GeoPRISMS Newsletter

Issue No. 28, Spring 2012

Published bi-annually by the GeoPRISMS Office
Rice University • 6100 Main Street • Houston, Texas USA • 77005

Geodynamic Processes at Rifting and Subducting Margins

In This Issue:

From the GeoPRISMS Chair

Julia Morgan, GeoPRISMS Steering and Oversight Committee Chair
Rice University

As I write this, the joint GeoPRISMS-EarthScope Science Workshop on Cascadia is just wrapping up, with ≈170 participants, including ≈60 students and postdocs. This extraordinary interest in the scientific opportunities in Cascadia, combined with similar enthusiasm for new investigations at the Alaska and Eastern North American Margin (ENAM), highlights the exciting new directions of GeoPRISMS research. Strong collaborations with EarthScope researchers in all three location promise to lead us to a much improved understanding of North American continental margins, their origins, evolutions, and natural hazards. This emphasis is timely and appropriate, particularly at a time when the US scientific community seeks to demonstrate the importance and relevance of the work that we do to the country and the rest of the world.

While research ramps up at these three primary sites, two international primary sites wait in the wings. The East African Rift System (EARS) and New Zealand both provide exciting opportunities for comparative studies that will more fully address the fundamental RIE and SCD objectives. Over the next year, planning workshops should take place for both primary sites (see back page), enhancing critical international collaborations in GeoPRISMS studies.

In addition to enriching discussions, major outcomes of these community planning workshops are updates to the GeoPRISMS Implementation Plan (IP), which outline the directions and approaches for GeoPRISMS research. On behalf of the entire GeoPRISMS community, I wish to thank all of the dedicated writers who have distilled the wide-ranging workshop discussions into focused objectives and key opportunities for research along these expansive continental margins. The updated IP is designed to inform the community and

NSF GeoPRISMS Proposal Deadline

July 2, 2012

Proposals for the FY13 solicitation will be accepted for the following topics:

- Data assimilation and small reconnaissance studies for all primary sites, relevant to GeoPRISMS objectives
- Research projects relevant to GeoPRISMS objectives at Cascadia and Alaska (and possibly ENAM)
- Thematic studies relevant to Cascadia and Alaska primary site objectives (and possibly ENAM)
- Workshop proposals for science or implementation at all primary sites
- Post-doctoral fellowship proposals relevant to GeoPRISMS science plans

For more info, see:
http://www.geoprisms.org/research.html
http://www.geoprisms.org/program-announcement.html

For information about submitting proposals to work with Cascadia Initiative data:
http://geoprisms.org/cascadia/cascadia-dcl.html

to guide future proposers. So, be sure to take a look at the most recent IP on the GeoPRISMS website (http://geoprisms.org/science-plan.html).

Note, this year marks the second call for GeoPRISMS proposals (July 2nd, 2012), and as elaborated in the NSF update (see below), this year's solicitation includes a wider range of topics than in previous years, again, guided by the updated IP. The new GeoPRISMS solicitation (July 2nd, 2012) can be reviewed at http://geoprisms.org/program-announcement.html. Also, NSF issued a "Dear Colleague Letter" (DCL) in December 2011 clarifying the funding opportunities and proposal deadlines for the ongoing ARRA-funded Cascadia Initiative Amphibious Array Facility; this is timely for the GeoPRISMS community, as data from the first year's OBS deployments should become available soon. Given the limited funds available through the GeoPRISMS Program, proposers are also encouraged to consider additional funding sources. As one example, the second NSF Frontiers in Earth System Dynamics (FESD) solicitation is coming up; pre-proposals are due on July 2nd, 2012 this year. This is an excellent opportunity to design interdisciplinary, team-based projects of relevance to GeoPRISMS. As usual, questions about all of these topics should be directed to the appropriate program officers at NSF. Also, take a look at suggestions for ways to enhance your Broader Impacts (page 23), and learn what you need to know about NSF's Data Management requirements (page 10) and the new GeoPRISMS Data Portal (page 22).

AGU 2012 represented an extremely busy time for GeoPRISMS, with a well-attended Town Hall and Student Forum, numerous GeoPRISMS-related special sessions, and the weeklong judging for the best student presentation. In addition, GeoPRISMS sponsored three mini-workshops during the conference, attended by ≈100 participants in total; this excellent turnout ensured stimulating discussions throughout the week. Keep an eye out for future such events, which provide inexpensive, interactive opportunities to discuss highly topical issues of interest to GeoPRISMS.

GeoPRISMS Education and Outreach efforts continue apace. In particular, the student symposia associated with community workshops are proving highly popular, and provide an excellent forum for pre-workshop introductions and discussions. The GeoPRISMS Outstanding Student Presentation competition at AGU serves to highlight some of the exciting research happenings around the world on GeoPRISMS-related topics. The Distinguished Lectureship Program remains very popular, with more than 60 applications for 8 speakers this past year. I would like to thank all of the speakers for taking the GeoPRISMS story on the road! Speakers for the 2012-2013 season are listed on page 34. We also continue to maintain the MARGINS Mini-Lesson collection, and hope to see new funding to grow the collection in the near future. I especially would like to thank Alison Henning, former GeoPRISMS Education and Outreach Coordinator, for her hard work jump-starting the new E&O activities. We all wish her the very best in her new career at BP.

Finally, I would like to thank two members of the GeoPRISMS Steering and Oversight Committee (GSOC) for their service to the program. Rosemary Hickey-Vargas rotated off in Fall 2011, although she continues to serve on the GeoPRISMS Education and Advisory Committee (GEAC). Ramon Arrowsmith rotated off in Spring 2012; however, as chair of the EarthScope Steering Committee, he continues to work closely with GeoPRISMS. I welcome Maggie Benoit as a new member of GSOC, also serving as liaison to the GEAC. Several other members of GSOC and GEAC have also been instrumental in running recent workshops and student symposia, along with volunteer conveners from the community, and I thank all of them for their tireless and good-humored contributions throughout!

National Science Foundation Update

Bilal Haq, GeoPRISMS NSF Program Officer

In the last report from the GeoPRISMS Program at NSF, published in the Spring 2011 GeoPRISMS Newsletter (Issue 26), I noted that the GeoPRISMS Program's relatively limited special funds primarily will go towards funding competitive proposals addressing community-wide science objectives at the selected primary sites (both group and individual proposals), with a smaller number supporting thematic studies related to objectives at these sites, as well as post-doctoral fellowships and rapid response surveys. Prospective proposers were also encouraged to cast a wider funding net (for proposals related to GeoPRISMS but at non-primary sites as well as broader thematic studies) to Core and other special programs in Earth and Ocean Sciences Divisions and the GEO Directorate. We also envisioned a phased-in approach to funding, ramping up some primary sites while ramping down others. These provisos still remain in force for this upcoming GeoPRISMS solicitation. Another key element for proposals seeking funding from sequestered GeoPRISMS funds is the existence of a detailed implementation plan (IP), discussed and approved by the community, which outlines the key GeoPRISMS objectives for each primary site. The PI community should refer to this document to determine if a proposed study falls within the scope of the program. Note that updates to the IP following community planning workshops further establishes the phased-in approach to the primary sites, guided by input from the GeoPRISMS Steering

and Oversight Committee (GSOC). These community-based decisions ensure that GeoPRISMS' major goals are identified and met in a timely fashion.

Towards this goal, GSOC has held three very successful community workshops in order to firm up the IPs for Alaska, Eastern North America (ENAM) and Cascadia primary sites, and future workshops are being planned for the East Africa Rift System (EARS) and New Zealand. The GeoPRISMS community is to be congratulated for the very wide interest shown in these workshops, and particularly, the prominent participation by early-career PIs and graduate students. These workshops were co-sponsored by both EarthScope and GeoPRISMS Programs and exemplify the close cooperation between these two major programs in the Divisions of Earth and Ocean Sciences to address common and overlapping science objectives along continental margins. The IP for Alaska is now available, and the one for ENAM is being finalized. An updated IP for Cascadia (subject of the most recent joint workshop) is also planned to be available in the near future. In addition, earlier this year the new Program Solicitation for GeoPRISMS Program was officially released by NSF and is available at: http://geoprisms.org/program-announcement.html

As we get ready for the second annual review cycle of the GeoPRISMS Program, with a proposal deadline of July 2nd, 2012, let me remind the prospective PIs that they should consult the new GeoPRISMS Program Solicitation before writing their proposals, and once again ask themselves whether the proposed work is appropriate to the specific GeoPRISMS' stated objectives for this review cycle (listed below), or whether the proposal can be sent to a relevant Core or other special programs at NSF (e.g. FESD, SEES).

The list of topics (discussed by the community and prioritized by GSOC and NSF) for which proposals will be accepted for consideration under the GeoPRISMS Program is as follows:

- Data assimilation and small reconnaissance studies for all primary sites, relevant to GeoPRISMS objectives.
- Research projects relevant to GeoPRISMS objectives at Cascadia and Alaska based on community decisions at primary site planning workshops. (Projects for the ENAM primary site can also be included in this list, if the IP for ENAM is finalized before the proposal deadline,).
- Thematic studies relevant to Cascadia and Alaska primary site objectives, as delineated during community planning workshops. (Thematic studies relevant to the ENAM primary site can also be included, if the IP for ENAM is finalized before the proposal deadline).
- Workshop proposals for science or implementation at all primary sites.
- Post-doctoral proposals relevant to GeoPRISMS science plans (with the same caveats listed in items 1-3 above).

GeoPRISMS Online

Charles Bopp, Science Coordinator

In March 2012, the GeoPRISMS website underwent a major software upgrade. With this new software installed, many new features and improvements are now possible. Recent changes to the GeoPRISMS website include:

- A discussion forum has been installed (find it at geoprisms.org/forum). Currently, the ExTerra and ENAM communities use it, but it is open access. Registration is free, and if you would like a dedicated area of the forum contact the GeoPRISMS Science Coordinator or send a message to webmaster@geoprisms.org
- New email addresses have been created for GeoPRISMS business. Messages related to GeoPRISMS Meetings can be sent to meetings@geoprisms.org; and messages about reimbursements can be sent to reimburse@geoprisms.org.
- Listserv notices now automatically post to Twitter; follow us at twitter.com/GeoPRISMS!
- The GeoPRISMS Media Kit 2012 is now available. The Media Kit includes PowerPoint themes and overview slides about the GeoPRISMS (and MARGINS) program(s). Download your copy at geoprisms.org/logos.
- Use of tabbed interfaces for most GeoPRISMS webpages. Tabs put all the important information groups at the top of the page, making navigation and organization easier for the user. Have a comment about the tabs? Send it to webmaster@geoprisms.org.

New features are also coming our way in the next six months, look forward to:

- Improved initiative (SCD & RIE) and primary site pages featuring pertinent information and news.
- GeoPRISMS ScienceBites: short synopses of research presented at GeoPRISMS meetings and events. Look for these in the initiative pages.
- Newsletter content online: GeoPRISMS has always made the newsletter available for download as a PDF, but soon newsletter articles will appear as HTML articles.
- The GeoPRISMS image gallery will soon be available to registered users. Anyone who has registered at the GeoPRISMS website will be able to upload images for all to see (and use) at the GeoPRISMS website.

Workshop Report: EarthScope - GeoPRISMS Science Workshop for Eastern North America (ENAM)

Frank Pazzaglia (Lehigh University), Dan Lizarralde (WHOI), Vadim Levin (Rutgers University), Martha Withjack (Rutgers University), Peter Flemings (University of Texas, Austin), Lori Summa (ExxonMobil), Basil Tikoff (University of Wisconsin, Madison), Maggie Benoit (The College of New Jersey)

Background and Motivations

The joint EarthScope-GeoPRISMS Eastern North America (ENAM) workshop held at Lehigh University from 26-29 October, 2011, with an attendance of ≈100 participants (Figure 1). EarthScope and GeoPRISMS represent research communities of geoscientists who study the processes that build continents, open oceans, and erode, transport and deposit sediments, along with the associated natural hazards of earthquakes, tsunamis, sea level rise, and landslides, both on land and under water. EarthScope science is undertaken primarily, but not exclusively on land and involves a facility of transportable and flexible arrays of seismometers with the primary goal of imaging the lithospheric and sub-lithospheric foundation of the United States. GeoPRISMS conducts shoreline-crossing interdisciplinary research to probe the processes that form and modify continental margins. Collectively, EarthScope and GeoPRISMS research provides an integrated framework for understanding the breadth of processes that govern continental formation, break-up, and evolution in the unique ENAM setting, and for assessing associated natural hazards and natural resources, in the US and Canada.

Further motivations for the convergence of interests in ENAM include the arrival of the EarthScope transportable array (TA) in 2012-13, while GeoPRISMS has identified ENAM as a primary site for research focused on rift initiation and evolution (RIE). The USGS also has been contracted to conduct a marine seismic survey of the US Extended Continental Shelf (ECS), tentatively in 2013. Concurrently, energy companies are showing a growing interest in the evolution of deep-sea margins, such as those along the eastern margin of North America. These activities offer distinct opportunities to leverage planned and potential onshore (e.g., USArray, FlexArray) and offshore (USGS or industry marine seismic surveys) programs. Therefore the timing is now ideal to organize the two communities and to identify the crucial science targets, and to develop or modify the strategies needed for science implementation for ENAM.

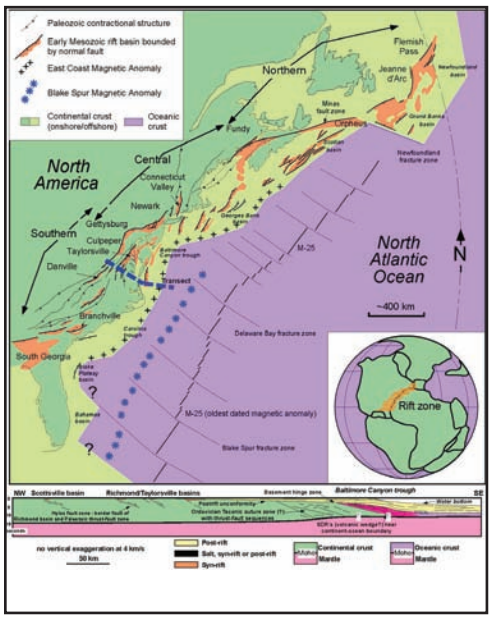
Figure 1. Workshop attendees gather outside the STEPS facility at Lehigh University during the EarthScope-GeoPRISMS Science Workshop for Eastern North America.

The GeoPRISMS community identified ENAM as a primary site to investigate rift initiation and evolution, in part because of the wide range of opportunities the geologic and geophysical setting provides for studying rifting and post-rift processes (figure 2). These include an apparent south to north transition from magma-rich to magma-poor break-up, numerous exposed and buried rift basins, thick archives of post-rift sediments and sedimentary rocks in shelf-slope basins, and well-documented surface processes. Similarly, ENAM appeals to the EarthScope community because of a long debated north to south transition in Appalachian structure, the west to east transition from craton to continental margin, the opportunity to investigate tectonic heredity in the context of continental assembly and dispersal, the emerging appreciation that sub-lithospheric dynamic mantle flow impacts surface dynamics, and the characterization of active seismic zones in a passive-margin setting.

An important goal of the science workshop was to focus the broader community effort on cross-disciplinary learning and approaches to collaborative science dedicated to the aforementioned science topics embodied in the archetypal passive margin. The workshop provided a national and international forum of scientists from universities, national laboratories, federal and state agencies, and industry, and included a colloquium and field trip specifically designed for early-career researchers including masters, doctoral, and post-doctoral scientists (figure 3).

Workshop Overview and Narrative

The workshop was constructed around two and one-half days of plenary presentations, short reports on “hot topics”, break-out sessions, and plenary discussions and decision making. Presentations and break-out sessions were organized around topics presented in participant white paper reports, and included: (a) orogenic processes, (b) rifting processes, (c) post-rift processes, and (d) neotectonic and surface processes. The break-out group attendance was designed to ensure diversity of thought, geographic interest, and synergy among the GeoPRISMS and



EarthScope communities. Subsequent break-out discussions were defined by evolving participant interest in the geographic regions best suited to pursue the process-oriented science relevant to their field of study. Throughout the workshop, lively discussion ensued on how to best leverage the respective approaches of the GeoPRISMS and EarthScope communities in ENAM research.

Early in the meeting, we reviewed the EarthScope and GeoPRISMS Science Plans with particular focus on their implication for the Eastern North American Margin (ENAM). The EarthScope science plan (http://www.earthscope.org/ESSP) and accompanying presentations of the 2009 science plan workshop articulate the key science targets for EarthScope research. Many of these science targets have direct relevance to ENAM, and presentations at the 2011 EarthScope National Meeting highlighted a range of scientific results from the study of these targets. More specific to ENAM was a 2004 EarthScope conference that focused on research frontiers and opportunities (http://www.earthscope.org/workshops/archive).

Similarly, the GeoPRISMS science plan (http://www.GeoPRISMS.org/science-plan.html) identifies rift initiation and evolution (RIE) as one of its initiatives. The implementation plan identifies

Figure 2 (left). Eastern North America and the major tectonic elements. The East Coast Magnetic Anomaly approximates the extent of seaward dipping reflectors in the continent-ocean boundary (red reflectors in the cross-section). Inset shows the configuration of Pangea during the late Triassic (Olsen, 1997) and highlights the rift zone between ENAM and NW Africa and Iberia. Modified from Withjack and Schlische (2005). Figure 3 (right). Frank Pazzaglia provides an overview to ENAM geology and tectonics during the student symposium.

ENAM as one of two RIE primary sites where the processes of continental rifting and transition to a passive margin will be studied. At ENAM, GeoPRISMS asks several interrelated questions regarding the distribution of lithospheric deformation, the influence of magmatism and pre-existing structural and compositional heterogeneity, the variation of rift structure and magmatism, the mantle dynamics of the syn- and post-rift margin, the processes that accompany the transition from late-stage rifting to mature seafloor spreading, how the margin has been influenced by post-rift tectonics, the identification of the magnitudes, mechanisms and timescales of elemental fluxes between the Earth, oceans and atmospheres along a passive margin during and after rifting, and characterizing the scales and frequency of submarine landslides and related natural hazards.

The first day of the meeting was dominated by plenary and hot-topic presentations that focused on building a content- and knowledge-base for ENAM from the wide range of geoscientific perspectives present at the meeting. Afternoon breakout sessions followed with a focus on the introduction of key research ideas and consideration of research corridors where the science could best be performed. What emerged out of this exercise was the organization of ENAM into three geographic regions: (1) a Northern area encompassing Atlantic Canada and New England; (2) a Mid-Atlantic region stretching from New York City to North Carolina; and (3) a Southern area stretching south from the Carolinas and wrapping around to the Gulf Coast.

The second day opened with breakout reports that articulated the geographic organization of science topics, followed by a slate of short presentations that focused on active tectonics, geodynamic modeling, and reports from aligned facilities, government organizations, and international partners. At this point, workshop participants were fully informed of the major science topics, high-interest focus areas, and opportunities for research synergy with community and industry partners. These presentations showed that the collective interests of university scientists, the USGS, and energy companies could provide a basis for a collaborative active-source seismic study offshore of the eastern United States, perhaps in the form of a jointly funded community experiment.

In the second round of breakout sessions workshop participants were charged with self-organizing into the three break-outs defined by geographic area, based on the results of the Thursday discussions. Nearly equal numbers of scientists attended the Northern and Southern geographic area break-outs, with a slightly larger proportion of participants attending the Central break-out. GeoPRISMS and EarthScope interests were similarly well-distributed among the three break-outs. In all groups, there was synergy across the shoreline among the terrestrial-based and marine-based geologists and geophysicists.

The relative size of the three geographic regions and the composition of the break-

out attendees influenced the break-out discussions and the level of science implementation detail. The Southern break-out group restricted their consideration to the Atlantic margin to allow a purposeful overlap with the EarthScope TA. Similarly the Central group explored a number of potential shoreline-spanning projects because of the relatively restricted geographic area. In contrast, the Northern group was challenged with a greater diversity of interests and possible projects given its larger size. The deliverable from this third break-out exercise were focus areas, defined by polygons drawn on copies of the GSA Geologic Map of North America for the ENAM region (Figure 4).

Breakout reports followed that defined and presented the research corridors. The Southern group settled on a swath that stretched from eastern Tennessee, through South Carolina centered on Charleston, and out onto the shelf on the Blake Plateau. The justification for this line includes a classic cross section of the southern Appalachians, incorporation of two seismic zones, including one that generated a historic M 7 earthquake, a traverse of rift basins that may contain the oldest syn-rift and post-rift sediments, a swath of the shelf that is underlain by potentially the oldest ocean crust, alignment with a funded mid-continent EarthScope project (OINK), and alignment with the Cape Fear Slide (CFS), perhaps the largest slide complex on the U.S. Atlantic margin.

The Central group defined two northwest-to-southeast mid-Atlantic focus areas, one in the south centered on Richmond, VA and one in the north centered on Philadelphia, PA. Both focus areas provide numerous opportunities for studying Appalachian structures, including the transition in deformation style from the northern Appalachians to southern Appalachians, Mesozoic rift basins, active seismic zones, and regions of documented recent deformation indicated by offset of deformed stratigraphic and geomorphic markers. They also take advantage of the thickest, richest, and best studied shelf-slope basin (the Baltimore Canyon Trough). The Richmond focus area has the added advantage of traversing early Cenozoic intrusive rocks. Given the close spatial position of the Richmond and Philadelphia focus areas, participants discussed the possibility of orienting a focus area parallel to the coast, centered more or less on the Fall Zone in an effort to take advantage of key features spanning the coastline in both the Philadelphia and Richmond areas. A north-south-oriented marine seismic line was also proposed that would link the extensive seismic and borehole data present across the continental shelf. As the U.S. Mid-Atlantic margins encompass the densest populations centers in ENAM, understanding the array of onshore and offshore geohazards are of particular concern for this region.

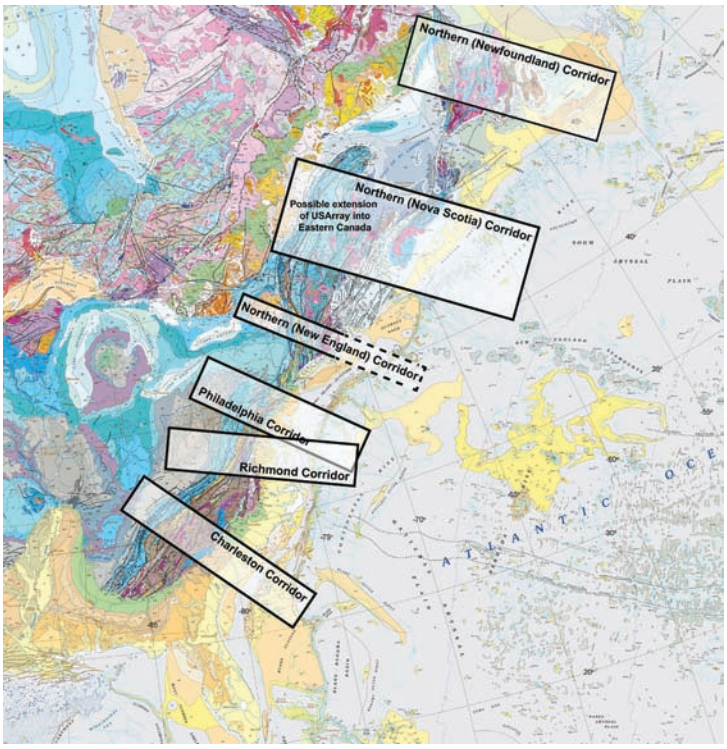


Figure 4. DNAG geologic map of eastern North America (modified from http://esp.cr.usgs.gov/info/gmna/) showing the focus areas defined for EarthScope-GeoPRISMS synergistic research in ENAM.

The Northern group defined a focus area centered on Nova Scotia that is positioned to take advantage of the well-known south to north transition from magma-rich to magma-poor continental margin. This focus area enjoys public access to an excellent Nova Scotia government-sourced database of industry seismic and well data for the Scotian basin, crosses the well-exposed Fundy rift basin, and shares a well-studied conjugate margin with Morocco. Notably, the EarthScope TA would have to be extended into Nova Scotia to take full advantage of onshore-offshore synergy. Nova Scotia is not currently part of the planned TA deployment, and modification to that plan will take effort and leadership by those individuals interested in studying this part of ENAM. The Northern group also defined a more narrow focus area stretching from the Adirondacks through southern New England and out onto the southern Georges Bank basin. There was considerable EarthScope geologic interest for study in this region, but it was not paired with equal enthusiasm for offshore research in the GeoPRISMS community, largely because the New England seamounts may overprint rift-related structure on the margin here.

Saturday morning opened with break-out reports for science implementation for the focus areas defined and supported on the previous day. There was lively discussion regarding how best to integrate field studies and data collection with several of the numerical models that had been presented. Discussion also ensued on which focus areas were best suited to leverage available resources and synergy with industry and community partners. There was an emerging sense that all of the focus areas had merit, but that there

was greater potential for EarthScope-GeoPRISMS synergy in the Charleston and Nova Scotia focus areas, although lying outside the EarthScope study area challenged the latter.

At this point, the students were asked to give their perspective on the meeting, which included an independent evaluation of the science goals and prioritization of the focus areas based on those goals, inferred likelihood of success, and best opportunities for EarthScope-GeoPRISMS collaboration. The student report provided an objective summary of the workshop prepared by a group that was fully engaged in the process. They offered a rank order of the focus areas, with the best potential for EarthScope-GeoPRISMS collaboration as follows: Charleston, Nova Scotia, Richmond, Philadelphia, New England.

The student report was followed by short presentations and a panel discussion of ENAM broader impacts led by representatives of the GeoPRISMS and EarthScope outreach offices as well as David Smith, representing the Allentown, PA-based DaVinci Science Center. Collaborative EarthScope-GeoPRISMS research along the ENAM offers important opportunities to address a range of societal issues that can impact the most densely populated part of the nation. Natural hazard catastrophes are not in the collective memory of the nation with respect to ENAM, but in recorded history there have been very large, damaging earthquakes, and there is emerging, albeit controversial evidence for tsunamis. Other, related hazards include submarine landslides, potentially catastrophic clathrate degassing, fluid venting, sedimentation and erosion, flooding, and sea level rise. Infrastructure built along the North Atlantic margin range from wind power to telecommunications, and would be affected by such catastrophic events, as well as long-term sea level change. ENAM research also will contribute to the geotechnical considerations of siting the next generation of nuclear power plants, a dozen of which are operating, under construction, or ordered as of 2009-11. The Atlantic margin is a prime target for hydrocarbon exploration, motivating an improved understanding of past and present processes of the ENAM. Onshore and offshore basins and basalt flows are actively being evaluated as targets for carbon sequestration. Finally, focusing efforts on the North Atlantic margins, particularly in eastern North America, opens the door for extensive education and outreach to US schools and universities active in Earth Science research.

Several opportunities were identified during the workshop for carrying out ENAM-wide synoptic studies, with a focus on those that would provide regional data sets that would benefit a wide range of GeoPRISMS and EarthScope researchers, i.e., the broader community. Specifically, there was discussion of the fate of the EarthScope TA once the planned deployment ends in 2015. Three main ideas were floated and discussed: (1) Plan to leave one in four TA instruments in ENAM and have these instruments adopted by state surveys, the NRC, and universities. This would provide for a widely spaced backbone (≈250 km) of instruments that could be densified by an FA for future EarthScope projects and OBS deployment for GeoPRISMS projects; (2) leave a 70-km spaced TA in place at one of the focus areas for more detailed, long-term studies of that region; (3) remove the TA completely and reassign the instruments to the FA pool for greater access and shortened wait times for smaller, more focused studies. The majority opinion was to exercise option (1), which is already taking place. A shorter discussion noted the opportunities for a parallel extension of a PBO GPS network. One EarthScope RAPID project has subsequently been successful in installing two PBO receivers on either side of the fault that ruptured in the 2011 VA earthquake.

A similar discussion was devoted to the possibility of a regional MCS and wide-angle survey along ENAM, leveraging planned USGS operations to conduct a seismic survey of the Extended Continental Shelf along the mid-Atlantic margin (see page 9, this issue). In addition, there was discussion about the future deployment of ocean bottom sensors as part of the Amphibious Array Facility (AAF) currently deployed along the Cascadia margin. The consensus was that the GeoPRISMS community needs to act now to demonstrate the interest to have these instruments move to ENAM when the facility leaves Cascadia. In the cases of future OBS or TA redeployment in ENAM, all participants agreed that one or more "heroes" will have to take up the cause and work closely with the community, NSF, IRIS, the USGS, and others to insure that there is lasting facility infrastructure in ENAM.

GeoPRISMS Data Portal

www.marine-geo.org/portals/geoprisms

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
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

Joint EarthScope-GeoPRISMS Eastern North American Margin Workshop Graduate Student Activities and Symposium

Maggie Benoit (The College of New Jersey)

Figure 1 (left). Group shot of student symposium field trip. Figure 2 (below). Student symposium attendees learning about the deformed strata exposed in the quarry.

The joint EarthScope-GeoPRISMS Eastern North American Margin (ENAM) workshop was held at Lehigh University in Bethlehem, PA from October 26-29 2011. This workshop brought together researchers working from both communities to articulate research priorities in the region. A total of 11 graduate students participated in a pre-workshop symposium and other activities over the course of the workshop designed to cultivate the next generation of GeoPRISMS scientists into interdisciplinary researchers.

The symposium was organized by Frank Pazzaglia (Lehigh) and Maggie Benoit (The College of New Jersey) with assistance from the GeoPRISMS Office staff and meeting conveners. It was kicked off with a series of talks about the rational for the workshop and tectonic history of the region. Maggie Benoit gave an introduction to the EarthScope and GeoPRISMS Programs, describing their similarities and synergies, as well as an overview of the RIE and SCD initiatives. Talks relating the orogenic, rifting, and geomorphological history of the region followed by Frank Pazzaglia, Martha Withjack (Rutgers), and Ryan McKeon (Lehigh), respectively. Then the graduate students gave 3-5 minute pop-up presentations about their research and interest in the region.

Everyone then set off for a field trip to the Appalachian foreland lead by Frank Pazzaglia and David Anastasio (Lehigh). The group examined the sedimentary structures produced during the orogenesis, and the trip was designed to give early-career geoscientists important observational skills to read and interpret the rock record. Key stops included limestone and slate quarries, as well as the Taconic unconformity along the Appalachian Trail. The trip concluded with a pizza dinner sponsored by ExxonMobil, before the students joined the other workshop participants for an icebreaker.

At the meeting, students interacted with pre-assigned mentors, who are established researchers in their field. The mentors shared meals with their mentees, introduced them to other scientists in the field, and provided formal feedback on their posters. The program was designed to provide students with an opportunity to network, obtain career advice, and enhance the sense of community among GeoPRISMS scientists.

Throughout the workshop, the students participated in the various breakout groups and plenary sessions, and they were tasked with providing their own viewpoint on the synergies between EarthScope and GeoPRISMS and what they thought were the best locations for research corridors along the margin. They presented their conclusions on the final day of the workshop, concluding that they indeed thought that the process of the workshop was like 'sausage making.' They also concluded that across-strike research corridors through Nova Scotia and Charleston would be able to best accomplish the GeoPRISMS science goals. They also took the organizers' advice to 'think big,' and recommended that there be an OBS array in the Atlantic, much like the onshore EarthScope Transportable Array, to examine the offshore region in better detail.

U.S. Earth Scientists Prepare for a Community Seismic Experiment in the ENAM Primary Site

Harm Van Avendonk (University of Texas at Austin, Institute for Geophysics), Beatrice Magnani (University of Memphis, Center for Earthquake Research and Information)

The Eastern North American Margin (ENAM) was chosen as a GeoPRISMS Rift Initiation and Evolution primary site because it represents a mature rifted continental margin in which the entire record of continental break-up and rifting is preserved. The rifting history along ENAM is well recorded in basin stratigraphy and the underlying crustal structure, although subsidence, sediment transport and fluid flow are presently the dominant geological processes along the margin. The study of old rifted margins is often challenged by a thick cover of sediments, which masks much of the deep crustal structure. This is also true for ENAM; however, over the next few years, unprecedented opportunities exist to carry out focused geophysical studies, revealing both shallow and deep structures of ENAM in greater detail.

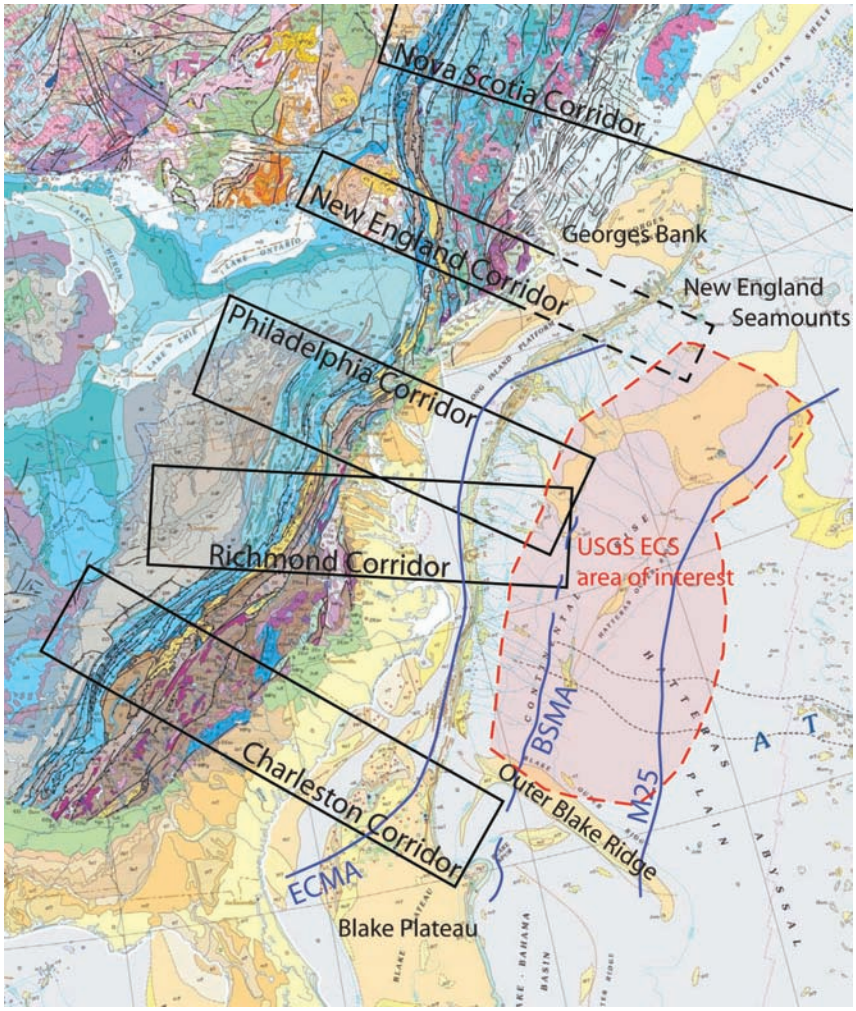


Figure 1. Map of Discovery Corridors in ENAM focus area. The red shaded area is the target of the USGS seismic program on the U.S. Extended Continental Shelf. ECMA = East Coast Magnetic Anomaly, BSMA = Blake Spur Magnetic Anomaly.

The convergence of two activities along ENAM serves to frame data-gathering opportunities. In 2013, the EarthScope Transportable Array (TA) will arrive in ENAM, and the USGS is planning a marine seismic reflection and a limited refraction study of the Extended Continental Shelf (ECS) along ENAM onboard the seismic vessel R/V Marcus Langseth, possibly as early as 2014. In addition, there is renewed interest from energy companies in the exploration of ENAM . At the joint Earthscope-GeoPRISMS Science Workshop on Eastern North America, held at Lehigh University in October 2011 (see page 4, this issue), discussions among various academic, government and industry scientists led to the suggestion that a community active-source seismic experiment could improve our understanding of the deep structure and evolution of ENAM, and make the best use of existing resources and upcoming opportunities. The planned USGS active-source seismic operations over the ECS provide part of the immediate impetus for such an experiment; however, the possibility exists to extend some of the proposed USGS profiles landward to image deep margin structures and obtain important seismic velocity constraints. Given the limited mission of USGS ECS surveys, funding to extend these profiles and record air-gun shots on-land must come from NSF, possibly with some industry sponsorship.

A GeoPRISMS-sponsored luncheon was held in San Francisco on December 8, 2011, during the AGU Fall Meeting. About 30 scientists met to discuss further the conceptual framework of a community proposal for an ENAM active-source seismic experiment. Several scenarios were discussed, from minimum-cost to comprehensive coverage. The latter could include onshore-offshore operations, e.g., air-gun shots from the R/V Marcus Langseth recorded not only by its 8-km-long multichannel seismic streamer, but also by co-linear OBSs and EarthScope Flexible Array seismometers, deployed along on-land extensions of selected marine seismic transects. In addition, land-based shots along these transects could be recorded by Flexible Array seis-

mometers as well as by OBSs, providing reverse coverage. Additional PI-driven piggyback deployments offshore and onshore could be designed to take further advantage of the community seismic effort. The consensus at the luncheon was that such a joint seismic experiment is feasible and opportune; however, the timing may depend on the final schedule for the USGS seismic program.

The GeoPRISMS ENAM primary site spans much of the U.S. and Canadian Atlantic margins, from Charleston to Nova Scotia. However, budgetary and logistical constraints require that the target area of a community seismic experiment be much smaller. The area of interest for the planned USGS ECS seismic study lies between the Outer Blake Ridge offshore South Carolina in the south and Cape Cod to the north (Figure 1). Within this region, the planned ECS seismic survey consists of profiles spaced 60 nautical miles apart, spanning the interval from the continental shelf break to the 200 nautical mile limit. To meet GeoPRISMS objectives, some of these profiles would be extended landward across the shelf, and onshore, where air-gun shots would be recorded by land stations.

At the EarthScope-GeoPRISMS Science Workshop at Lehigh, participants identified a few major corridors where dense data acquisition would benefit integrated studies of rifted margin processes (Figure 1). The "Philadelphia" and "Richmond" corridors exhibit pronounced along-strike structural variations in the Appalachians; thus, seismic transects that cross the shoreline in these two areas may yield insights into the role of inherited orogenic structure on the development of rift half-grabens, such as the Culpeper and Hartford basins, and the nature of syn-rift magmatic wedges that define the continent-ocean transition offshore. To the south, a transect in the vicinity of Charleston, SC, would image the transition between the Carolina Trough and the Blake Plateau, clarifying the structure and origin of basement in this area. In addition, the gas hydrate province of Blake Ridge is an important site for the assessment of geohazards on the continental slope. Comparisons of the deep-seismic structures along the northern and southern corridors would provide a view of regional differences in extension and magmatism during the opening of the Atlantic, helping to explain the linkages between these processes.

To have a true community experiment, broad participation from the U.S. scientific community is necessary. Researchers interested in participating in an ENAM community seismic experiment are invited to help with the (a) design of the active-source seismic data acquisition plan, (b) proposal writing, and (c) staffing of the data acquisition teams on-land and offshore. The involvement of graduate students and postdocs in this effort is very important, as these early-career scientists represent the core of the future GeoPRISMS and EarthScope communities. In the sprit of community science, we envision rapid data release and open data access following the experiment, enabling many members of the scientific community to participate in seismic data analysis and interpretation. Science proposals to use the seismic data could be submitted to NSF once the data are collected.

Although funding of the USGS seismic study of the ECS is currently uncertain, this field program is tentatively being planned for 2014. To create a successful partnership with the USGS in 2014, collaborative proposals must be submitted to the NSF GeoPRISMS and EarthScope Programs solicitations in 2012, on July 2nd and July 16th, respectively. Over the next few months, we hope to engage our colleagues in discussions about ENAM science priorities, and we welcome insights and contributions to the ENAM community seismic experiment proposal. Consider contributing through the GeoPRISMS forum site (http://geoprisms.org/forum) or by contacting us directly.

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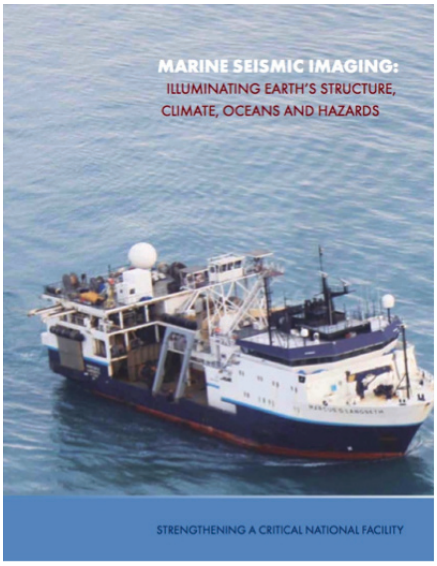
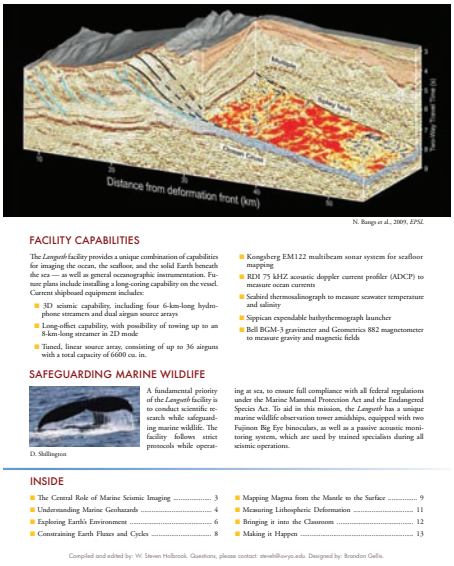
The Future of Academic Marine Seismic Imaging

W. Steven Holbrook (University of Wyoming) and Graham Kent (University of Nevada, Reno)

Seismic imaging is a critical technology in support of many GeoPRISMS goals, from quantifying serpentinization in subduction zones to elucidating the subsidence history of rifted margins. A community planning effort that began with a Spring 2010 workshop has produced two planning documents: a workshop report and a recently released "glossy brochure" highlighting the scientific rationale for supporting and strengthening our national marine seismic facility, the R/V *Marcus G. Langseth* (See http://www.steveholbrook.com/mlsoc for more information). Here we summarize a few highlights of those documents.





The *Langseth*, which is owned by NSF and operated by Lamont-Doherty Earth Observatory, is unique among ships in the UNOLS fleet, in that it is not just a research vessel, but also a national facility (a distinction it shares with the DSV *Alvin*). This means that the vessel is overseen by the Marcus Langseth Science Oversight Committee (MLSOC), a UNOLS committee that serves as a link between the user community, NSF and LDEO. The *Langseth* provides unique capabilities for imaging everything from the interior of the ocean to the upper mantle, including 3D imaging and large air gun sources to support wide-angle OBS and onshore-offshore seismic surveys.

A major goal of the 2010 workshop and subsequent activities is to devise strategies for increasing access to the *Langseth* and the data it produces. In practice, opportunities to conduct research using the *Langseth* (and its data) are somewhat limited, due both to finite funding and a status quo of relatively "closed" research expeditions. For the *Langseth* facility to thrive in a climate of increasing budgetary pressure, it must be open to all interested practitioners in more than a *de jure* sense – it must become a *de facto* part of the research and education portfolios of a much broader range of scientists and educators. The *Langseth* must become the "Hubble telescope" of Earth science: a stably funded, widely accessible platform for integrated educational and research activities that serve and involve a diverse community. The *Langseth* should become a household name, famous among the lay public as the downward looking "telescope" that is unlocking the Earth's secrets. Fortunately, we are entering an auspicious moment in history that makes this possible: technology provides a level of connectedness that enables the sharing of data, ideas, and images in ways that were unimaginable a decade ago. New, user-friendly software lowers the barriers of entry to marine seismology, especially at the undergraduate level. The plan outlined by the marine seismic community at the 2010 workshop will broaden access to the national marine seismic facility and its data – creating a "bigger tent" that will lead to better, higher-impact science.

The new "Marine Seismic Imaging" brochure presents a path toward building that bigger tent, by shining a spotlight on *Langseth* science and recommending an increasingly open-access, community-based approach. The brochure includes contributions from a cross-section of the *Langseth* user community highlighting scientific results in many areas, including methane hydrates, sea level change, mid-ocean ridge processes, island arc structure, great subduction zone earthquakes and tsunami. The brochure finishes with a call for stabilized funding for the national seismic facility.

The GeoPRISMS program represents a major opportunity to continue the efforts to broaden the *Langseth* user community. The MLSOC stands ready to work with the GeoPRISMS community toward building community-based approaches to conducting seismic expeditions in the GeoPRISMS focus sites; an early example of such an expedition will occur in summer 2012 on the Cascadia margin. See http://www.unols.org/committees/mlsoc for more information about the *Langseth,* MLSOC, and related links. If you would like a copy of the workshop report or brochure, you can download a pdf from http://www.steveholbrook.com/mlsoc, or contact Steve Holbrook (SteveH@uwyo.edu) or Graham Kent (gkent@unr.edu) directly.

Magmatic Rifting and Active Volcanism Conference, Afar Rift Consortium

Anne Egger (Central Washington University), Tyrone Rooney (Michigan State University), and Donna Shillington (Lamont Doherty Earth Observatory)

Conference Overview

The Magmatic Rifting and Active Volcanism (MRAV) Conference took place in Addis Ababa, Ethiopia January 10-13, 2012, convened by members of the Afar Rift Consortium, an international team investigating active magmatism and deformation in the Afar region. Over 200 people from around the world attended. The conference participants primarily presented the results of work on ongoing rifting processes in Afar, but work was also presented that addressed other portions of the East African Rift, comparable rift settings elsewhere, rifting processes in general, and the hazards and resources associated with the East African Rift.

The scientific program outlined the current state of knowledge in the East African rift and placed recent discoveries within the broader context of rift-related research globally. Central to the meeting was the presentation of results from thematic, multi-collaborator, international programs (e.g. Afar Consortium, RiftLink, Actions Marges), individual research groups, and industrial partners. The rich detail and modern datasets presented at the meeting highlight the importance of the existing infrastructure of international research in East Africa, which should be leveraged by GeoPRISMS to effectively focus resources in the extensive East African Rift System primary site.

Scientific Advances in East Africa Related to GeoPRISMS Goals

What follows is a brief summary of scientific results reported at the MRAV conference. A complete volume of abstracts and the program can be found at http://www.see.leeds.ac.uk/afar/new-afar/conference/conference.html. We present these results in the context of the questions outlined in the GeoPRISMS science Implementation Plan for the East Africa Rift System (EARS).

<u>How is strain accommodated and partitioned throughout the lithosphere, and what are the controls on strain localization and migration?</u>

A significant focus of the conference was the 2005 Dabbahu rifting event, which was dominated by a series of 14 dike intrusions and 4 eruptions with an estimated 2.5 km^3 of magma intruded since September 2005. The initial Dabbahu diking events affected a large portion (60 km) of the magmatic segment, while subsequent activity was more localized. Several lines of evidence (including InSAR and seismicity) indicate that diking preceded and drove seismicity in the Dabbahu events. Importantly, the seismic moment and the associated slip along faults accounts for only 10% of the geodetic moment, indicating that most deformation in this rifting event was taken up aseismically, through dike injection or other igneous intrusion. Many aspects of this rifting resemble the 1974-89 rifting event at Krafla, in Iceland.

Additional recent tectonic activity reported on at the conference included the 2010 Gulf of Aden seismic swarm, which occurred along three segments of the rift at depths of less than 10 km. The 1989 Dobi earthquake swarm in central Afar appears to have followed a "bookshelf faulting" model, with slip occurring on at least 14 different faults during the earthquake sequence. The Asal rift was imaged with RADARSAT from 1997-2008; this time series showed 2-3 m of opening, accompanied by subsidence in the rift itself and uplift on the flanks with some component of shear.

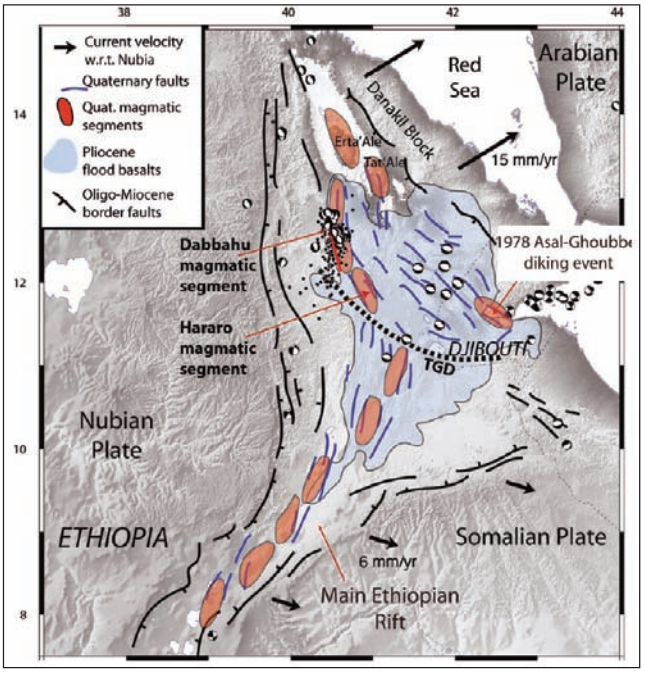


Figure 1. Map of the Afar rift region showing major tectonic and magmatic features from Ebinger et al., 2008.

<u>What factors control the distribution and ponding of magmas and volatiles, and how are they related to extensional fault systems bounding the rift?</u>

The Dabbahu event was dominantly a diking phenomenon, with magma playing a key role in crustal deformation. Similar to other portions of the rift, fractional crystallization processes and magmatic plumbing systems differ between axial and off-axis magmas. Resistivity surveys, surface velocity models, and receiver functions in the Dabbahu area all suggest that some 3000 km^3 of magma remains in the crust, possibly stored in elongated magma chambers parallel to the rift axis, and that these may erupt on ≈40 ka cycles. At upper mantle and lower crustal depths, the resistivity structure of active and inactive segments of the Afar rift are similar. The most significant heterogeneity exists at mid-crustal depths and is related to the presence or absence of melt.

Very high-resolution seismicity obtained through deployment of seismometer arrays helps detail the relationship between magmatic activity and faulting. While



Figure 2 (left). Main Ethiopian Rift Valley and the eastern margin. Figure 3 (center). Field trip participants examine 'blister cave' in a welded tuff in the southern Afar. Figure 4 (right). A fissure of the edge of Lake Besaka. Fantale volcano is in the background; it last erupted 170,000 years ago.

normal faulting occurs during the diking process, regions where magmatism has occurred are less seismically active. More broadly in the region, rift basalts show expected age progression with the youngest basalts at the center of the rift, and pointing to a spreading rate of 12 ± 1 mm/yr. However, less clear is off-axis magmatism, which shows no simple age progressive trend.

How does the mechanical heterogeneity of continental lithosphere influence rift initiation, morphology, and evolution?

Many presentations addressed aspects of the rift beyond the Dabbahu event. Comparing the recent, well-studied and well-constrained rifting event in Afar with the longer geologic record highlights that these processes change over time. Primarily, the asymmetry of the Afar rift suggests that the locus of rifting has migrated eastward. The orientation of different fault sets in the Asal-Danakil rift indicate two different directions of tension between 1.35 Ma and 0.3 Ma. This could be due to magmatic loading and flexure of the crust in addition to extension. Paleomagnetic data suggest minor block rotation (≈7°) in Afar. The marginal grabens on the western edge of Afar are enigmatic: still seismically active, on top of the steepest gradient of crustal thickness. They are likely developed over crustal flexure, and the variability from north to south is controlled by migration of a wave of erosion. Farther south, thermochronology from the Albertine section of the rift show a complex, multi-stage cooling history and differential uplift within mountain blocks.

Several geophysical results suggest that structures at the surface mimic and reflect structures at depth in the lithosphere. Crustal anisotropy (fast direction) and the geoelectric strike both match the orientation of surface structures, with a transition zone in Afar. Both also increase in the magmatic segments of the rift: anisotropy is sensitive to strain fabrics, and MT to presence of melt. Shear-wave splitting directions in the mantle are different below mid-ocean ridges and the East African Rift. Below the Main Ethiopian Rift, they are parallel to rift axis; below the EPR, they are perpendicular to the rift axis. At slower-spreading ridges (mid-Atlantic and Gakkel), they are more variable. Gravity profiles across Dabbahu suggest a Moho depth of 19 or 23 km, and that faults at the surface may continue at depth.

How does the presence or absence of an upper-mantle plume influence extension?

At a wider scale, discussions focused on the lithosphere-asthenosphere boundary and how the thermo-chemical state of the East African upper mantle impacted the rifting process in East Africa. The nature of the lithosphere-asthenosphere boundary differs on the rift flanks in comparison to the central part of the rift. Beneath the flanks, velocities decrease with depth, suggesting melt pockets at the lithosphere-asthenosphere boundary, whereas velocities increase with depth beneath the main rift. These properties mean that at ≈70 km depth, the rift in Afar resembles the East Pacific Rise. These observations are consistent with observations that at 50-150 km depth, the lowest seismic velocities follow the ridge structure. However, at 300 km depth, there is a very broad anomaly that lacks structure and extends down to the transition zone. Elevated mantle potential temperatures are detected in Afar and throughout the East African rift, supporting seismic evidence of a deep upwelling. Despite these elevated temperatures, the magnitude of the observed seismic anomalies cannot be explained solely by a thermal means and requires a chemical component within the upwelling.

How does rift topography, on either the continental- or basin-scale, influence regional climate, and what are the associated feedback processes?

Rifting affects climate through the construction of topography, which can have a significant effect on the local distribution of precipitation. Results of modeling experiments suggest that both tectonic events (the development of high topography associated with rifting) and orbital forcing (variability in insolation) are likely to have affected climate in eastern Africa over the last 20 million years. The East African Rift is also an excellent location to explore the mesoscale affects of orography, due to the presence of multiple lakes. Lakes generate their own weather, and interact with prevailing winds and local topographic features. There are coring efforts underway in Lake Malawi to test these effects. Rift lake sediments preserve unique records of climate and tectonics, including key time intervals in hominid evolution.

Broader Impacts

Hazards

Volcanic hazard risks associated with

Ethiopian volcanoes are unexpectedly high, largely due to the uncertainties associated with individual volcanic centers. In particular, the geologic record is temporally limited. Of concern is that InSAR observations have shown that there are far more volcanoes that are currently deforming than have erupted historically, suggesting significant potential for future eruptions. To more broadly assess volcanic hazard potential, the NERC-funded 'Global Volcano Model', in cooperation with 12 international partners, seeks to better characterize potentially hazardous volcanoes.

Remote volcanic hazard monitoring through SO_2 emissions, InSAR, thermal imaging, and infrasound, provide means to monitor volcanoes in difficult to access areas. Eruptions in remote regions may not have an immediate hazard impact due to sparse habitation, however the Nabro event in Eritrea was determined to have been the largest SO_2 producer since 1991. These remote sensing techniques therefore have further application for global SO_2 models with obvious implications for climate change studies.

Resources

The economic potential of East Africa is substantial; energy, commodity and tourism resources are clear growth areas. Epithermal gold deposits in Afar that are associated with geologically modern hydrothermal systems linked to rift magmatism are targets of active exploration. The gold potential of these systems is enhanced by the relatively low salinity magmatic environment in the rift. The resources being devoted to this epithermal play speak to the resource potential of currently active rifts (i.e. we do not have to wait for them to fill with sediments and develop oil).

There is extensive oil exploration in Lake Albert region in Uganda, and many boreholes have been drilled. Little production is occurring at this time, due to transport constraints, although estimates of the resources are substantial (≈1000 million barrels). Oil exploration has also focused on the Lake Turkana region, where very detailed gravity, magnetic surveys and mapping have been completed.

Significant challenges remain in the electrification of East Africa. Only 15% of East Africans have access to electricity with an average consumption of 68 KwH/yr (compared with ≈2500 KwH/yr per person globally). With current production, every East African could light a 60W bulb 3 hours/day. Energy production needs to expand 33 fold. So far, only ≈1% of the geothermal potential of the Ethiopian Rift has been exploited. And while geothermal energy is a key area of exploration, there are inherent problems with power generation and cost scaling – small facilities are more costly to operate. There is also a drive to construct more dams for hydropower in Ethiopia, but the selection of dams is complicated by seismic and volcanic activity, which may be episodic.

One particularly interesting presentation addressed geotourism as a growing industry that should be examined in more detail, including prioritizing the generation of digestible information and graphics for visitor centers.

Opportunities and Challenges for GeoPRISMS

Attendees expressed strong interest in continuing research in the Afar region, as well as other parts of the East African Rift. Several projects are continuing or planned, and there are multiple opportunities for GeoPRISMS. Close collaborations with African scientists, particularly, will be essential to the success of GeoPRISMS work in the EAR, and many scientists from Ethiopia and elsewhere who attended the meeting expressed enthusiasm for such interactions.

The conference was opened by the Ethiopian Minister for Mines, who emphasized her desire to engage international scientists and the need to translate the scientific knowledge gained through research into economically useful information. The logistical, cultural, and administrative challenges of working in East Africa require and benefit from close collaboration with scientists from the host countries. Many of the participants from Africa were directly involved in the energy, commodity, or tourism industries, or other efforts that closely link to the scientific research being undertaken

Questions Arising from the Conference:

- What are the triggers for a large, caldera-forming eruption such as those that have clearly occurred in the Main Ethiopian Rift and Afar in the geologic record, but not historically?
- What controls dike initiation? Is there a ductile zone that buffers magma chambers from the brittle crust?
- What is the nature of the seismic activity along the western margin of Afar (and east of the Red Sea in Saudi Arabia) given that they are no longer the focus of rifting?
- There is a 10x discrepancy between short-term and long-term slip-rate velocities: why? Is this related to migration of main rifting or something else?
- Rhyolites at Dabbahu are not being generated through melting of crust, but through fractional crystallization. Is there evidence for dense cumulates at depth? Are they interacting with brines?

in the region. Another opportunity for GeoPRISMS scientists is to build successful cooperative efforts by linking the fundamental research to applications in energy, resource development, and hazards mitigation that can yield tangible benefits to the host country.

The conference was closed by the Dean of Research at Addis Ababa University, who articulated the need for a better understanding of the rift and its consequences for hazards and announced a new 5-year, $10 M Ethiopian birr (over $500,000 USD) initiative focused on hazards. Representatives from energy companies (including geothermal and hydrocarbon) and mining companies also attended the meeting and expressed interest in collaborating with international academic teams to better understand the tectonics and their consequences for resources. In January 2013, the 24th Colloquium of African Geology will be held in Addis Ababa, with sessions dedicated to the East African Rift, providing an additional opportunity to focus GeoPRISMS' efforts.

Numerous graduate students from around the world were present at the meeting, as well as several undergraduates from Addis Ababa University. The opportunities to build research capacity in Africa by involving graduate and undergraduate students from the host countries in research are tremendous, and should be a part of any GeoPRISMS effort.

Ultimately, GeoPRISMS must work closely with East African scientists and develop a strategy that complements and capitalizes on existing initiatives. The opportunities for meaningful collaborations are significant.

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Ebinger, C. J., D. Keir, A. Ayele, E. Calais, T. J. Wright, M. Belachew, J. O. S. Hammond, E. Campbell, and W. R. Buck (2008), Capturing magma intrusion and faulting processes during continental rupture: seismicity of the Dabbahu (Afar) rift, Geophys. J. Int., 174, 1138-1152.

Call for Interdisciplinary Mini-workshop Proposals

The GeoPRISMS Office and GeoPRISMS Steering and Oversight Committee (GSOC) seek to support early planning activities relating to GeoPRISMS science objectives, both at the new GeoPRISMS primary sites and for initiative thematic studies (see GeoPRISMS science planning documents at ***http://www.geoprisms.org/science-plan.html***). Members of the GeoPRISMS community can apply for support to organize and fund mini-workshops to be held in conjunction with national meetings, to bring together groups of interdisciplinary investigators for these purposes. Such mini-workshops can be associated with GSA, AGU or other national meetings at which the research area is well represented. Options for mini-workshops include 2-4 hour sessions in an evening, or half-day sessions before or after the meeting. Mini-workshops can bring together multiple investigators with interests in one of the primary sites, spanning multiple primary sites within one initiative, or addressing a theme that transcends initiatives, depending on the group's objectives and assessment of the greatest needs.

Mini-workshop proposals should be submitted at least three (3) months prior to the proposed meeting date to info@geoprisms.org. Proposals for mini-workshops during GSA 2012 are due July 1. Proposals for mini-workshops during AGU 2012 are due August 1.

Proposals should include the following:

- Scientific rationale for the workshop and reason for its timeliness
- Sufficient evidence that a wide group of interdisciplinary researchers would be able to attend
- The national meeting with which the mini-workshop would be associated
- Possible meeting dates and desired meeting format (evening, half or full day, pre- or post-meeting)
- Proposed number of attendees
- Anticipated costs (meeting space, refreshments, A/V equipment, etc.)
- Note: A detailed budget is not required initially, and participant travel and/or lodging costs cannot not be provided.

Approved proposals will have reasonable costs associated with the meeting covered by the GeoPRISMS Office. The office will also assist with logistical arrangements. Workshop conveners are responsible for developing the science program and communicating with participants on scientific matters. Any GeoPRISMS supported mini-workshop will be open to all interested parties and will be advertised via the GeoPRISMS mailing list and website. Workshop conveners will provide a summary, including major results of the meeting for inclusion on the GeoPRISMS website and newsletter within 60 days of the meeting.

Report on GeoPRISMS Mini-Workshop - "Using Geoinformatics Resources to Explore the Generation of Convergent Margin Magmas"

R. Stern (University of Texas, Dallas), M. Feigenson (Rutgers University), K. Lehnert and A. Goodwillie (Lamont-Doherty Earth Observatory), P. Van Keken (University of Michigan), J. Kimura (IFREE, JAMSTEC), B. Dreyer (University of California, Santa Cruz), E. Jordan and W. Lieu (University of Texas, Dallas)

Twenty geoscientists attending Fall AGU forsook the chance to enjoy a beautiful Sunday in San Francisco on December 4, 2011, and chose instead to descend into the bowels of the Grand Hyatt for the chance to explore how geoinformatics can help geoscientists understand the composition and generation of convergent margin magmas. The all-day workshop was organized in support of the science goals of the GeoPRISMS Subduction Cycles and Deformation (SCD) Initiative. SCD aims to understand how subduction zones work, from cold, shallow regimes (accretionary prism, forearc crust, and the seismogenic zone) to deeper, hotter regions where fluids and melts from the subducted slab trigger melting in the convecting asthenosphere above it. SCD builds on and integrates the successes of the predecessor MARGINS Seismogenic Zone and Subduction Factory experiments, targeting the Aleutian and Cascade arcs as community-chosen focus sites. The techniques and insights developed from studies of these arcs can be applied globally, and we hope to attract more geoscientists to join the "subduction parade". In our efforts to involve a more diverse group of geoscientists in this effort – from students to university professors to expert researchers - we need to develop better, more accessible tools for this community to use. The Geoinformatics workshop was an effort to attract new members of the GeoPRISMS SCD team and help prepare these geoscientists.

These are lofty goals that can only be realized if interested geoscientists gather to explore effective tools and how they can be used. The most important community tools are databases, data visualizations, and data analysis software. Examples of each of these were highlighted in the workshop, as is clear from the agenda below (with pertinent links and other information). Each 50 minute long session encouraged questions and comments from workshop participants and was followed by a 10-minute break that allowed folks to stretch and refuel with plenty of food and beverages provided by GeoPRISMS.

Figure 1. Dec. 2011 GeoPRISMS geoinformatics workshop participants.

1. Geochemical databases and how to access them – Kerstin Lehnert (LDEO) explained how geochemical databases such as PetDB, Georoc, SedDB, and NAVDAT (all of which can be accessed via Earthchem; http://www.earthchem.org/) are increasingly important aspects of teaching and research (including GeoPRISMS SCD). Kerstin also explained how the new SESAR (System for Earth Sample Registration; http://www.geosamples.org/) can resolve problems of sample ambiguity (for example: how many samples have the same ID, e.g., how many "D1" samples are there in dredge collections around the world?) and data redundancy (for example: how many samples have been analyzed multiple times for different elements and isotopes, each reported with slightly different IDs that are entered separately into one or more databases?). Kerstin emphasized how important it was that samples studied as a result of GeoPRISMS SCD should each be registered for IGSN (International Geo Sample Number), a 9-digit alphanumeric code that uniquely identifies samples and provides information about where these can be found.
2. Data Visualization Tool: GeoMapApp – GeoMapApp is an Earth science exploration and visualization application that is maintained and improved as part of the Marine Geoscience Data System at LDEO. Andrew Goodwillie (LDEO) (http://www.geomapapp.org). There are several YouTube GeoMapApp multimedia tutorials that can be accessed from (http://www.geomapapp.org/tutorials/index.html). Of special interest to this workshop is the fact that GeoMapApp has a new feature that allows users to determine the depth of the subducted slab beneath a given arc volcano, and one tutorial shows how to do this, using the global compilations of Syracuse and Abers (2006): (http://www.youtube.com/watch?v=JnXJ-Y8Ry0s).
3. Central America and Izu-Bonin-Mariana arc geochemical databases – Erika Jordan and Warren Lieu (UT Dallas). CentAm and IBM were focus sites for the MARGINS Subduction Factory experiment and geochemical data for these from EarthChem have been compiled and are being filtered so that these can be made available as an Earthchem data library (http://www.geoinfogeochem.org/grl/browse). Erika summarized the status

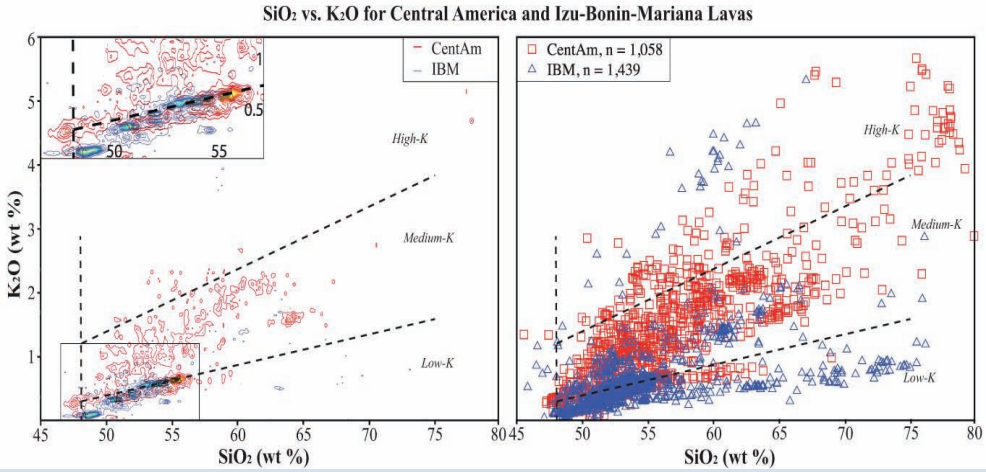


Figure 2. Two different ways to present large compilation geochemical datasets for volcanic rocks from the magmatic fronts of MARGINS Subduction Factory focus sites in Central America (CentAm, red, n=1,058) and Izu-Bonin-Mariana (IBM, blue, n=1,439), using K_2O vs. SiO_2 as an example. Most Central American lavas have higher K_2O contents at a given SiO_2 content than most Izu-Bonin-Mariana samples. Left panel presents contoured data, right panel shows individual data

of compilations for volcanic front lavas from these two focus sites, using graphs to show their geochemical similarities and differences. Once completed, these compilations will be available to anyone as a Geochemical Reference Library (http://www.geoinfogeochem.org/grl/browse). One of the important issues related to such compilations is how to best show these data. There are hundreds to thousands of data points in these compilations, so individual points on graphs often lie on top of each other and it can be difficult to see underlying structure. Warren showed how large data sets can be contoured and it is clear that making such data visualization tools available will be key for exploiting large geochemical data sets.

4. Thermal structure of subducted slabs – Modeling the thermal structure of subduction zones and using geochemical and geophysical data to test and refine these models is leading to some of the most rewarding collaborations between geodynamic modelers, geophysicists, and geochemists. After lunch, Peter van Keken (U. Michigan) presented some of the latest thinking about how lithosphere age and convergence rate control temperatures in subduction zones. It is the slightly (≈1%) more dense nature of the ≈100 km thick lithosphere relative to ambient mantle that makes plates subduct, but it is the thin veneer of subducted sediments and the upper, altered portion of the oceanic crust– typically only a few tenths of a percent of everything that is subducted – that controls the subduction zone incompatible element budget. We cannot understand the trace element and isotopic composition of arc lavas without understanding how sediments are cooked in the subduction zone kitchen. Subducted sediments lie athwart a very strong temperature gradient between hot convecting asthenosphere and cool conducting lithosphere, so it is not surprising that our thinking has fluctuated between a consensus that subducted sediments beneath the arc mostly are sufficiently cool that they only release hydrous fluids to the idea that they are mostly hot enough to melt. Thermal models for subducted sediments need to be tested and refined with geophysical and geochemical data and experiments.

5. Introduction to Arc Basalt Simulator 3.1 – Jun-ichi Kimura (JAMSTEC/IFREE) presented the theoretical underpinnings of an evolving software package for understanding arc petrogenesis, called "Arc Basalt Simulator", or "ABS". ABS is a forward model designed to match the incompatible trace element and radiogenic isotopic composition of primitive (high Mg#) arc lava by inputting appropriate subducted sediment and altered oceanic crust compositions and compositions of unmodified mantle wedge, choosing an appropriate subduction zone thermal model (from Syracuse et al., 2010) and adjusting some other subduction zone parameters, such as where fluids or melts are extracted from the downgoing slab and the depth of mantle melting. ABS is an Excel-based spreadsheet that can be run on any PC or Mac, so all members of the GeoPRISMS SCD community can use it. A tutorial walks the new user through the various functions of ABS 3.1. The ABS spreadsheet and ABS tutorial can be downloaded from the Geochemical Resource Library at this URL: http://grl.geoinfogeochem.org/view.php?id=248. A recent paper (Kimura et al., 2010) uses ABS version 3.1 to investigate compositions of primitive magmas along the Izu arc, and a new version (ABS 4) is being developed by Dr. Kimura and colleagues.

6. ABS exercise – Bob Stern (UTD) and Mark Feigenson (Rutgers) provided some practical experience with ABS3.1. Bob walked workshop participants through each of the ABS3.1 user-adjustable functions, then Mark showed the group how ABS 3.1 could be used to understand the composition of primitive Cerro Negro (Nicaragua) lavas.

There are some useful lessons to be learned for others considering proposing future workshops before or after national geoscientific meetings like AGU or GSA. It is important to start planning early so that possible participants have the

workshop on their "radar screens" before they buy their air tickets for the meeting, and so these societies can include the workshops on meeting announcements. In addition, workshop conveners should make a strong push to advertise the workshop at least two months before the meeting, in order to maximize workshop attendance. The conveners would be happy to discuss other considerations with people thinking about proposing a GeoPRISMS workshop.

References:

Kimura, J.-I., Kent, A.J.R., Rowe, M.C., Katskuse, M., Nakano, F., B. R. Hacker, P. E. van Keken, H. Kawabata, and R. J. Stern, 2010. Origin of cross-chain geochemical variation in Quaternary lavas from the northern Izu arc: Using a quantitative mass balance approach to identify mantle sources and mantle wedge processes. Geochemistry, Geophysics, Geosystems 11, Q10011, doi:10.1029/2010GC003050

Syracuse, E.M., Abers, G.A., 2006. Global compilation of variations in slab depth beneath arc volcanoes and implications. Geochem. Geophys. Geosyst. 7, Q05017, doi:10.1029/2005GC001045.

Syracuse, E. M., van Keken, P.E., and Abers, G.A., 2010. The global range of subduction zone thermal models, Physics of the Earth and Planetary Interiors 183, 73-90. doi:10.1016/j.pepi.2010.1002.1004

Report on GeoPRISMS Mini-Workshop - "Integrating CRISP IODP Drilling and 3D Seismic Study"

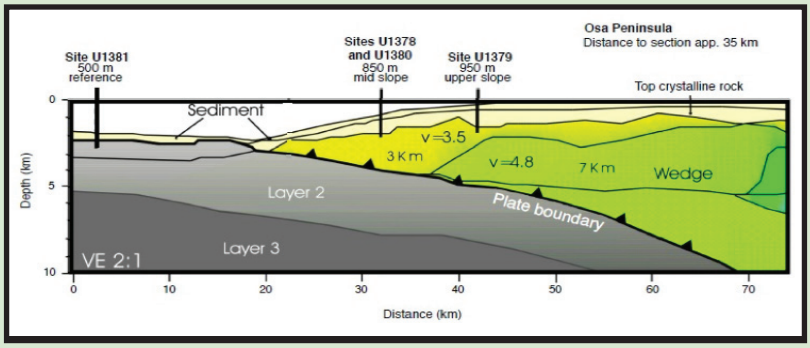
Eli Silver (University of California, Santa Cruz), Paola Vannucchi (University of Florence), Nathan Bangs (University of Texas, Austin), Kohtaro Ujiie (IFREE, JAMSTEC), Rob Harris (Oregon State University), and Cesar Ranero (CSI, Barcelona)

Proposals to drill the seismogenic zone have focused on Nankai and Costa Rica as "end members" in the spectrum of accretionary vs. erosional subduction zones. Accretionary margins, such as Nankai, had been thought to represent the sites of great (M>=9) earthquakes, whereas erosional margins, such as Central America and northern Japan, were thought to be sites of less energetic earthquakes. The March 11, 2011 Tohoku earthquake dramatically reopened that paradigm to intense scrutiny, emphasizing the critical importance of understanding the seismogenic potential of all subduction margins.

During March and April, 2011, IODP Expedition 334 carried out a program of drilling off the southwest coast of Costa Rica, with a focus on understanding the nature of the seismogenic zone and processes of subduction erosion. A second expedition (344) has been approved for October-December, 2012. During April and May of the same year, scientists on the *R/V Marcus Langseth* carried out a 3D seismic reflection acquisition program. Both the drilling and seismic reflection programs were focused on understanding the nature of the transition from aseismic to seismic behavior on the active seismogenic zone of an eroding subduction zone. The CRISP Mini-Workshop brought together about 45 attendees (Figure 1), including participants from the drilling expeditions and the 3D seismic study, members of the US Consortium for Ocean Leadership and the Japanese programs JAMSTEC and CEDEX, as well as a number of other interested scientists, to discuss preliminary results, plans for the new expedition, and ways to most effectively integrate the scientific community. Eli Silver, who chaired the workshop, introduced the workshop aims and agenda. Roland von Huene summarized the history of the Costa Rica Seismogenesis Project (CRISP) and how the program developed. He pointed out that the need for *D/V Chikyu* drilling in greater than 500 m of water meant that the site slated for drilling into the seismogenic zone had to be located on a different seismic line from that of the shallower sites, in order to meet all objectives. Paola Vannucchi then presented an overview of Expedition 334 results (Figure 2), including the implications of that program for understanding subduction erosion. Findings from that expedition included very thick Pleistocene sedimentary sections on the outer shelf and upper slope regions, which included coring into the acoustically-imaged basement of the upper plate at the shallow site. Studies of paleo-water depth in these long sedimentary sections provided excellent information on rates of vertical motion of the forearc and implications for rates of subduction erosion here. Drilling also provided an intriguing look into the role of deep fluid circulation within the faulted forearc and surprising variations in stress orientation between the mid-slope and outer shelf regions.

Figure 1. Attendees at the AGU CRISP Mini-workshop learn about the upcoming IODP expedition from Rob Harris and Eli Silver.

Nathan Bangs followed with an overview of the 3D seismic experiment, some preliminary results and a discussion of the status of and plans for processing of these data. He pointed out the difficulty in obtaining complete datasets working in areas with large numbers of sea turtles, but that the final data were excellent (Figure 3). Nathan's talk was followed by a question and answer period, during which the audience had a chance to obtain clarification of the presentations, as well as to add to the discussion. At



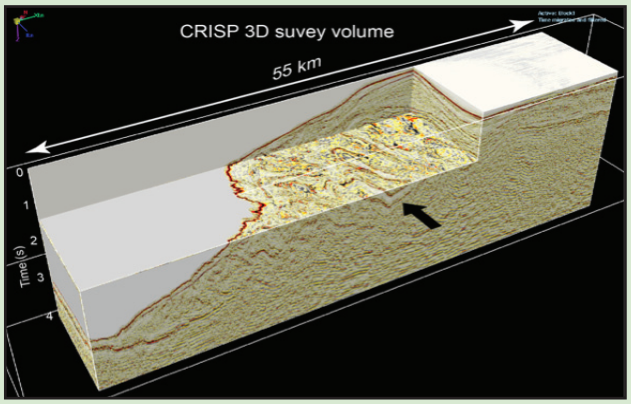


Figure 2 (left). Location of sites drilling during Expedition 334 off southern Costa Rica (based on seismic refraction line of Stavenhagen et al. (1988). Figure 3 (right). Example of 3D seismic cube from preliminary processing by Bangs et al. (2011).

this point the meeting broke to focus on posters that had been set up in the next room, as well as to allow participants to enjoy the refreshments.

The meeting reconvened for a discussion of the up-coming Expedition 344, led by co-chief scientist Rob Harris. He pointed out that the new Expedition has the purpose of meeting objectives that were not completed during Expedition 334 due to its abbreviated schedule. These include casing holes while drilling into forearc basement if needed, drilling a site in the frontal prism through the decollement, and recovering sediment cores on the incoming plate. A plan was formulated to have participants from the 3D seismic program present at the upcoming pre-cruise meeting for Expedition 344, in order to site a pilot hole for riser drilling based on the results of the new 3D seismic and multi-beam bathymetric data.

References:

Bangs, N.L., K.D. McIntosh, E.A. Silver, C.R. Ranero, J.W. Kluesner, R. von Huene, S. Cavanaugh, S. Graf, A.L. Cameselle, A. Muñoz Baracco, E. Nuñez, 2011, Preliminary results of the CRISP 3D seismic experiment, offshore Costa Rica, AGU, 92, Fall Meet. Suppl., T21B-2341.

Stavenhagen, A.U., E.R. Flueh, C. Ranero, K.D. McIntosh, T. Shipley, G. Leandro, A. Schultze, and J.J. Dañobeitia, 1998, Seismic wide-angle investigations in Costa Rica—A crustal velocity model from the Pacific to the Caribbean, Zentralbl. Geol. Palaeontol., Teil 1, 3(6), 393–408.

Report on GeoPRISMS Mini-Workshop – "ExTerra: Understanding Convergent Margin Processes Through Studies of Exhumed Terranes"

Maureen Feineman (Pennsylvania State University), Sarah Penniston-Dorland (University of Maryland), Brian Savage (University of Rhode Island)

On the evening of December 7, 2011, about 35 geoscientists convened in the ExTerra mini-workshop during the fall AGU Meeting to discuss how to integrate the study of exhumed rocks into the GeoPRISMS Subduction Cycles and Deformation (SCD) initiative (Figure 1). After introductory presentations by the convenors and keynote speaker Brad Hacker (University of California, Santa Barbara), workshop participants divided into four groups based on different types of exhumed terranes: subducted slab, mantle wedge, arc crust, and fault systems. The group discussion was divided into two areas: identification of scientific objectives and organizational strategies. Details of the outcomes from each discussion group are outlined at *http://geoprisms.org/scd/exterra.html*. This is an ongoing discussion leading to a white paper contribution to the GeoPRISMS SCD Science Plan, and we invite all interested parties to participate! There is an online discussion forum at a site linked to the outcomes website (*http://geoprisms.org/forum*).

Figure 1. GeoPRISMS ExTerra mini-workshop participants.

What is ExTerra?

The NSF GeoPRISMS Science Plan for the SCD Initiative identified the study of exhumed terranes as an important component of subduction zone research. It remains to be determined how to best integrate the study of exhumed terranes

Figure 2 (clockwise from left). SOTA fieldtrip to see Cycladic subduction zone rocks on the island of Syros, Greece. Figure 3. ILP Subduction channel workshop fieldtrip to the Monviso Ophiolite, W. Alps, Italy. Figure 4. AGU fieldtrip to see subduction zone rocks of the Franciscan Complex, CA.

and high pressure rocks into GeoPRISMS SCD. GeoPRISMS largely follows the very effective model used previously by MARGINS of building a research program around a few locations, referred to as primary sites, at active subduction zones. This focused research was a clear strength of the MARGINS Program. Work at focus or primary sites, however, may not be the best way to approach exhumed terranes. During active subduction, these features are buried deep beneath the surface. Of necessity, exhumation most often occurs during or following the death of a subduction zone. The nature of exhumation processes is such that entire subduction zones are rarely if ever exposed in a single location, requiring fieldwork to be conducted at multiple locations, and most often by multiple research groups using different techniques and approaches, before a comprehensive range of pressure and temperature conditions can be represented. Currently, the study of exhumed terranes is included in the GeoPRISMS Implementation Plan as a thematic study. The goal of this mini-workshop and the resulting white paper is to explore how we can best organize research on exhumed terranes under the umbrella of GeoPRISMS SCD such that we might accomplish more as a group than we could as individuals working independently.

What can studies of exhumed systems contribute to GeoPRISMS?

The integration of studies of exhumed systems through GeoPRISMS can organize individual efforts towards major interdisciplinary objectives. Integration of data from multiple sites allows coverage of a broad range of conditions not observable at a single site. Studies of exhumed systems under the umbrella of GeoPRISMS have the potential to link experiments and seismic observation to physical reality, adding the components of space and time. Collaboration and communication between different communities represented within GeoPRISMS allow sample and data collection to be tuned to serve the needs of other groups (geochemists helping seismologists, petrologists helping modelers, etc.).

Target areas

Four target areas have been identified as significant to improving our understanding active subduction processes by the study of exhumed terranes: 1) subducted slab, including HP and UHP rocks such as blueschists, eclogites, and metapelites; 2) mantle wedge, including serpentinites, ophiolites, and peridotites; 3) middle and lower arc crust, including granitoids, gabbros, migmatites, gneisses, amphibolites, granulites; and 4) exhumed fault systems, including accretionary prisms.

Fostering Interdisciplinary Communication

Several different ideas have been suggested in order to facilitate communication among different geoscientists. One idea is to hold focused, interdisciplinary field trips in order to provide the opportunity for non-field geologists to observe exhumed rocks and create an environment for exchange of ideas between field geologists and non-field geologists. Another idea is to create a sample repository and associated database that will allow sample collectors to connect with those who have use for rock samples. For example, experimental petrologists can make use of a sample repository to find materials for their experiments.

Challenges

We recognize that there are many challenges facing the integration of the study of exhumed terranes into GeoPRISMS. How do we open the dialog between petrologists, geophysicists, and modelers? How can studies of exhumed terranes worldwide be related to current GeoPRISMS focus sites? GeoPRISMS is a small program, and we will need to leverage with funds from outside sources.

Status Report on the SedDB Sediment Geochemistry Database: March, 2012

Annika Johansson, Kerstin Lehnert and Leslie Hsu (Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY)

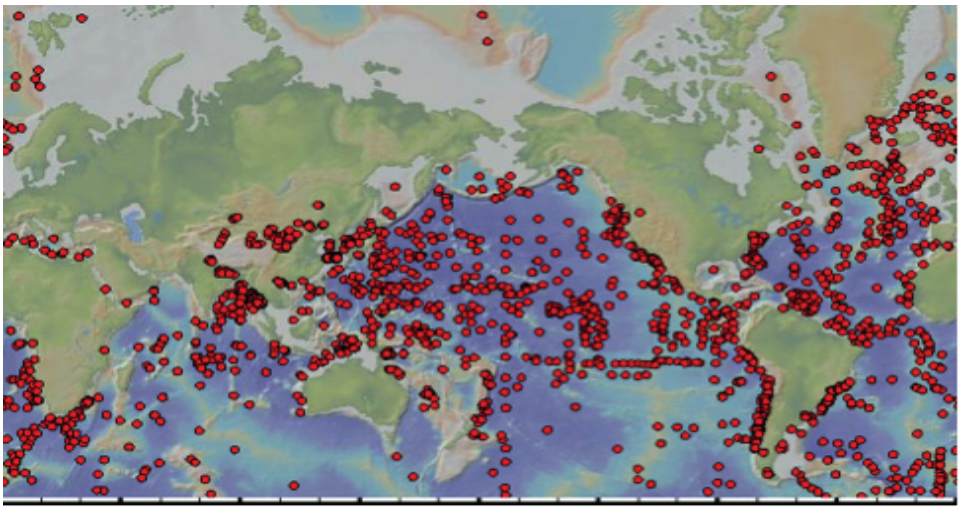


Figure 1. Current SedDB data sites plotted in GeoMapApp. Note that each dot may represent dozens of, or more, data values.

SedDB (www.seddb.org) is an online database that consolidates, manages and provides open access to an integrated compilation of sedimentary geochemical data for the research and educational communities (Lehnert et al., 2007).

SedDB is part of the NSF-funded IEDA data facility (Integrated Earth Data Applications, www.iedadata.org) that operates, among others, the Marine Geoscience Data System, the GeoPRISMS, Ridge2000, and MARGINS Data Portals, the geochemical data systems EarthChem, PetDB, SedDB, and VentDB, and the System for Earth Sample Registration (SESAR).

The relational structure of the SedDB database allows users to quickly and easily access comprehensive integrated global data sets over the web, and to extract subsets that include data from any number of publications based on queries customized to an investigator's interests.

Data Holdings

Since its inception and initial release in 2006, SedDB data holdings have steadily grown both in number and geographical scope while maintaining focus on areas of particular interest to the user community such as the northern Indian Ocean, Southern Ocean, North Atlantic/Arctic Oceans. As of the latest data upload in February 2012, SedDB contains:

Data from References	Cores	Samples	Individual Values	Individual Analytes
506	10,779	85,612	614,999	234

SedDB's original mandate to compile data from the MARGINS Focus Sites of Izu-Bonin, CentAm, and the Equatorial Pacific has been fulfilled with the following statistics:

	Data from References	Cores	Samples
Izu-Bonin-Marna	57	766	4,037
Cntrl America	32	526	2,210
Equatorial Pacific	141	2472	23,024

In a proactive response to the establishment of the GeoPRISMS Alaska Primary Site significant effort has been made to include as many data as possible for this study site. To date, geochemical values for nearly 80 analytical parameters from over 600 samples from the Alaska-Aleutian area are available at SedDB.

Data Submission

SedDB encourages investigators to contribute their data to the database so that it can be discovered and reused by a diverse community now and in the future. Data can be submitted using templates available at http://www.geoinfogeochem.org/data/contribute. The templates provide guidance to assure that relevant information regarding the analytical data quality and sample provenance is included, following the Editors' Roundtable Recommendations for the Publication of Geochemical Data (http://www.seddb.org/contribute). Samples should first be registered with International Geo Sample Numbers (IGSN), which can be obtained at the System for Earth Sample Registration (http://www.geosamples.org). The IGSN ensures unique identification and unambiguous referencing of data to samples.

Please contact us at: info@seddb.org with any questions or for help with data submission.

References

Lehnert , K. , et al., 2007. SedDB- A New Information System to Facilitate Use of Marine Sediment Geochemistry in Science and Education. MARGINS Newsletter No. 18, Spring 2007:9-11

GeoPRISMS - MARGINS Data Portal Status Report

Andrew Goodwillie and GeoPRISMS/MARGINS Database Team (Lamont-Doherty Earth Observatory)

The GeoPRISMS data portal (www.marine-geo.org/portals/geoprisms) was launched in 2011 as a new portal of the MGDS database. For the GeoPRISMS primary sites, the portal is populated with information and links to a range of new and existing high-priority data sets.

Since the last newsletter report, information on field programs of interest to the GeoPRISMS community has been added to the data portal and to GeoMapApp, as highlighted below. In addition, the database group participated in the GeoPRISMS-EarthScope ENAM science meeting, holding a workshop to help increase awareness of database resources. At a pre-AGU GeoPRISMS-sponsored event, the database group ran one of the hands-on sessions showing how GeoMapApp can be incorporated with studies of arc basalt geochemistry (see report on page 16).

Alaska-Aleutians Primary Site

Basic field information for three 2011 Langseth multi-channel seismic cruises is now available via the data portal. The Alaska Megathrust MCS survey, MGL1110, led by Donna Shillington, Mladen Nedimovic and Spahr Webb was sandwiched between two USGS surveys that were overseen by scientists Jonathan Childs, Ginger Barth, Warren Wood and Sean Gulick in support of the US Extended Continental Shelf (ECS) claim in the Gulf of Alaska and the Aleutians-Bering Sea. As well as streamer MCS data, all three Langseth surveys collected refraction and wide-angle reflection data with OBS instrument arrays.

Cascadia Primary Site

Field program details were added for the first two Cascadia Initiative OBS deployment legs. In GeoMapApp (www.geomapapp.org), under the Focus Sites menu, links have been added for the Cascadia Initiative Year 1 (legs 1, 2, 3) OBS work, the 2010-2011 joint Japan-Canada-US SeaJade OBS array, Neptune Canada cabled seismometer stations, Canadian National Seismometer Network stations, and stations associated with the many components of EarthScope USArray and PBO instrumentation (Fig 1). A link is also provided for geochemistry data from the EarthChem portal.

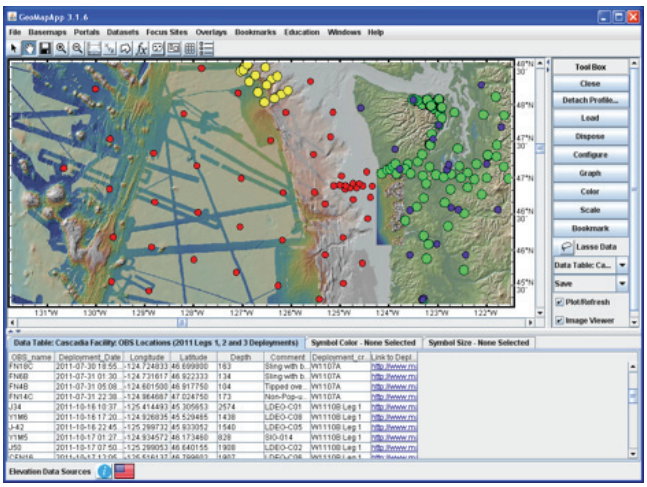
ENAM Primary Site

The GeoPRISMS data portal provides access to data from USGS seismic surveys and the Canadian LITHOPROBE-FGP seismic imaging initiative. A range of other cruise-based data includes the Mountain-Miller MCS survey across the New Jersey slope and high-resolution multibeam bathymetry and backscatter data collected as part of the US ECS claim (Fig. 2).

GeoPRISMS Search For Data

The portal offers a customized search-for-data interface to help researchers speed their way to GeoPRISMS-related data. The search can be done on a key word such as data type or investigator or by searching within a geographical box, as well as on NSF award number or for data sets related to publications.

A Google Maps™-based interactive map shows ship survey tracks, and the location of stations and samples from GeoPRISMS-related expeditions within each of the primary sites. Clicking on a track or station invokes a link to associated data sets and field program information.



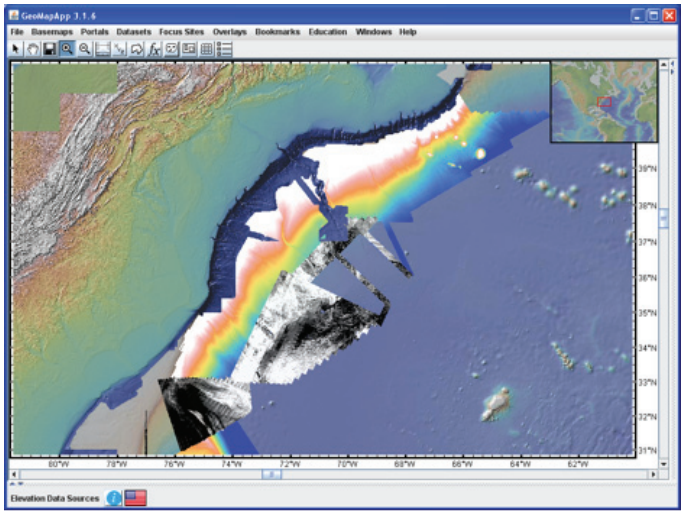


Figure 1 (left): Cascadia instruments plotted in GeoMapApp and overlain on 100m-resolution bathymetry for the Juan de Fuca and Gorda plates, and on 10m high-resolution bathymetry for coastal Washington state. Circle symbols: Red – Cascadia Initiative year one OBS deployments; Yellow – SeaJade OBS array; Green – EarthScope Flex Array stations; Purple – EarthScope TA Array. Figure 2 (right): GeoMapApp screenshot shows on-land shaded relief from the NGDC Coastal Relief model and the USGS NED terrestrial data set which provides a remarkable 10m horizontal resolution. Off the coast, a grey-scale backscatter data set overlies brightly-hued multibeam bathymetry; both have a 100m resolution and were collected as part of the US Extended Continental Shelf claim.

Statistics on data file downloads are compiled annually and sent to the contributing scientists.

Data Management Plan Tool

To help investigators meet the NSF requirement that each submitted proposal includes a data management plan, we developed an on-line tool (www.iedadata.org/compliance) that can be quickly filled in by PIs and printed in PDF format ready for attachment to a proposal. We have also developed a tool to help PIs show their compliance with NSF data policies.

GeoPRISMS Bibliography

An integrated, searchable GeoPRISMS bibliography has been created. It currently contains more than 170 references related to GeoPRISMS science, with papers tied to associated data sets: www.marine-geo.org/portals/geoprisms/references.php. The lists of publications can be exported to EndNote™.

GeoMapApp and Virtual Ocean

GeoMapApp (www.geomapapp.org), a free map-based data exploration and visualisation tool, currently stands at version 3.1.6. Recent GeoMapApp updates include the ability to import a wider range of gridded formats; an updated Digital Seismic Reflection Profiles portal that includes new options to access MCS and SCS data collected by USGS; updated versions of the PMEL seafloor earthquake catalogues; enhancement of the profiling tool; and, the ability to import Excel spreadsheets containing formulas in the cells. With GeoMapApp, users can import their own data tables and grids and manipulate them with the full range of GeoMapApp functionality. Multimedia audio-visual tutorials are available on the GeoMapApp web page and on YouTube™.

Virtual Ocean (www.virtualocean.org) offers GeoMapApp-style capabilities in 3-D. A wide range of built-in data sets is available and, as with GeoMapApp, data tables can be imported and manipulated, and custom maps can be generated. The release of version 2.5.4 includes three new Global Terrain Maps – Road map, Hybrid map, and OpenStreetMap – and enhancement of the seismic reflection fence diagram functionality.

GeoPRISMS MediaBank

MediaBank (media.marine-geo.org) provides access in a gallery format to GeoPRISMS-related images including photos from field expeditions. Please send compelling images to be considered for inclusion in the GeoPRISMS MediaBank gallery.

The GeoPRISMS data portal team is here to help the community. Please contact us at info@marine-geo.org.

Enhance the Broader Impacts of your GeoPRISMS Proposals

The GeoPRISMS Office, along with the GeoPRISMS Education and Outreach Committee (GEAC), offers the following suggestions to proposers responding to NSF solicitations, to help you plan and achieve your broader impacts:

Plan to submit your GeoPRISMS data to the data portal hosted by MGDS in a timely manner to disseminate your data to the scientific community -- contact Andrew Goodwillie (*andrewg@ldeo.columbia.edu*)

Include the development of mini-lessons in your proposal as a way to expose undergraduate students to your research. The GeoPRISMS Office can help you develop these lessons.

Invite your students into the GeoPRISMS community, where they can take advantage of many student resources. Examples include:

- Participate in the GeoPRISMS Student and Community Forum at AGU.
- Attend GeoPRISMS workshops, especially ones that include student symposia.
- Apply for the GeoPRISMS Student Prize at AGU.
- Stay informed through the GeoPRISMS listserv -- sign up at *http://geoprisms.org/contact-us.html*
- Visit our web site regularly for updates on these resources and more: *http://geoprisms.org*
- Consider including support for an REU a new grant, or applying for a supplement on an existing grant, to involve students in GeoPRISMS research.

Apply for a Research Experience for Teachers (RET) Supplement to an existing grant or include one in future proposals. You can receive up to $12,500 per teacher to support their participation in your NSF-funded research project.

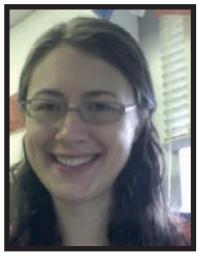
For more information, see *http://geoprisms.org/broader-impacts.html* or contact the GeoPRISMS Office at *info@geoprisms.org*

GeoPRISMS Student Prize for Outstanding Presentations

2011 AGU Fall Meeting, San Francisco
December 5-9, 2011

Congratulations to the winners of the GeoPRISMS 2011 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. The GeoPRISMS Student prize is open to any student who can show a link between their research and the stated aims of the GeoPRISMS Program. We thank all our entrants and judges for making this contest possible and worthwhile.



Oral Presentation Winner

Christie Regalla, Penn State University
Title of Abstract: "An alternative mechanism for forearc subsidence along the Northeast Japan erosive margin?"
Co-Authors: Donald Fisher, Kevin Furlong, Eric Kirby
From the Judges: "Christine's talk was well-delivered and well-structured. She smoothly presented her data, results, conclusions, and the significance of her results."
From the Student: "I am very honored and excited to be recognized by GeoPRISMS for this award. The MARGINS/ GeoPRISMS community consists of an outstanding group of researchers and I have had positive, encouraging interactions with its members. I am grateful that they continue to support student research and encourage the scientific development of its newer members."

Poster Presentation Winner

Manahloh Belachew, University of Rochester
Title of Abstract: Timing and dynamics of dike intrusions in Afar, Ethiopia: Faulting above dikes
Co-Authors: Cindy Ebinger, Dustin Cote
From the Judges: Demonstrated mastery of background, technique, and interpretation of seismic activity associated with dike emplacement in the East Africa Rift
From the Student:"It is an honor that the presentation by my collaborators and me received this recognition from an outstanding community of earth scientists among the many excellent GeoPRISMS-related presentations at AGU. I look forward to continuing my research on GeoPRISMS related initiatives – Thank you!"

Honorable Mention

Brett Carpenter, Pennsylvania State University
Title of Abstract: Mineralogical Controls of Fault Healing in Natural and Simulated Gouges with Implications for Fault Zone Processes and the Seismic Cycle
Co-Authors: Matt Ikari, Chris Marone
From the Judges: The significance of this work is very high. ... The student provided very detailed and thorough explanations and handled questions very effectively.
From the Student:"I am delighted and honored to receive recognition from the GeoPRISMS community. I want to commend GeoPRISMS by taking the initiative to promote and reward outstanding student research. I am happy to be part of the GeoPRISMS community as it has been rewarding and helpful for young scientists, like me, looking to promote and discuss their research."

Honorable Mention

Jamie Howarth, University of Otago
Title of Abstract: Reconstructing earthquake-driven erosion in the Southern Alps, New Zealand using sedimentary record
Co-Author: Fitzsimons, S.J., Norris, R.J., Jacobsen, G.E. and Strong, D.T.
From the Judges: Exciting science, very innovative approach to the problem, has clearly mastered the complexities of the modeling and understands the nuances of interpretation. Well presented.
Student's Comment: "I am honored to have my research recognized by the GeoPRISMS community. I appreciate the efforts made by GeoPRISMS to promote and encourage graduate research and I look forward to working within the GeoPRISMS community in the future."

Honorable Mention

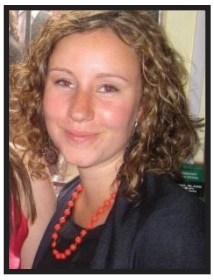
Jean-Arthur Olive, MIT

Abstract Title: Evidence for Trench-normal Flow Beneath the Western Hellenic Slab from Shear-wave Splitting Analysis

Co-Author: Rondenay, Stephane and Pearce, Frederick

From the Judges: Impressive depth of knowledge, focus on undersatnding observations and integration of data from other studies to provide and original interpretation. Very rigorous ... It was outstanding.

Student's Comment: "I am very happy and grateful that our research has been recognized by GeoPRISMS.I truly appreciate the way this program brings together geodynamicists, seismologists and geochemists, and look forward to exciting new findings on plate-boundary processes."



Honorable Mention

Gemma Smith, National Oceanography Center

Abstract Title: Fault structure, properties and activity of the Makran Accretionary Prism and implications for seismogenic potential

Co-Authors: Lisa McNeill, Timothy J Henstock, Jon Bull

From the Judges: "Best student talk I saw at the meeting. Quite impressed with her presentation, thoughtful suggestions, and knowledge of the field."

Student's Comment:"I feel very honored to be recognized by GeoPRISMS in this way. Thank you for supporting student research!"

GeoPRISMS Postdoctoral Fellow: Biography

Since 2003, the MARGINS program has funded a number of postdoctoral fellows, both within the special MARGINS Post-doctoral Fellowship and within the regular NSF-MARGINS programs. These biography profile postdoctoral fellows Abhijit Ghosh at the University of California Santa Cruz. His research is entitled: "Systematic search and characterization of very low frequency earthquakes and offshore tremor in Cascadia using the Amphibious Array"

Subduction zones worldwide pose great seismic hazard, as they repeatedly produce large damaging earthquakes and associated tsunamis. Large earthquakes nucleate at the locked zone of the fault, spanning approximately 10 to 40 km in depth. Such fast earthquakes are believed to be the main observable mode of stress release for major plate boundary faults. But recent discovery of slow earthquakes in the transition zones forces earth scientists to rethink this paradigm. Such slow earthquakes are believed to load the up-dip locked zone, taking it closer to the next large megathrust earthquake. I study earthquakes, both fast and slow, using seismology as the main tool to understand the dynamics of earthquakes and faulting.

I did my undergraduate in structural geology. I earned my first Masters Degree in Geology from the University of Calcutta, India. While doing that, I got interested in earthquakes and faults. I got my second Masters Degree in the Earth and Atmospheric Sciences from Georgia Tech, where I studied earthquake statistics to infer variations in plate coupling in the Middle America Trench. In my PhD at the University of Washington, I focused on slow earthquakes and tremor in the Cascadia Subduction Zone, and San Andreas Fault. I developed new array techniques to image slow earthquakes with unprecedented resolution. I used this technique to image slow earthquakes captured by multiple seismic arrays that we designed and installed in Cascadia. I helped to resolve a long-standing scientific debate in Cascadia by showing that the majority of the tremor, the seismic signature of slow quakes, is occurring at the plate interface and likely a result of shear slip on the subduction fault. Furthermore, I showed that the behavior of tremor is complex and varies with distinct, identifiable patterns over timescales of minutes to months. My works suggest that the interaction between the stress field and rheological and/or geometrical asperities on the fault plane may control the evolution of slow quakes.

In the GeoPRISMS Postdoctoral proposal, I plan to integrate land-based and offshore seismic data collected under the Cascadia Initiative to scan the seismicity from the trench offshore to the base of the down-dip transition zone, up to ≈100 km inland from the coast. In the process, I will systematically search for exotic elusive events like, very low frequency earthquakes and offshore tremor. The goal is to take a holistic approach to better understand the full spectrum of fault slip behavior, and how it governs the subduction zone dynamics.

GeoPRISMS Steering and Oversight Committee Highlights, Fall 2011

November 7-8, 2011, Rice University, Houston, TX

Edited by Charles Bopp, GeoPRISMS Science Coordinator

The Fall GeoPRISMS Steering and Oversight Committee Meeting focused on reviewing the recent Planning Workshops for Alaska and Eastern North America (ENAM) primary sites, and the role that community experiments might play in carrying out GeoPRISMS Science.

NSF Update

The FY 2012 saw 21 proposals submitted and reviewed by a virtual panel. Approximately 8-10 projects were likely to be funded, with budgets in the $150-$300K range. The next deadline for submission in July 2nd, 2012, and a new GeoPRISMS solicitation is being drawn up. Additionally, NSF has issued a Dear Colleague Letter clarifying the proposal submission process for the Cascadia Initiative. James Beard replaced Ian Ridley as OCE-ODP liaison to the GeoPRISMS Program. OCE-MG&G is seeking a geophysicist to replace Rick Carlson. This position includes overseeing the OBS pool. Finally, the national separation of IODP facilities has been finalized: the D/V Chikyu will be operated and paid for by Japan, and NSF will fund the D/V Joides Resolution.

GeoPRISMS/EarthScope Alaska Planning Workshop

The joint GeoPRISMS/EarthScope workshop on Alaska was held in September 2011, following upon an EarthScope sponsored workshop on Alaska in May 2011 to discuss the deployment of the transportable array (TA). The Alaska Planning Workshop settled upon three focus areas for GeoPRISMS-related studies: the Aleutian Island Arc, emphasizing along-arc geophysical surveys and key focus studies, especially around the Amlia fracture zone; the Alaska Peninsula, emphasizing megathrust processes onshore and offshore; and the Cook Inlet Region, which offers opportunities to collaborate with EarthScope and build upon previous research. Further information can be found in Issue 27 of the GeoPRISMS Newsletter.

EarthScope/GeoPRISMS Eastern North American Margin Science Meeting

Two workshops on ENAM were held in 2011: a planning workshop following the EarthScope national meeting near Austin, TX in May and the Science Meeting held in Lehigh, PA in October. A summary of the former meeting can be found in GeoPRISMS Newsletter #27; a report of the Lehigh meeting is on page 4 of this issue.

Cascadia Initiative Update

Several cruises have taken place to deploy OBS instruments in Cascadia; recovery and redeployment will take place in Spring 2012. The offshore OBS array will alternate deployments in the north and the south over the four-year deployment. A workshop will take place after the first year's data has been collected, and redeployment plans may change based on the outcome.

The GSOC is one of at least four committees with in the Cascadia Initiative. Coordination among these committees and their organizations is crucial. A similar situation exists with CI outreach programs: there are several websites presenting materials, managed by different organizations. Again, these efforts should be coordinated and updated.

Finally, NSF has prepared a Dear Colleague Letter announcing when announcing when proposals using CI data will be accepted. Open questions remain, however, regarding the initial processing of OBS data, the preparation and handling of QC, metadata, and archiving of data, and similar questions. One plan was for OBSIP to take responsibility for this, but these responsibilities may shift to IRIS, in which case the IRIS Board of Directors becomes another steering committee with a stake in the CI. Future discussions should resolve these responsibilities, and enhance coordination.

Data Portal and Resources

The GeoPRISMS data portal is now up and running. The primary site areas of the portal have been populated, and an expanding array of data is becoming available. Such datasets include results from Cascadia Initiative cruises, USArray stations, PBO stations, and others. The MARGINS data portal also continues to be updated, as do the MARGINS and GeoPRISMS bibliographies.

Other updates from IEDA include improvements to GeoMapApp, which now includes USGS seismic data. PetDB should include KALMAR data soon, as well. Further, the IEDA data compliance and data management plan tools are now available at IEDA for PIs. IEDA is also working toward users submitting their own data.

Data Policy

The GeoPRISMS Data Policy has been updated, and is available at the GeoPRISMS website (geoprisms.org/data-policy.html). The current policy focuses mainly on field data, and questions remain about how to handle derived data products. Standardization of these products is a particular concern, however the need to retain these products and make them available was widely recognized. It was also noted that education products should be archived as well.

Updates from Partner Organizations

EarthScope was renewed in 2010 and has a science plan through 2020. IRIS and UNAVCO will submit concurrent proposals to continue Operations and Management for USArray and the PBO facilities. These proposals will require "deep community input," partially satisfied by the joint GeoPRISMS-EarthScope workshops. EarthScope funding levels are fixed, however, thus any expansion must occur at the expense of something else, or through increased efficiency. EarthScope's present activities include the eastward migration of the TA (including Ontario and Quebec); EarthScope is hoping for a 1-in-4 adoption plan for seismometers on the east coast to maintain long-term coverage. An expanded GPS network based on the NOAA CORS network is in the works. Also, the State of Alaska is acquiring LiDAR along most state highways, a project that could serve as a good backbone to future Alaska projects.

The IODP science plan is now available for comment, and the NRC review was generally positive. The science plan is organized around 14 "Grand Challenges," of which Themes 3 and 4 are most relevant to GeoPRISMS. IODP and the GEO large facilities programs are under review, with the NSB decision coming in May. Guidance is being sought through a web survey, and a planning meeting will be held in Denver; attendees will be drawn from the survey participants. The current Science Advisory Structure will continue despite the separation of ship responsibilities, but a new system for drilling proposals is being implemented. NSF will take a more active role in planning ship tracks to help overcome the high costs of ship transit time. The target is

to support ≈8-10 months of drilling per year. The new system should reduce proposal wait times from ≈10 years, to ≈4 years.

Community Experiments

Much discussion during the GSOC meeting was focused on community experiments, given the potential increasing importance of such efforts in GeoPRISMS. Examples include the Cascadia Initiative and possible geophpysical experiments in Alaska and ENAM. The role of the GSOC, and the definition of a "community experiment," were prime points of discussion. It was agreed that a "community experiment" is defined as an experiment authorized or endorsed by a community workshop, with data made available as soon as possible, subject to reasonable QC and processing, and the call for participation and data access should be open and broad. Discussion continued around: how much of the GeoPRISMS funds should be dedicated to community experiments vs. individual PI proposals, the distribution of such funds between large, often geophysical, experiments vs. other disciplines, and how community proposals will review, etc. The GSOC will take a largely advisory role in defining such experiments.

The possibility of a community seismic experiment along the ENAM was also discussed. Such a project could leverage the USGS Dept. of State ECS program cruise expected in 2013, as well as industry interest in the ENAM region. The GSOC broadly supported this concept, noting that planning needs to begin quickly (A luncheon was held at the Fall 2011 AGU, to discuss this project. See summary on page 9).

Office Activities, AGU plans, Website Upgrades

The GeoPRISMS Office has organized or co-organized 5 workshops in the last 12 months, three since March, with average attendance of more than 100. Two newsletters have been published, the 2011-2012 DLP planned, and others. GeoPRISMS will be very active at AGU, with several mini-workshops and a luncheon on the ENAM community seismic experiment, the Townhall meeting, and other events. The GeoPRISMS website continues to be developed: plans to migrate archival MARGINS content are being formed, and many suggestions from students and workshop attendees have been received. A system-wide web upgrade is also planned.

Other Workshop Summaries

An IODP workshop on "Using Ocean Drilling to Unlock the Secrets of Slow Slip Events" took place in New Zealand in August 2011. This workshop considered locations for drilling slow-slip events; a smaller working group convened following that workshop to develop a proposal to drill on the Hikurangi margin. This project offers the possibility of strong collaboration with GeoPRISMS.

A workshop on "Ocean Mantle Dynamics: From Spreading Center to Subduction Zone" took place in Chiba, Japan in September, 2011. This meeting focused on lithosphere and asthenosphere structure and melt migration. Using ship time efficiently and allowing for dredging of petrological samples wherever possible were emphasized, and as critical to advance the science. International cooperation was also stressed, given the ambitious nature of future projects.

Future GeoPRISMS Workshops

A science workshop should be organized for the Cascadia primary site to inform the community, foster collaboration across the disciplines, and to update the GeoPRISMS IPs. This meeting should be held jointly with EarthScope. Possible conveners were discussed and a GSOC representative for the convener group was selected (Note: this event was held in April, 2012).

A planning meeting for the East African Rift System (EARS) site was also deemed to be important, as the community may disengage if the issue is left too long. A related conference of the Afar Consortium is scheduled for Jan. 2012 (see report on page 12), and many projects are taking shape in the region. Further decisions on the EARS planning meeting, and the possibility of a New Zealand planning meeting, were deferred to the spring 2012 GSOC meeting.

Initiative Reports

Ongoing GeoPRISMS RIE Projects include:

- The Salton Seismic Imaging Projct (SSIP; Hole, et al.) continues in the Salton Trough. This project tests ideas about the nature of transitional crust at rifted margins and the role of sediments in the creation of new continental crust.
- The northern Gulf of California study (Dorsey, Oskin) is testing the role of transtension in continental rupture. Field and seismic studies are largely complete. There appear to be two simultaneous active detachments, with sediment accumulating asymmetrically.
- The Gulf of California Synthesis project (Dorsey, et al.) is reconstructing the evolution of that region over the last 16Ma at 1-2Ma resolution; total slip could exceed 400km.
- The project in Northern Malawi (Shillington, et al.) is investigating the origin of a cluster of deep earthquakes. The usual explanation for such clusters is dike emplacement, but this would be unusual in this area. This project also features a significant outreach component to the Malawi Geologic Survey.

MARGINS SubFac and SCD:

- Boyce and Manning are developing a self-standardizing technique for ion microprobe analysis for determining volatile content in magmas.
- Reagan is mapping the geology of the Marianas forearc to understand early arc initiation, growth, and subduction initiation. Early arc stratigraphy spans 7-8 Ma and evolves from basalts to normal andesite arc magmas; he also located a peridotite-hosted cold seep supporting clams and other sea life.
- Wada (MARGINS Postdoc) is numerically modeling subduction zones to predict grain size distributions and incoming plate hydration.
- Fischer and Kincaid are performing glucose tank experiments to simulate 3D wedge flow to understand seismic anisotropy measurements.
- Spiegelman and others are developing next generation models of coupled fluid and solid dynamics to understand melt migration.
- Stern and others are continuing the SubFacSIP. They run workshops to teach users the Arc Basalt Simulator Excel package. They are also compiling a large database of petrologic data that enables statistical observations.
- Dasgupta is performing sediment melting experiments to understand the role of volatile content on melting.
- The long delayed Marianas MCS, OBS cruise of Lizarralde and Wiens is scheduled for early 2012, and will offer many opportunities for student participation.

MARGINS SEIZE and SCD:

- Naliboff (GeoPRISMS Postdoc) is numerically modeling the subduction zone outer rise to understand the development of shear zones and fluid alternation. His case-study region is Central America.
- Kitajima (GeoPRISMS Postdoc) is performing sediment deformation experiments under varying stress paths and documenting numerous empirical relationships between stress state and physical properties, notably between Vp and porosity.
- Tudge (GeoPRISMS Postdoc) is working

with logs and cores to understand the petrophysics of sediments along the Nankai margin.

- Syracuse and Thurber are working on imaging the slab in Costa Rica from TUCAN data and data from regional networks.
- DeShon is imaging the shallow thrust interface beneath Costa Rica from several passive seismic experiments. She is also developing an automated picker.
- Rowe is working on fluidization in granular fault zones and the release of overpressures.
- Dixon and Schwartz have developed a GPS-seismic network on the Nicoya peninsula to image slow slip and tremor.
- Continuing MARGINS S2S Projects include:
- Straub and Sheets are funded through RIE to statistically invert stratigraphic surfaces to understand stratigraphy-building.
- Kniskern (MARGINS Postdoc) is studying sediment dynamics along the Waipaoa river, adapting sediment transport models and studying shelf development. REU Dan O'Hara is working with her to simulate varying shelf widths to understand mid-shelf mud deposits.
- Roering has a project in New Zealand studying landslide effects on erosion rates.
- Nittrouer and Kuehl are preparing chapters for the Chapman S2S conference for Earth Science Reviews.

Education and Outreach

- Student symposia were held prior to both the Alaska and ENAM meetings. These symposia offered introductory talks, brief presentations by the students themselves, and a half-day field trip. Students were also entrained in other conference activities (at ENAM, they were assigned mentors and served as breakout group scribes) and had a student-only dinner during which they could discuss the conference happenings and also learn about career paths from other researchers. Students were asked to evaluate the symposia; these evaluations were generally positive. Students were keen about the opportunities to speak and present their viewpoints, and about the symposia activities as a whole. Concerns were raised about the brief time allotted for their presentations, and difficulties in poster session scheduling.
- The GeoPRISMS Office submitted two proposals to NSF about E&O activities: a TUES proposal and an REU proposal. The TUES proposal's goal was to develop cohesive components for undergraduate curricula from the MARGINS mini-lessons and to incorporate new MARGINS synthesis into the mini-lessons. The REU proposal would have established a distributed GeoPRISMS REU program similar to the IRIS REU program. As of this GSOC meeting, both proposals were pending. (The TUES proposal is still pending; the REU proposal has been declined.)

Other E&O activities were also discussed:

- GeoPRISMS' participation in a presentation about natural hazards on Capitol Hill (summarized in Newsletter #27)
- The continuing demand for the Distinguished Lectureship Program, and plans for collecting videos of presentations to post on-line.
- The GeoPRISMS Postdoctoral Fellowship Program was considered at length. The GSOC agreed that the program is an important opportunity for early career scientists, but proposed that surveys and postdoc tracking would be helpful to asses its success.

Other Business

- Rosemary Hickey-Vargas completed her term on the GSOC, but will stay on the GEAC. A new GEAC member will need to rotate on to the GSOC. The next GSOC meeting will be held at NSF HQ in March 2012, before the next NSF solicitation deadline, to resolve any science and funding situations.

GeoPRISMS NSF Awards 2012

These are the funded GeoPRISMS proposals for FY 2012; additional awards will be posted on the GeoPRISMS website.

NSF Award 1144164 **Thermal Structure of the Cascadia Subduction Zone on the Washington Margin** *P. Johnson, E. Solomon (U. of Washington)*

The Cascadia Subduction Zone (CSZ) is known to have generated a large number of large-magnitude M_w9 earthquakes, and poses the greatest single source of seismic hazard to the northwestern United States. This serious earthquake hazard to the heavily populated Pacific NW is driving extensive research by the NSF GeoPRISM and Cascadia Initiative Programs into the tectonic processes active in the region. To accurately constrain potential seismic moment release of future CSZ events, data regarding earthquake recurrence frequency, along-strike rupture length, and both up-dip and down-dip extent of co-seismic rupture are required. The limits of the locked zone of the megathrust fault are determined by the intersections of isotherms with the decollément, and the subsurface thermal environment of the Washington margin is presently unconstrained. In order to locate these limits, we will be conducting a 29-day heat flow and fluid flux survey on a 2.5-D profile on the Washington margin using Jason II in 2013, from abyssal plain depths to the shelf edge. This geophysical/geochemical profile will be conducted over one of the 2-D Multi-Channel Seismic lines being carried out the R/V LANGSETH in 2012 and adjacent to the North Focus Site of the OBSIP Ocean Bottom Seismometer deployments in 2011. The new heat flow profiles will be acquired using both thermal blankets and traditional sediment probe methods, and fluid flux measurements will use both geochemical and direct instrumentation techniques.

NSF Award 1144483 **The Subduction Margin Carbon Cycle: A Preliminary Assessment of the Distribution Patterns of Multicycle Carbon** *N. Blair (Northwestern U.)*

The role of recycled fossil C in elemental budgets and organic C behavior on active margins is not known beyond the mid-slope. Fossil C would be expected to persist longer in surface environments than younger materials because of its low reactivity. Its persistence would influence the global C and O_2-cycles, product formation during deep burial, and the interpretation of sedimentary organic geochemical records. This exploratory study of the three GeoPRISMS Subduction Cycles and Deformation (SCD) primary focus sites, the Alaskan, Cascadia and Hikurangi Margins, has the specific objective of developing a preliminary assessment of the distribution of multicycle C at the sites. Samples will come primarily from archives held by the National Institute of Water and Atmospheric Research of New Zealand and the Deep Sea Drilling Project/Ocean Drilling Project repositories in the US. In addition, sample collection and analysis is proposed for the planned Integrated Ocean Drilling Program expedition to the Alaskan margin in 2013. Analyses of samples will include Raman and FTIR microscopy, stable carbon and radiocarbon isotopic measurements, and

elemental (H/C) determinations. The survey to be generated by this project will be a first look at multicycle C across several active margin environments beyond the mid-slope. The baseline information will be used to plan future C-cycling and paleoenvironmental studies.

NSF Award 1144493 **Potential contributions of Seafloor Geodesy to understanding slip behavior along the Cascadia Subduction Zone** *D. Chadwell (Scripps)*

The purpose of the study is to determine the optimum placement of seafloor geodetic monuments along the Cascadia Subduction Zone and the frequency and duration of horizontal and vertical seafloor geodetic measurements required to resolve the character of slip along the offshore portion of the thrust fault. Presently, onshore geodesy has determined that the locked region lies almost entirely offshore, however these data lack proximity and poorly resolve details of the stick-slip behavior near the deformation front and the location of the boundary from full stick slip to some component of stable sliding. This one-year project to assimilate existing models of fault geometry, locking behavior along the fault, onshore GPS data, and field-proven precisions of horizontal and vertical seafloor geodesy into an elastic/visco-elastic model. Using this model construction, various placements of seafloor geodetic monuments will be simulated and the resolving power estimated to determine the minimum required array configuration along Cascadia to constrain regional-scale slip behavior on the thrust fault.

NSF Awards 1144494, 1144499 **Collaborative Research: A 21st Century Reconnaissance of Aleutian Arc Inception** *B. Jicha, B. Singer (U.W. Madison); S. Kay (Cornell)*

The Alaska/Aleutian Arc is the most geologically active region in North America with abundant large earthquakes and eruptions from more than 50 active volcanoes. Determining precisely how and when the Aleutian Arc began to form is one of the key elements for understanding the origin of the Bering Sea-Alaska-North Pacific region, as well as how several circum-Pacific volcanic zones are related to one another. Our understanding of how volcanism initiated in the Aleutian Arc is clouded due in large part to the scarcity of data that bear on the ages of the earliest volcanic rocks in the Aleutian Islands. The reconnaissance investigation of Aleutian Arc inception involves sampling and determining the ages of the oldest records of volcanism. We will employ 40Ar/39Ar and U-Pb geochronology, along with geochemical, and isotopic analysis of the dated rocks. The focus is on subaerial outcrops on Amatignak, Ulak, and Kiska islands, which hold the greatest potential for exploration into the early history of the Aleutians. New geochronologic and geochemical data will precisely constrain when Aleutian arc inception began, what the compositions of the eruptive products were, and how they evolved during the earliest history of the arc. This information will also be used to evaluate existing tectonic models of Aleutian arc inception and Pacific Plate motion during the middle Eocene. Our findings will be used to determine where future efforts to examine the Aleutian Arc and its fore-arc structures via submersible ROVs, dredging, and geophysical imaging should concentrate to best address questions of subduction zone initiation.

NSF Award 1144555 **The explosive volcanic history of the Central Oregon Cascades: Probing the changing state of the Neogene Cascade arc** *A. Kent, R. Duncan, A. Grunder (Oregon State)*

We propose to establish the temporal, volumetric, compositional and petrologic nature of the explosive silicic magmatic output of the Cascade arc during Neogene times (~4-15 million years), via study of a remarkable section of volcaniclastic and pyroclastic deposits accumulated within the Deschutes Basin, located to the east of the modern arc. We will use a combination of approaches, including field, geochronological, geochemical and petrological studies to establish the basin-wide chronostratigraphy for explosive silicic rocks in the Deschutes (~4-8 Ma) and Simtustus (12.2-15 Ma) Formations within the Deschutes Basin and to identify changes in eruption rate, eruption volume and chemical and isotopic composition through time. This Miocene and Pliocene record will improve our understanding of the Cascadia subduction system by: (1) documenting the record of explosive volcanism through time, and providing the means to relate this record to tectonic and other forcing factors; (2) providing a basis for studying the earliest phases of the High Cascades arc and the transition between earlier Western Cascades volcanism to the High Cascades, (3) allowing improved comparisons between the relatively well-studied Quaternary rocks of the Cascades and earlier episodes of arc volcanism, and (4) allowing for more complete comparisons between the Cascades, an end-member "hot and dry" arc, and other subduction systems.

NSF Awards 1144558, 1144392, 1144367 **Collaborative Research: Dating Submerged Continental Crust Beneath the Southern Gulf of California, and a Synthesis of the Magmatic and Tectonic History of This MARGINS Focus Site** *P. Lonsdale (Scripps); M. Grove, D. Kimbrough (Stanford)*

The PIs propose to measure and interpret U-Pb crystallization ages of a varied suite of volcanic and plutonic rocks recovered from water depths of 300-3500m at several hundred sites on the submerged and previously unsampled rifted continental crust that underlies most of the southern Gulf of California. Many samples were collected along traverses up fault scarps and across volcanic features by ROV; 50 dredge hauls also recovered igneous rock. All relevant samples have been petrographically described and geochemically analyzed. These samples record a long and complex magmatic history in this region, which in the past 20 Myr has changed from a volcanic arc to a subaerial intra-continental rift, been flooded by a marine incursion, and developed a chain of axial basins growing by seafloor spreading. Radiometric dates are needed to define this history, and to test hypotheses that up till now have been solely derived from still-subaerial outcrops at the margins of the rift. Existing dating show striking discordance between the age estimates, hinting at interesting cooling histories with likely tectonic implications. Targeted zircon (U-Th)/He and K-feldspar 40Ar/39Ar thermochronologic analyses and modeling will constrain thermal histories, thereby contributing to understanding rift tectonics including continental uplift and subsidence in the gulf rift.

NSF Awards: 1144568, 1144455, 1144353, 1144351 **Collaborative Research: Illuminating the architecture of the greater Mt. St. Helens magmatic systems from slab to surface** *O. Bachmann, K. Creager, H. Houston, J. Vidale (U. of Washington); A. Levander (Rice U.); A. Schultz, P. Bedrosian (Oregon State), G. Abers (LDEO)*

To better understand volcanic activity, it is fundamental to get an accurate representation of magma generation zones and storage regions in the Earth's crust and upper mantle. Illuminating the architecture of the plumbing system beneath volcanoes will allow scientists to determine (1) at which depths and conditions magmas are generated, and (2) the shapes and sizes of pathways and reservoirs along which magma travels towards the surface. Such knowledge will allow to make informed predictions on the durations of volcanic crises and on the total volume of erupted material during eruptive episodes. This project focuses on the Mount St. Helens volcanic edifice, (WA, USA), whose explosive eruption in 1980 attracted world's attention, and was the first volcano to be thoroughly monitored with modern instruments. Mount St. Helens provides an ideal setting to apply state-of-the-art geophysical and geochemical techniques to image its subterranean roots: It is active, easily accessible, and has a well recorded past history. The project will use several different methods (active and passive source seismic tomography and scattered wave

imaging, magnetotelluric imaging, petrology and geochemistry), involving a large collaborative team, to image the volcano's plumbing system with unprecedented resolution, from the subducting plate to the surface.

NSF Award 1144695 **GEOPRISMS Posdoctoral Fellowship: Systematic search and characterization of very low frequency earthquakes and offshore tremor in Cascadia using the Amphibious Array** *E. Brodsky (UC Santa Cruz)*

The study will undertake a systematic search for very low frequency earthquakes (VLFE), along the entire margin of Cascadia subduction zone, from the trench to the down-dip edge of the transition zone. The sources of VLFEs will be located and characterized to better understand the physics of fault slip, particularly at the edges of the locked zone. The study will better characterize the nature of seismic radiation and their spatiotemporal variability along the fault zone in the crust. It also will improve our understanding of the full spectrum of the seismic radiation during slow slip episodes, physical mechanisms governing slow earthquakes, and their relationships with regular seismicity. It may also shed light on the implications of slow seismic activity on the nucleation of large damaging earthquakes. The study will examine the seismicity of a subduction zone that can potentially produce great damaging earthquakes. It reflects some of the major goals of the NSF-GeoPRISMS and the Cascadia Initiative, and makes good use of the Amphibious Array. Results from this study may help in planning focused interdisciplinary experiments, and guide the selection of target areas for future research.

NSF Awards 1144759, 1144648 **Collaborative Research: Plutons as ingredients for continental crust: Pilot study of the differences between intermediate plutons and lavas in the intra-oceanic Aleutian arc** *P. Kelemen, S. Goldstein, S. Hemming (LDEO); M. Rioux (UC Santa Barbara)*

Felsic plutonic rocks formed in arcs are buoyant with respect to mantle peridotite over the entire range of relevant pressures and temperatures. They tend to remain at the Earth's surface, to form the fundamental building blocks of continental crust. In the Aleutians, most felsic plutonic rocks have compositions that overlap estimates for the bulk composition of the continental crust, and that are distinctly different from spatially associated lavas. Understanding the genesis of Aleutian felsic plutonic rocks is a key to understanding continental genesis and evolution via arc magmatism, a key science goal for the MARGINS and GeoPRISMS Initiatives. The PIs will address the following questions: (1) Do Aleutian plutonic rocks have an isotopically distinct source composition, compared to nearby lavas? (2) Has there been compositional variation in the Aleutian arc over time? Do differences between plutonic and volcanic rocks represent temporal evolution of the arc, or different modes of magma transport and emplacement for different magma compositions? And (3) are high viscosity felsic magmas preferentially emplaced in plutons, while low viscosity, mafic magmas preferentially form lavas? What biases does this introduce, when lavas are presumed to be representative of arc magmatic processes and compositions?

NSF Award 1144771 **Developing a comprehensive model of subduction and continental accretion at Cascadia** *Y. Shen (U. of Rhode Island)*

Cascadia is a prime site to understand subduction dynamics and continental accretion, because it has one of the youngest subducting slabs in the world and a wide range of tectonic units. A variety of scientific questions can be addressed at Cascadia: What controls the subduction zone segmentation? What is the role of water transport in the subduction zone? Where does melting occur and how does magma migrate in the mantle and crust? And how does oceanic lithosphere accrete to the continent? Paleoseismic records show that Cascadia has a history of generating ~M9 megathrust earthquakes, so research is needed to improve the assessment of seismic and tsunami hazards from megathrust earthquakes at Cascadia. This project develops and implements an advanced seismological method to construct a comprehensive, high-resolution velocity model of the crust and upper mantle for the entire Cascadia subduction zone. The velocity model provides a detailed structural framework and new understanding of the subduction processes. The structural correlations of a well-resolved model will help address whether serpentinization of the forearc mantle varies substantially along strike and how it is related to the subduction of sediments, pre-existing features on the slab, and melt production beneath the volcanic arc. The project tests whether the recurrence of episodic tremor and slow slip events is related to properties of the overriding plate or the subducting oceanic plate. The research helps in understanding how accretion of oceanic lithosphere contributes to continental growth and subduction evolution. Accurate and high-resolution characterization of the crust and upper mantle structure is also critical to refining seismic and tsunami hazard assessment in Cascadia.

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Vignettes from the Salton Seismic Imaging Project: Student Field Work Experiences

Kathy Davenport (Virginia Tech) and members of the SSIP field crew

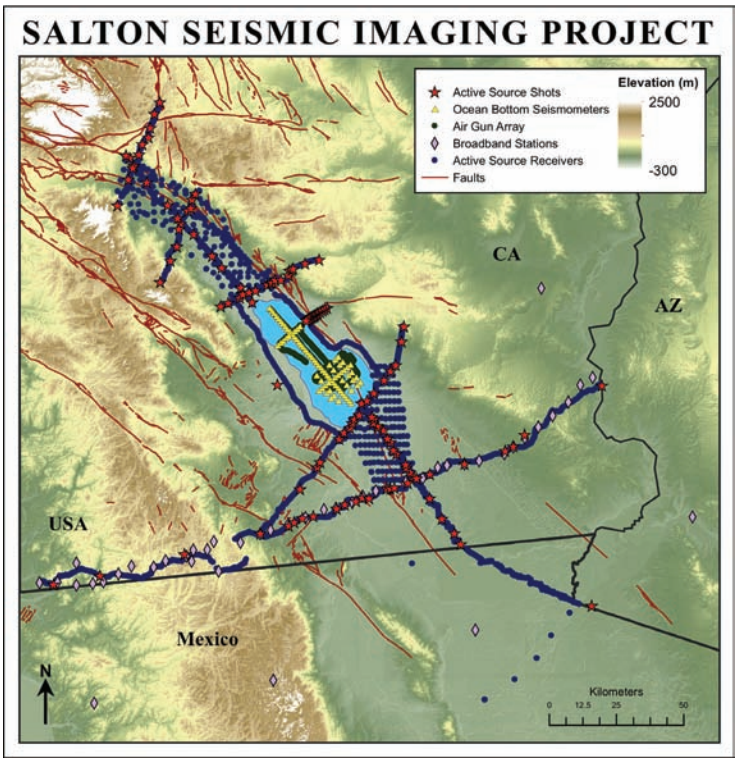


Figure 1: SSIP project map. Red lines are faults; symbols (see index) are seismic sources or seismographs.

This is the third in a series of field blogs, to inform the community of real-time, exciting GeoPRISMS research. If you would like to contribute to this series, please contact the GeoPRISMS office at info@geoprisms.org

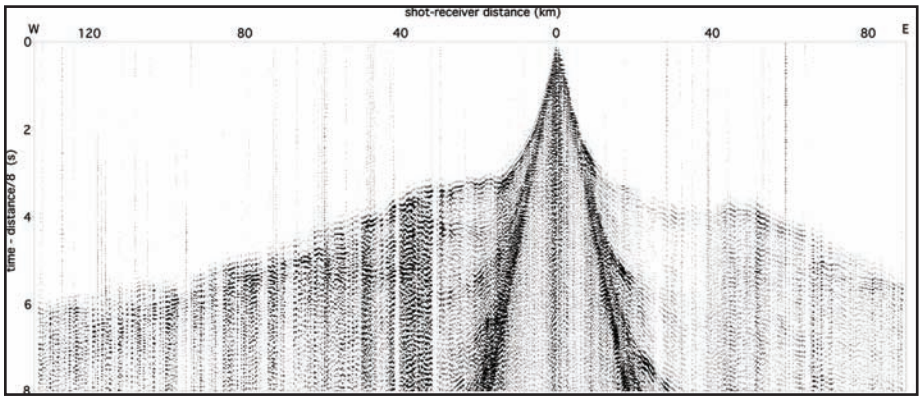
In early 2011, the Salton Seismic Imaging Project (SSIP) descended on Southern California. The Salton Trough was part of the Gulf of California focus area for MARGINS, and processes in this setting also address issues of rift initiation and evolution (RIE) important to GeoPRISMS. Over the course of three weeks, we acquired refraction and low-fold reflection seismic data along 7 lines totaling over 750 km, two 3D grids, and an offshore array. About 130 people participated in the data acquisition, including students from 31 different colleges and universities. During this time, 126 shots were fired, totaling 33,329 kg of explosives, and a 3.4-liter GI airgun was fired 2330 times in the Salton Sea. These sources were recorded on land on 2595 single-component seismographs and 186 three-component seismographs at 4235 unique sites, as well as 48 three-component ocean bottom seismographs at 78 sites in the Salton Sea. A 42 station broadband deployment was also live during this time. We deployed instruments in sand dunes and snow, on bombing ranges and golf courses, beneath windmills and Joshua trees. We hiked through mesquite, avoided cactus and endangered lizards, and endured the stench of the Salton Sea. It took the best efforts of all the people involved to accomplish this massive data acquisition in the Salton Trough!

On January 23, Steve Skinner and I went to survey station locations along the San Andreas Fault east of Mecca. In this area of the desert few people have passed, so there are very few roads. We drove through washes and desert, looking for the easiest paths possible to reach our tentative waypoints. Jack rabbits and lizards tried to run away from us. When we finally stepped on the fault, with one foot on the Pacific Plate and the other on the North America Plate, looking at Salton Sea and the sunset, at that moment I felt that I was a real geologist. -Liang Han, Virginia Tech. January 23, 2011

The Salton Trough is a prime target for investigating rift initiation and evolution and earthquake hazards because it is the northernmost extent of the Gulf of California extensional province. The San Andreas Fault ends in southern California, and strike-slip plate motion is transferred to the Imperial Fault. This step-over created the Salton Trough, a basin extending from Palm Springs to the Gulf of California. Previous studies suggest that North American lithosphere has rifted completely in the central Salton Trough. However, rifting here has been strongly affected by rapid sedimentation from the Colorado River, preventing the onset of seafloor spreading as has occurred in the southern Gulf of California. The 20-25 km thick crust in the central Salton Trough apparently is composed entirely of new crust created by magmatism from below and sedimentation from above. Between the major transform faults, active rifting is manifested by faults observed in modern sediment, abundant seismicity, minor volcanism, very high heat flow, and corresponding geothermal energy production.

Based on the paleoseismic record, the southern San Andreas Fault is considered overdue for an earthquake of magnitude >7.5, and other nearby faults have had historic earthquakes with magnitudes >7. Earthquake hazard models and strong ground motion simulations require knowledge of the dip of the faults and the geometry and wavespeed of the adjacent sedimentary basins, but these parameters are currently poorly constrained.

SSIP ultimately will constrain the initiation and evolution of nearly complete continental rifting, including the emplacement of magmatism, effects of sedimentation upon extension and



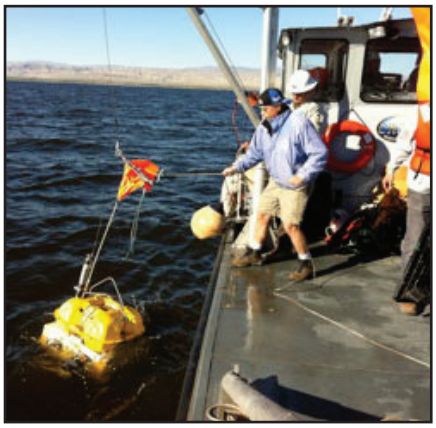


Figure 2 (top). Shot gather. The 911 kg shot was at the Imperial Fault. The 1142 seismograms (from Texans, plus vertical components from RT130's) were recorded along Line 2 that extends from the San Diego and Tijuana suburbs across the Peninsular Ranges, Salton Trough and Chocolate Mountains, to the Colorado River. Figure 3 (right). Deploying a Texan seismograph on a wind farm near Palm Springs. Figure 4 (far left). Deploying an OBS into the shallow Salton Sea. The barge vessel was custom built for the OBS and airgun work. Figure 5 (center). Backpacking seismographs across a Naval bombing range. Each person is carrying ≈8 Texan seismographs and deployment equipment.

magmatism, and partitioning of strain during continental breakup. To improve earthquake hazard models, we will image the geometry of the San Andreas, Imperial and other faults, the structure of sedimentary basins in the Salton Trough, and the three-dimensional seismic wavespeed of the crust and uppermost mantle. raining all these targets in the Salton Trough requires good instrument coverage in areas that are not always easily accessible. For instance, the deserts of Southern California are home to multiple military training facilities. These include the El Centro Naval Air Facility, whose bombing ranges are the winter training grounds for the Blue Angels, and the Chocolate Mountain Gunnery Range, Marine lands used for live munitions training. The Navy and Marine Corp were very accommodating to our project, providing safety training and time windows where we could safely cross the bombing ranges to deploy and pick up instruments. Of course, we had to work around the daily operations of these facilities, and that was not always easy.

The military assured us they had done sweep along our route so there shouldn't be any live munitions on the ground. For safety, however, we were warned to avoid anything that appeared to be man-made. It was my role to drive into the desert, drop off the cross-country hikers, then drive around and pick them up on the other side of the bombing range. When I checked in at the operations center I was told that the Blue Angels were flying that day, and they don't like moving objects on the ground. When I saw them I was to stop driving until they passed by. It seemed like I could drive for no more than a few minutes before the Blue Angels flew overhead and I would have to stop driving. It was pretty awesome to see them flying and executing their performance maneuvers right over our heads! As I stood by the truck awaiting the hikers, a solitary Blue Angel flew by, absolutely directly over my head. In the rush of noise and vibration of the flight, his elevation seemed like it was barely 30 meters. I decided to assume his flight path at that moment was a salute for the good work he thought we were doing.- Janet Harvey, Caltech. March 2, 2011. El Centro NAF

Our access to the Chocolate Mountain marine bombing range was scheduled around daily munitions training. This meant we could only be on the range during hours when there was no chance of encountering one of the training groups, making this our earliest deployment - beginning at 3 am! We left the warehouse in El Centro hours before sunrise to give us enough time to get on and off the range before the firing started. Due to the extremely limited access, we could not survey the station locations ahead of time and instruments had to be deployed without precise GPS locations. We scurried around in the dark, planting seismometers as quickly as we could by flashlight, and left the base just

as the sun came up. When we returned to retrieve the instruments we only had approximate station coordinates, so we had to scramble around, searching through the brush by flashlight for the buried instruments, with the imposing deadline of live ammunition flying through the air motivating us to find our instruments and get out by our sunrise deadline. -Steve Skinner, Caltech. March 2, 2011. Chocolate Mountain Gunnery Range

Much of our work in the Imperial and Coachella Valleys was outside the urban areas and farmlands where the population is concentrated. We worked in the desert, the mountains, and on the Sea. Very often we found ourselves driving in washes or hiking because there were no roads where we needed to be. Bushwhacking, boating, and travelling cross-country led to many adventures for our deployment crews.

During surveying along Hwy 78 towards the Algodones sand dunes we chose a small, sandy side trail that was much safer than the main road. We tested the utility vans we would be using for deployment and learned that carefully driven, empty vans could successfully navigate the sandy road. Unfortunately, on deployment day I was the one driving the van loaded with instruments on this section. As we approached the dunes I saw the access to the side trail, took a deep breath, and began turning the van off the main road. 100 meters later, I learned that through either my lack of utility van experience or the weight of the fully loaded van, our test had failed... we were stuck. When we were pulled free we opted to work from the narrow shoulder on the main road. Later the trail looked more manageable, and much safer than pulling over on the half-shoulder of Hwy 78, so I gave it a second go... and 200 meters later became stuck again. After being pulled out for the second time, we finished our deployment from the main road. I would not try the van on the sandy trail again. -Erin Carrick, Virginia Tech. March 1, 2011

The Salton Trough is often a barren and desolate place. Working on the Salton Sea, however, redefines desolate. I never saw another vessel on the water, despite a warning sign at the marina advising in case of emergency to flag down a passing boat, as there are no 911 services or coast guard rescue. We deployed our sound source and streamers off of a ~100' barge towed behind a dual engine 40' vessel. The water in the Sea is unbelievably hard on boat engines, precipitating salt quickly and preventing the internal cooling system from working. The Salton Sea also 'blows out' very quickly, going from dead calm to ocean size waves in 15 minutes. One nerve-wracking day, the water was as rough as I have ever seen it, one engine was out completely, and the other was screaming with warning sirens, close to overheating too. One may expect that this would be scary for fear of personal injury or lost data or ruined equipment, but the mind changes priorities on the Salton Sea. During the 4-hour ride back to the marina, I was only fearful of how utterly disgusting it would be to be in the water with the millions of dead tilapia. I would surely die from disgust! This particular evening, in true Salton Sea form, the water returned to glass 20 minutes out from the launch, and we enjoyed one of the most beautiful sunsets we had ever seen. -Annie Kell, University of Nevada, Reno. March 2011

The day's assignment was to deploy two-dozen seismometers and geophones across the southern tip of the San Andreas Fault. We would drive as far as possible, and then pack in the instruments and equipment the rest of the way. Our crew had two extra members on this trip – a reporter and photographer from the Los Angeles Times. We drove into the field area on a path we blazed through the brush a month earlier. On the hike both of the media men were good sports, following us across the dry powdered mud in the heat, asking questions about regional tectonics and the SSIP experiment. After deploying the instruments we began the hike back to the vehicles along an abandoned railroad. All of a sudden we were stopped instantly in our tracks. An overwhelmingly close rattle sounded from just a few yards away and the biggest rattlesnake I have ever seen was coiled right off the tracks. We all backed away slowly. The cameraman, however, jumped into action, switching lenses and approaching the snake head-on until he was no more than a foot from its venomous fangs. Its head bobbed forward and back while he got his shots. This man who had fought in an infantry unit in Vietnam, covered troops in Iraq and Afghanistan, and won a Pulitzer Prize for following undocumented workers from Central America to the USA, had managed to find excitement and danger with a few geoscientists in the Salton Sea, California. -Frank Sousa, Caltech. March 13, 2011

Onshore SSIP principal investigators are John Hole (Virginia Tech), Joann Stock (Caltech), and Gary Fuis (USGS, Menlo Park), working with Mexican collaborators Antonio Gonzalez-Fernandez (CICESE) and Octavio Lazaro-Mancilla (Univ. Autonoma de Baja California). The onshore work was funded by the NSF MARGINS Program (GeoPRISMS predecessor), the NSF EarthScope Program, and the USGS MultiHazards Program. The marine component, Wet-SSIP, is funded by an NSF Marine Geology and Geophysics Program grant to Neal Driscoll and Alistair Harding (Scripps Inst. Oceanography) and Graham Kent (Univ. Nevada, Reno). Broadband-SSIP is led by Simon Klemperer (Stanford Univ.) with funding from the NSF Geophysics Program. Onshore seismometers were provided by the EarthScope FlexArray and IRIS PASSCAL instrument pools with field support from PASSCAL. The OBSs were supplied by the OBSIP.

Distinguished Lectureship Program

The GeoPRISMS office announces the annual Distinguished Lectureship Program for academic year 2012-2013. Distinguished scientists involved with GeoPRISMS science and planning are available to visit American colleges, universities, or other institutions to present technical talks and public lectures on subjects related to GeoPRISMS science.

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Any college or university wishing to invite a GeoPRISMS speaker may apply via *www.geoprisms.org*. Applications are due July 15, 2012. 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 Ph.D. programs. Institutions may request a technical and/or public lecture. The GeoPRISMS Office will cover airfares for speakers' travel and will coordinate travel and off-site logistics. Host institutions are responsible for local living costs for the duration of the visit. Questions? Email *info@geoprisms.org*

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GeoPRISMS Newsletter • Issue No. 28, Spring 2012

Geodynamic Processes at Rifting and Subducting Margins

Upcoming Workshops

GeoPRISMS Workshops

• GeoPRISMS Planning Workshop for the East Africa Rift System

Fall 2012 (Final dates and location will be announced soon)

The East Africa Rift was chosen as a primary site for GeoPRISMS because it offers unique opportunities to address a wide variety of questions outlined within the Rift Initiation and Evolution Science Plan and to link with other US and international efforts in Africa focused on tectonics, climate, hazards and energy.

A workshop to develop a detailed implementation plan for the GeoPRISMS East Africa Rift System primary site is tentatively planned for October 2012.

The main goals of the workshop are to

- Prioritize GeoPRISMS science objectives for the East Africa Rift System
- Identify linkages with other US and international efforts in this region
- Discuss the concept of 'Discovery Corridors' for focused, multidisciplinary research and select candidate areas.

White papers will be solicited in advance of the workshop to ensure community input. *http://geoprisms.org/meetings/ears-fall2012*

• GeoPRISMS Planning Workshop for the New Zealand Primary Site

Spring 2013 (Tentative timing; location to be determined)

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