intra-oceanic arc, and emphasized some of the key science opportunities such as progressive changes in convergence rate and continental contributions along strike from North to South, the significant proportion of felsic rocks that are present, and the possibility for studies of arc initiation in older preserved arc remnants.

These opportunities were also discussed and expanded on by reports from a number of international groups that are either already working in the region or that have well advanced plans. Most of these groups are actively seeking collaborators, reinforcing the potential of the KAHT system for driving multidisciplinary collaborative research. Kaj Hoernle (GEOMAR, Germany) discussed results for upcoming cruises aimed at understanding the inception and evolution of the Vitiaz Arc that was subsequently split into the Tonga-Kermadec and Lau-Colville Ridges. These ridges offer important targets for understanding the timing of initiation and evolution of the KAHT system – particularly in comparison with recent results from the Izu-Bonin-Mariana Arc (IBM) to the North. This point was also emphasized by Mark Reagan (U. of Iowa), who summarized advances in understanding of arc initiation in the IBM – and there may be close parallels between the KAHT and IBM. Yoshi Tamura (JAMSTEC) outlined ambitious plans for ROV studies of arc initiation, origin of basalts, caldera volcanism, and hydrothermal fluids associated with submarine volcanism within the KAHT. This proposed project would be conducted by a Japanese-led team of international researchers. Adam Kent (Oregon State U.) presented results provided by Richard Wysoczanski (NIWA, New Zealand) of sampling cruises to a number of submarine KAHT volcanoes as well as a number of regional and focused geophysical surveys. Many of these data sets will provide valuable for future selection of targets for detailed study. Erin Todd (USGS) discussed trace element and isotopic variations in dredged lavas from the Havre Trough – focusing on the interplay between tectonic and magmatic processes. Erin emphasized the importance of the KAHT for resolving the effects of melting styles, tectonic settings, and mantle thermal conditions on magma production during the rifting phase of backarc basin evolution.

These presentations were followed by a number of "pop up" talks – short presentations detailing other opportunities presented

by KAHT research. These included Fernando Martinez (U. of Hawaii) discussing the large difference in spreading rates between the Lau Basin and Havre Trough. Samer Naif (Scripps Institution of Oceanography) described the potential for use of marine EM techniques and Dan Bassett (U. of Oxford) discussed the interplay between structure, mechanics, and seismicity. Jessica Warren (Stanford) detailed a global data base of abyssal and forearc peridotite compositions and Ken Rubin (U. of Hawaii) and Osama Ishizuka (GSJ/AIST) showed results from recent cruises to the northern Lau and the Tonga Trench respectively, that provided additional information on the range of mantle compositions and magmatic processes in the Kermadec-Tonga system.

The final part of the workshop was spent discussing future plans for KAHT research, with a consensus that the system offers many exciting new opportunities for international collaborative research.

Field Logistics for GeoPRISMS in the Aleutian Arc

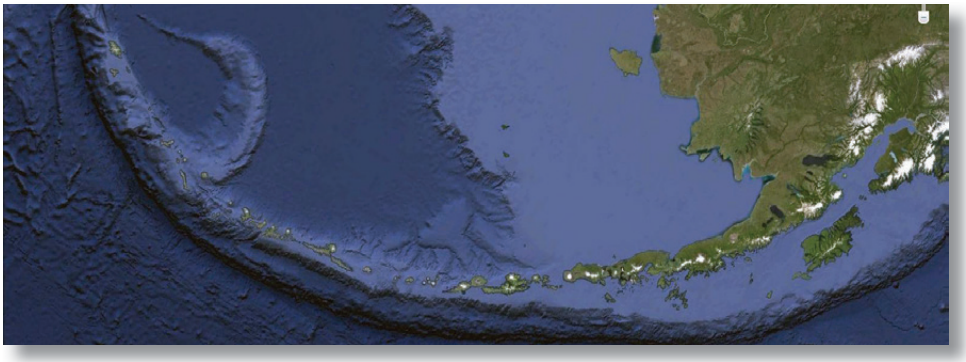
Conveners: Peter Kelemen (LDEO), Geoff Abers (LDEO), Jeff Freymueller (University of Alaska, Fairbanks), Paul Haeussler (USGS), Steve Holbrook (University of Wyoming), Brian Jicha (University of Wisonsin), John Power (USGS), Gene Yogodzinski (University of South Carolina)

A Mini-Workshop, with support from GeoPRISMS, was organized to explore options for shared logistical support for NSF funded research in the Aleutian volcanic arc, which is part of the GeoPRISMS Alaska Focus Area. The goal is to reduce the logistical costs per project in order to enable a larger group of investigators to benefit from the opportunity that the GeoPRISMS focus is intended to foster. The workshop was held in the Fillmore ABC meeting rooms, in the Grand Hyatt San Francisco Hotel on Sunday, December 8, 2013 from 12:40 to 6:00 PM.

Despite inclement weather across North America, which prevented some registrants from attending, there were more than 90 participants from more than 60 universities and research organizations, mostly in the US.

The workshop began with a series of very short "Keynote" talks – mostly 10 minutes long, with speakers limited to 3 to 5 Powerpoint/Keynote slides, linking fundamental science problems with likely needs for logistical support in the Aleutians. These presentations were summarized by John Powers, who then outlined some end-member options for shared logistical resources.

Following the scheduled talks, there was a period for plenary discussion during which participants could present a single slide or simply comment from the floor. Including a couple of short coffee breaks, this plenary discussion occupied about three hours of the meeting. Results are summarized below.



Aleutian Islands (Google Earth)

Science

The Aleutian arc, where the Pacific Plate subducts beneath the North American Plate, is arguably the best place on Earth to investigate several fundamental questions about arc magmatism and the conditions that create new subduction zones. It has never been rifted, so that the entire crust formed by arc processes can be geophysically imaged. Subduction erosion has exposed older sections of arc crust in the fore-arc, allowing geochronology of the entire edifice. The oceanic arc has abundant, exposed mid-crustal intrusions, providing insight into the composition of plutonic arc crust, which is almost unique among intra-oceanic volcanic arcs. The major and trace element contents of the volcanic rocks are more similar to continental crust than any other intra-oceanic arc, whereas the Sr, Nd, Hf and Pb isotopes in the western part of the arc are the most depleted of any arc, worldwide, recording a depleted mantle source with essentially no input from a terrigenous sediment component. Thus, the Aleutians represents the best place on Earth to study formation of "juvenile" arc crust, similar to continental crust, with little or no incorporation of older, inherited continental material. Pilot studies have demonstrated strong links between volatile contents, major element composition, and trace element abundance in lavas, with profound implications for magma generation and differentiation processes. The Aleutians have been the site of great earthquakes, among the largest ever recorded, and of large volume submarine landslides. They sit astride major air transportation routes, rendering the volcanic hazard particularly acute. Subduction rates, and the depth of sediments in the trench, decrease systematically from East to West, offering the opportunity to study the effect of these factors on arc magmatism and deformation.

Several participants gave brief presentations on existing Aleutian data and potential sites for future exploration in geochemistry, active and passive source seismology, geochronology, tectonics, and deformation. All provided insight on the logistical requirements for such research.

All participants were invited to submit latitudes and longitudes of sites where they wish to do geological field work or make geophysical observations.

Logistics

Following science-based presentations, additional speakers described the benefits of using a shared facility for fieldwork as well as the operations of the Alaska Volcano Observatory, Earthscope, the Plate Boundary Observatory, and the German-Russian KALMAR project, which has been and will continue to be active in the westernmost Aleutian and Bering Sea regions.

Field campaigns in the Aleutians are logistically challenging and expensive unless research is conducted in the vicinity of one of the few airports, which are widely spaced along the more than 2,500 kilometers of plate boundary. Further, an amphibious approach is required for collecting geological, geophysical, and geodetic data from the numerous active volcanoes.

In the plenary sessions, attendees discussed several logistical matters. Should such a facility be used primarily for research in the oceanic Aleutian arc, or extended to include field campaigns on the Alaska Peninsula? Is there a need for shared ship support that may not require a helicopter (i.e. M/V Tiglax)? Could cost-effective research be conducted with a vessel capable of supporting helicopter operations? If so, would a small (80-120 foot) ship be sufficient, or is a larger UNOLS vessel with a helicopter required? Would it be possible to achieve most science goals with a helicopter based from commercial airstrips (in the oceanic arc away from the continental shelf, these are on Unalaska, Atka and Adak Islands, and perhaps also Attu) plus a small vessel without a helicopter?

Participants also discussed how to best share existing samples and data so as not to duplicate prior field campaigns. Workshop attendees determined that a logistics manager or office may be needed to coordinate efforts once a field facility is in place.

A key workshop outcome was a strong consensus in favor of developing shared field platforms that include a ship and helicopter. This could be in the form of a ship with a helipad, or perhaps a combination of a smaller ship and chartered helicopters based at airstrips with commercially available fuel (in the oceanic arc these are on the Unalaska, Atka and Adak Islands). When asked whether, if such support were available, participants would write proposals to NSF to take advantage of this support, 28 people present (of perhaps 50 or 60 at that point) raised their hands. At the same time, conveners asked for dissenting votes and there were none. This highlights the potential for having about 20 proposals submitted to GeoPRISMS to make use of such shared logistical resources.

Participants in both the seismic and geodetic communities stressed that the ship/helicopter platform(s) would need to be available for a minimum of two and ideally three summers so that instruments can be deployed, collect a sufficient amount of data, and be retrieved. The distance range of helicopters based at airstrips would be insufficient to achieve optimal, uniform instrument distribution over significant distances along the arc. Bringing instruments onshore from ships using small boats would be unreliable, is dangerous, and would result in less-than-optimal instrument sites. Thus, the workshop participants who are planning onland deployment of seismic and geodetic instruments strongly favor a ship-based helicopter platform. In turn, most workshop participants favor a combined geophysical, petrological, and geochemical approach for GeoPRISMS-supported work in the Aleutians. Thus, there is a consensus that the ship-based helicopter platform is best for the community, though this consensus is not as strong as the overall support for shared resources in general.

Modified from B. Jicha, G. Yogodzinski and P.B. Kelemen, Sharing Resources for Aleutian Arc Research, Eos, 2014

Submit your Mini-Workshop proposal!

Deadline July 1, 2014

More information at:
http://www.geoprisms.org/mini-workshops.html

Collaborative Efforts in the East African Rift System

Conveners Part 1: Simon Kattenhorn (University of Idaho), Cynthia Ebinger (University of Rochester), Tobias Fischer (University of New Mexico)
Conveners Part 2: D. Sarah Stamps (MIT), Wendy Nelson (University of Houston), Robert Moucha (Syracuse University), Andy Nyblade (Penn State University)

The AGU GeoPRISMS Mini-Workshop on Collaborative Efforts in the East African Rift System was held Thursday evening, 12 December 2013 at the Grand Hyatt hotel in San Francisco during the AGU Fall Meeting. It was well attended with 50 participants, 9 of whom were graduate students and 7 were postdoctoral researchers. This workshop had two sections sharing a common theme of bringing scientists together to discuss collaborative efforts underscored by the GeoPRISMS East African Rift System (EARS) implementation plan.

Part 1. The Eastern Branch Focus Site

Ongoing research programs in the Kenya-Tanzania rift sector were briefly reviewed as a foundation for scientific planning, and as experiential learning in terms of data acquisition and collaboration. These studies show high levels of seismicity, fault activity, and gas emissions in this magmatically-active region, which spans basins that formed at 25 Ma to < 1 Ma. The age span enables studies of rift initiation, propagation, and evolution within one sector. Presenters outlined existing data sets acquired by academics, petroleum, mineral, geothermal exploration, and governmental organizations.

Coordination of field programs and collaborative training opportunities enables fuller, more rewarding interactions with our international colleagues and provides more effective liaison with the relatively small EAR research community. For example, Fischer outlined strong support offered by geothermal exploration and production teams in Kenya.

Presenters outlined the procedure to obtain research permits in Kenya and Tanzania, as well as potential collaborating institutions. Attention was drawn to the USAID PEER program, which enables African collaborators to seek separate funding for enrichment of participation in NSF-funded research.

Part 2. Synoptic Studies of the East African Site

The GeoPRISMS initiative offers an unprecedented opportunity to synthesize EARS data and models for an improved understanding of the fundamental geodynamics of continental rifting. In 2012, during the GeoPRISMS EARS planning workshop, the community identified synoptic investigations along the entire EARS as a Collaborative Target of Opportunity. The initial questions posed in the implementation plan motivate studies of the mechanisms enabling rifting of cratonic lithosphere, the origin, composition, and timing of volcanism, the rate and distribution of strain along and across the rift systems, and large-scale pre-rift structure and dynamics underpinning the rift system.

Part 2 of the Mini-Workshop centered on obtaining feedback from participants in real-time. We presented three questions for discussion and report responses to each:

1. What questions are of interest to the community that concern synoptic studies of the EARS? *https://docs.google.com/document/d/1-6jK_qQiP23KRK0irGkf4HKj2pfpA6KhRyTsRLBgQ-g/edit?usp=sharing*

2. What datasets exist and what is needed to address system-wide studies of the EAR? *https://docs.google.com/document/d/1zQWpmj6dqZ-hOXzHyAkZxdzaufBMYmcgYWZZh-fna_0/edit?usp=sharing*

3. Is there interest in a community-driven proposal?

Given the recorded responses at the AGU Mini-Workshop, there is some interest within the GeoPRISMS community to develop a community-driven proposal to address synoptic studies of the EARS as evidenced by 50% of the responses.

Acknowledgements

We thank the GeoPRISMS Program of the National Science Foundation for funding this workshop, the moderators who volunteered to record participant responses in real-time to on-line documents using their personal computers, and the GeoPRISMS chair for providing Internet connectivity during the workshop.

Figure 1. (top) Simon Kattenhorn presents research background and planning for studies of the Eastern Rift focus site. Figure 2. (bottom) Moderators prepare their computers for real-time input during discussions.

Exploring the Interplay between Solid Earth Tectonics and Surface Processes using Community Codes

Conveners: Phaedra Upton (GNS Science, New Zealand), Mark Behn (Woods Hole Oceanographic Institution), John Jaeger (University of Florida)

About 30 scientists with a wide range of interests spanning field-based to modeling studies, spent the Wednesday night of AGU at the Grand Hyatt San Francisco exploring the interplay between solid Earth tectonics and surface processes with an emphasis on using community codes. The workshop was associated with AGU sessions EP33B and EP43E/44A, sponsored by GeoPRISMS, and supported by the Community Surface Dynamics Modelling System (CSDMS). The workshop was prompted by the inclusion of a new Geodynamics Focus Research Group into CSDMS 2.0 (*http://csdms.colorado.edu/wiki/Geodynamics_Focus_Research_Group*), co-chaired by Phaedra Upton (GNS Science, New Zealand) and Mark Behn (WHOI). The AGU sessions and the Mini-Workshop created an opportunity to bring together members of the long-term tectonics community with members of the CSDMS community, particularly those interested in surface processes in actively deforming terrestrial settings. The workshop began with half an hour of informal discussions over snacks and posters. The formal part of the evening began with a welcome and introduction from Peter van Keken, the incoming chair of GeoPRISMS. Phaedra Upton, co-chair of the Geodynamics FRG, introduced CSDMS and the Geodynamics FRG. She was followed by Irina Overeem (CSDMS) who gave an overview of the support, website, modelling tool, and educational repository offered by CSDMS. Three invited speakers, Ritski Huismans, Brian Yanites, and Louis Moresi then shared their thoughts and experiences using coupled modeling approaches to link solid Earth tectonics and surface processes. Ritski Huismans described his efforts to include surface processes into his geodynamic models. He discussed some of the computational issues of linking the two types of processes with significantly different spatial and temporal scales. He described how models have improved with increasing computational power allowing higher resolution. Brian Yanites talked about modelling surface processes as a geomorphologist working in tectonically active regions. He focused on rivers as "rivers (or glaciers) dictate orogen scale relief". He discussed the commonly used streampower law and its limitations and showed a series of models of river incision in an uplifting region that took into account other mechanisms including bed properties (e.g., erodibility) and river capture. Louis Moresi, one of the developers of the geodynamics open source code Underworld, related many of the lessons they have learnt while building a versatile, multi-scale, community code. He conceded they did not reach all their goals, having produced a very powerful and versatile code but one which is challenging to use and thus has not been widely adopted by the community.

Following these three presentations, the floor was open for discussion. Themes that arose included:

- The potential for more collaboration between CSDMS and the long term tectonics working group Computational Infrastructure for Geodynamics (CIG).
- Coupling is important and interesting because of the potential for feedbacks between surface processes (e.g., erosion and re-deposition) on long term tectonic proecesses
- We need to be careful to do the coupling correctly, this requires including researchers from both communities.
- An important issue is the mismatch of spatial and temporal scales between tectonic and surface processes. What are the best computational methods to deal with these different scales?
- As the community, we need to think about whether we should be moving toward meshless methods.
- The importance of bookkeeping for stratigraphy. In coupling between a landscape evolution model and a tectonic code, the overlap is not just the 2D land surface, thus coupling needs to be in 3D extending to a depth beneath the surface that records deposition.
- One action item that came out of the meeting is that there is immediate value in coupling a high resolution 2.5D tectonic model with a landscape evolution model. Specifically, while 3D is essential for some problems, it is not necessary for all problems and often a 2D model output (extrapolated into the 3rd dimension) is sufficient and has the advantage of being higher resolution and faster to run. Therefore, it was proposed that the Geodynamics Focused Research group works to release a 2D model into CSDMS soon. This model could be coupled with existing landscape evolution models to produce some simple test cases to look at key feedbacks between fault evolution and surface processes.

The meeting came to an end with a feeling of energy and momentum. However, it is important to keep the dialogue going. In particular, there are several upcoming meetings that are relevant to both the long term tectonics and surface processes communities:

- 2014 CIG Mantle and Lithospheric Dynamics Workshop, Joint with the Canadian Geophysical Union, Banff, Canada, May 4-8 (*http://people.ucalgary.ca/~cguconf/*)
- CSDMS 2014 annual meeting, Boulder, CO, May 20-22 (*http://csdms.colorado.edu/wiki/Form:CSDMS_annual_meeting)*
- 2014 Workshop on Crustal Deformation, Stanford, CA, June 23-27 (*http://geodynamics.org/cig/events/calendar/2014-cdm-workshop/*)

We look forward to developments facilitated by linkages between GeoPRISMS and CSDMS.

Call for GeoPRISMS Mini-Workshop Proposals at AGU 2014

Application Deadline: July 1st, 2014

We are pleased to announce that this year we will again be able to host a few Mini-Workshops at the 2014 AGU Fall Meeting (December 15-19). A Mini-Workshop is a research meeting that is held during an evening of the Fall Meeting or on the Sunday leading up to the meeting. Examples of Mini-Workshops held in association with recent and upcoming national and international meetings can be found at: *http://geoprisms.org/mini-workshops.html* .

Mini-Workshops offer excellent opportunities to jump-start science discussions, as well as to coordinate implementation for future GeoPRISMS studies, both for primary sites and thematic studies. We encourage you to consider such an undertaking. The GeoPRISMS Office provides logistical support, a meeting room, and refreshments. We do not cover any travel costs or per diem to the organizers or participants. GeoPRISMS Mini-Workshops will be open to all interested parties and will be advertised via the GeoPRISMS mailing list, newsletter, and website.

If you would like to host a GeoPRISMS-related Mini-Workshop in association with the 2014 AGU Fall Meeting, we invite you to submit your proposal to the GeoPRISMS Office at info@geoprisms.org. The proposals will be reviewed and ranked by the GeoPRISMS Steering and Oversight Committee (GSOC). The number of Mini-Workshops is limited but we expect to be able to host three to four events.

The deadline for upcoming Mini-Workshop proposals is July 1, 2014. The proposal guidelines are described on the GeoPRISMS website at: *http://geoprisms.org/mini-workshops.html#organize-a-mini-workshop*. We encourage you to contact the GeoPRISMS Office with questions or advice prior to submitting at info@geoprisms.org.

We look forward to hearing your ideas.

Questions should be directed to the GeoPRISMS Office:
info@geoprisms.org
More information can be found at:
http://geoprisms.org/mini-workshops.html

GeoPRISMS Student Prize for Outstanding Presentations

2013 AGU Fall Meeting, San Francisco

Congratulations to the winners of the GeoPRISMS 2013 AGU Student Prize! As in previous years, the judges were greatly impressed by the quality of the entrants this year, and awarding individual prizes to just a few in such an outstanding field was very difficult. Here we honor two prize winners and four honorable mentions. Thank you to all the entrants and judges for making this contest possible and worthwhile.

Poster Presentation Winner

James Muirhead - University of Idaho

Title of Abstract: The evolving contribution of border faults and intra-rift faults in early-stage East African rifts: insights from the Natron (Tanzania) and Magadi (Kenya) basins

Coauthors: Simon Kattenhorn, Edwin Dindi, Remigius Gama

From the Judges: "James demonstrated an excellent knowledge of regional geology, tectonics, and theory related to his research"; "His poster was really well presented and articulated"; "Significant and mature, integrative"

From the Student: "With such exciting research being conducted within the community, I am thrilled that GeoPRISMS has acknowledged this presentation. This work has greatly benefited from interactions facilitated through GeoPRISMS meetings, and I am grateful to GeoPRISMS for their efforts to support student research."

Oral Presentation Winner

Megan Newcombe - Caltech

Title of Abstract: Chemical zonation in olivine-hosted melt inclusions: A record of syn-eruptive cooling

Coauthors: Alessandro Fabbrizio, Youxue Zhang, Chi Ma, Marion Le Voyer, Yunbin Guan, John Eiler, Alberto Saal, Edward Stolper

From the Judges: "This was a super high quality talk"; "The discovery of chemical zonation *inside* melt inclusions is new … she's developing a crystal clock method for minutes-hours timescales!"; "This is mature work…"

From the Student: "I was absolutely thrilled to hear that I had won this award! I am very grateful to the judges, and I would like to thank the GeoPRISMS community for supporting student research in this way."

GeoPRISMS is offering two $500 prizes for Outstanding Student Presentations on GeoPRISMS- or MARGINS-related science at the AGU Fall Meeting in San Francisco. The two prizes, one each for a poster and an oral presentation, highlight the important role of student research in accomplishing MARGINS- and GeoPRISMS-related science goals, and to encourage cross-disciplinary input. The contest is open to any student whose research is related to the objectives of GeoPRISMS or MARGINS.

Presentations are judged throughout the AGU meeting. Students have also the opportunity to display their posters (or poster versions of their AGU talks) at the GeoPRISMS Townhall and Student Forum, organized each year on Monday night at the Westin Market Street Hotel. This is a great opportunity for students to share their results further, to interact with a wide spectrum of GeoPRISMS scientists, and to hear about upcoming events and opportunities. More information on this year's contest will become available closer to AGU on the GeoPRISMS website, so stay tuned!

Honorable Mention

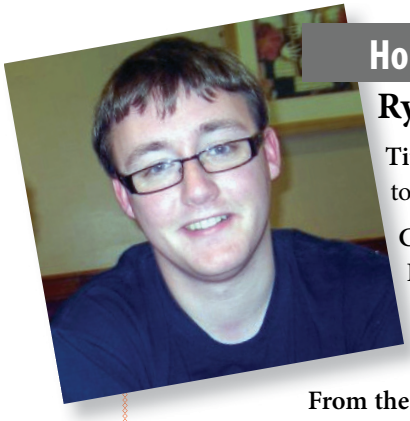
Suzanne Birner - Stanford University

Title of Abstract: Variations in oxygen fugacity among forearc peridotites from the Tonga trench

Coauthors: Jessica Warren, Elizabeth Cottrell, Oscar Lopez, Fred Davis, Trevor Falloon

From the Judges: "Suzanne spoke clearly and with enthusiasm for the scientific problem that she's trying to understand"; "The speaker gave a clinic on the subject matter"

From the Student: "It is an honor to be recognized by GeoPRISMS for this award. GeoPRISMS is a wonderful scientific community that I look forward to contributing to further in the future."



Honorable Mention

Ryan Gallacher - National Oceanography Centre Southampton

Title of Abstract: Mantle structure beneath the Afar triple junction derived from surface wave tomography

Coauthors: Derek Keir, Nicholas Harmon, Graham Stuart, Sylvie Leroy, James Hammond, J-Michael Kendall, Atalay Ayele, Berhe Goitom, Ghebrebrhan Ogubazghi

From the Judges: "Ryan was engaging and enthusiastic"; "He attracted a steady stream of visitors, including geochemists and geodynamicists"

From the Student: "I am honored that my research has been recognized by GeoPRISMS and would like to thank the community for their attempts to highlight and promote student research. I hope that I can continue to contribute to the GeoPRISMS community in the future."

Honorable Mention

Stephanie Grocke - Oregon State University

Title of Abstract: Storage conditions and temporal signals for the Tara supereruption magma; insights from geothermobarometry and quartz chemistry

Coauthors: Shanaka L. de Silva, Jan M. Lindsay, Rodrigo Iriarte, Elizabeth Cottrell, Benjamin Andrews

From the Judges: "Wow, Stephanie is a dynamite speaker."; "Her Ti thermometry and diffusion profiling provided a novel clock for magma processes at this novel clock for magma processes at this super volcano"

From the Student: "I am honored and delighted to have my research recognized by the GeoPRISMS community. I really appreciate the efforts made by GeoPRISMS to support and encourage student research and I look forward to working within the GeoPRISMS community in the future."

Honorable Mention

Jiyao Li - Lamont-Doherty Earth Observatory

Title of Abstract: Constraints from seismic reflection signature on the seismogenic region in the Alaska/Aleutian subduction zone

Coauthors: Anne Bécel, Donna J. Shillington, Mladen R. Nedimovic, Harold Kuehn, Spahr C. Webb

From the Judges: "Jiyao did a very good job highlighting the importance of understanding the plate interface… using seismic reflection images. These findings provide important constraints"; "Jiyao had a very strong presentation that rivals work of postdocs"

From the Student: "It is quite an honor to have my research recognized by the GeoPRISMS community. GeoPRISMS provides wonderful opportunities to study the structure and dynamics process of plate margins. I am very grateful for the efforts made by the GeoPRISMS community to encourage and support student research."

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Meet the GeoPRISMS Staff

The GeoPRISMS Office is hosted by the Department of Earth and Environmental Sciences at the University of Michigan in Ann Arbor, Michigan. Founded in 1817, the University of Michigan is one of the first and largest public institutions in the US and now enrolled approximately 44,000 students. The Department of Earth and Environmental Sciences consists of 27 full-time faculty, whose investigate the formation of the Earth, how it progressed to its present state, how life originated and evolved on Earth, how the solid earth, oceans, atmosphere and biosphere interact, and how the Earth's climate and environment change through time.

GeoPRISMS Chair

Peter van Keken is a geophysicist at the University of Michigan who uses computational methods to study the causes and consequences of plate tectonics. He focuses on the long term chemical and thermal evolution of the Earth, the dynamics of mantle plumes, and the structure and evolution of subduction zones. Within GeoPRISMS, Peter works on interdisciplinary projects focusing on the cycling of volatiles in subduction zones and their role in generating earthquakes and arc volcanism. Peter has been involved in MARGINS then GeoPRISMS for a long time. He served on the MARGINS Steering Committee from 2004 to 2008 and as Distinguished Lectureship Program Speaker from 2011 to 2012, visiting Universities across the Country to present technical and public lectures about his GeoPRISMS-related research on subduction zones.

GeoPRISMS Science Coordinator

Anaïs Férot was part of the Office transition and continued as the GeoPRISMS Science Coordinator. She assists the Chair of the Program, facilitating the communication with the science community, helping plan and organize workshops, and taking notes at Steering Committee Meetings. She also maintains and develops the GeoPRISMS website and carries out the edition of the GeoPRISMS Newsletter. Her duties also include the management of the Education & Outreach activities, in particular the Distinguished Lectureship Program. Anaïs completed her PhD in experimental petrology from the "Magmas et Volcans" Laboratory in Clermont-Ferrand, France in 2011. She aimed at constraining the distribution and partitioning of water in the Earth's upper mantle, performing high-pressure and high-temperature experiments.

GeoPRISMS Administrator

Jeanne Bisanz is the administrative coordinator and responsible for tracking the budget, reimbursements, event coordination, and assisting with promotional materials. She has enjoyed being part of several creative and complex interdisciplinary projects, both in the educational and private sectors, and has organized workshops throughout the Midwest, New England and Poznan, Poland. Before joining the GeoPRISMS Program, she administered the Science, Technology, and Public Policy (STPP) Graduate Certificate Program at the UM Ford School of Public Policy and organized the STPP Lecture Series. Prior to STPP, she was project coordinator for the Great Lakes Region of the US National Climate Change Assessment and coordinated Detroit Auto Show charity events for General Electric Corporation Automotive Division. She has a BS from MSU in Resource Development.

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Korovin, Konia, and Kliuchef volcanoes - Atka Island. Photo courtesy of Game McGimsey (USGS) and Gene Yogodzinski (Univ of South Carolina)

In 2015 and 2016, The GeoPRISMS Office will organize Theoretical and Experimental Institutes (TEIs) which will focus on intermediate synthesis of SCD and RIE projects. More to come on the GeoPRISMS website so stay tuned!