GeoPRISMS

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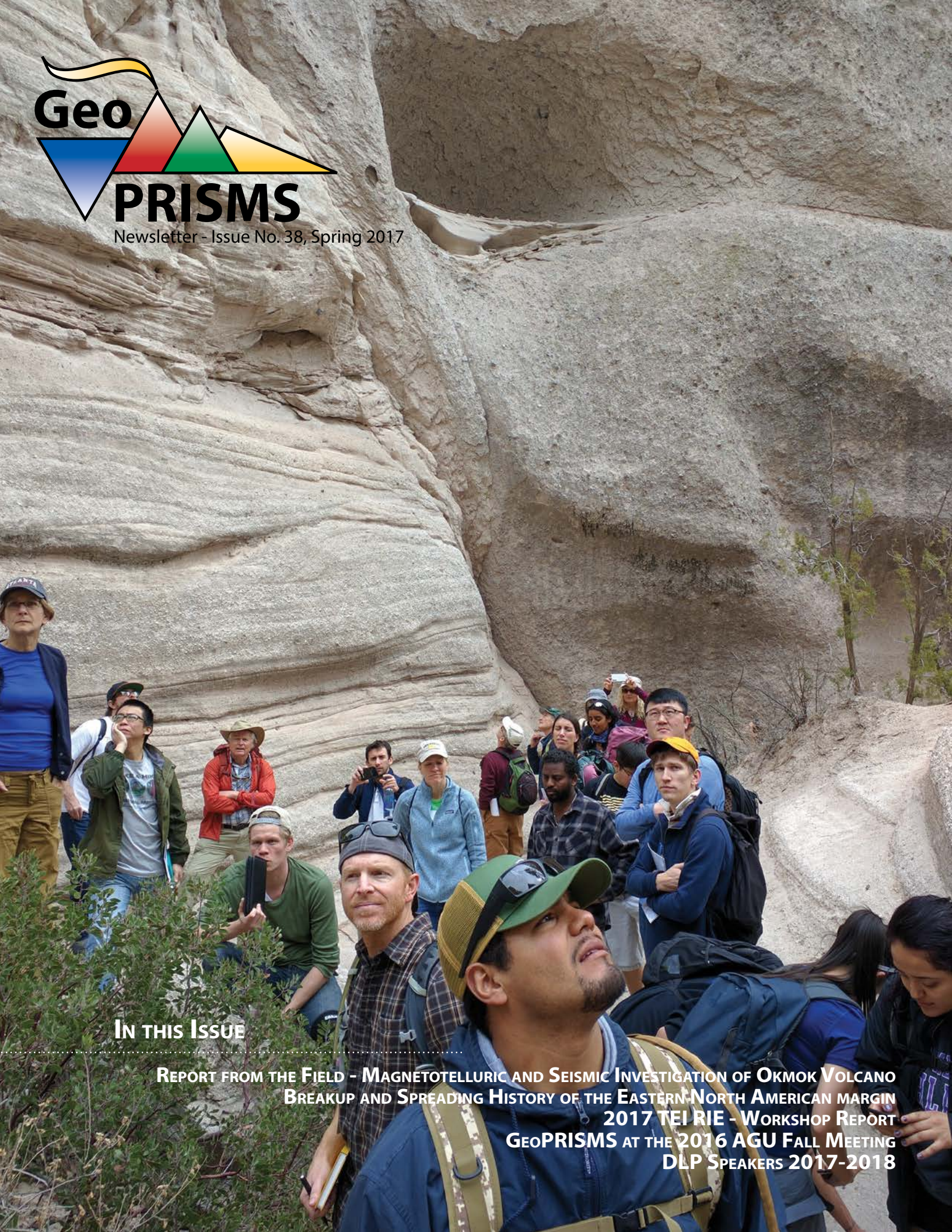

In this Issue

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

From the Chair

I'm pleased to introduce the Spring 2017 issue of the GeoPRISMS newsletter. As has been the case for the past few years, the Spring edition will be distributed in print and be available online, while the Fall issue will be electronic only. We are lucky to have an exciting set of articles for the current edition, including a "report from the field" from Ninfa Bennington and Kerry Key on their work on arc melt generation beneath Okmok Volcano, and a science report from Anne Bécel on her investigation of the breakup and spreading history of the Eastern North American Margin. This issue also includes a number of updates on Fall 2016 AGU activities and student awards, descriptions of newly funded GeoPRISMS projects, and announcements about upcoming opportunities (e.g., call for mini-workshop proposals to precede Fall 2017 AGU; the GeoPRISMS solicitation).

The past year has been an active time for the office and the GeoPRISMS community. Following a busy AGU week that featured a pair of successful mini-workshops and well-attended townhall meeting - along with many special sessions of interest to the GeoPRISMS community - early 2017 was marked by a highly successful Theoretical & Experimental Institute (TEI) for the Rift Initiation and Evolution (RIE) initiative. The TEI provided an important opportunity to review progress toward the GeoPRISMS Science Plan, and to identify exciting new directions, critical knowledge gaps, and key topics primed for synthesis and integration efforts. With over 130 attendees, almost half of whom were students or postdoctoral scholars, the workshop also served to highlight a vibrant and interdisciplinary RIE community. I'd like to thank the conveners, and particularly Donna Shillington (Lamont-Doherty Earth Observatory) and Tobias Fischer (University of New Mexico) for their leadership in organizing this important milestone for the community. The final report from the workshop is on p. 8 of this issue.

I'm also pleased to introduce five new members of the GeoPRISMS Steering and Oversight Committee (GSOC): Danny Brothers, Chad Deering, Becky Bell, Luc Lavier, and Jessica Warren. Thanks in advance for your contributions! I'd also like to thank outgoing committee members Estella Atekwana, Harm Van Avendonk, Paul Wallace, Tony Watts, Brandon Dugan, and Tyrone Rooney for their efforts on behalf of the GSOC and the GeoPRISMS community over the past three (or in some cases four) years. The distinguished lecture program remains an important and highly successful venue for engagement and dissemination of GeoPRISMS research; speakers Esteban Gazel, Heather Savage, and Brandon Schmandt will be returning for a second year, and Cindy Ebinger will join them to begin her stint this fall.

Finally, I'd like to welcome the newest member of the GeoPRISMS community, Marius Ferot-Giachetti (b. 03/24). Warm congratulations to our Science Coordinator Anaïs Ferot and family (Marius and his Dad, Thomas Giachetti)!

I look forward to the next several months, with the important and exciting phase of synthesis and integration on the horizon. This will be a focus for upcoming discussions at the GSOC, and for a planned TEI in the next year. In the meantime, we are preparing for AGU activities, and welcome proposals for mini-workshops focused on primary sites, thematic studies, allied projects, education and outreach, or other topics of interest to the GeoPRISMS program. I hope to see you at one of these upcoming events.

Demian Saffer
Chair, GeoPRISMS Program

Cover Photograph:
TEI participants attending the post-meeting field trip in the Tent Rocks National Monument, NM. Photo credit: Daniel Láo-Dávila.

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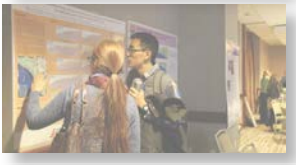
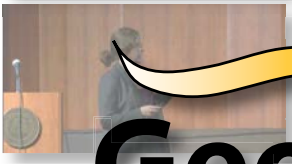
Message from NSF









This year NSF moves to its new building in Alexandria beginning in July, with all operations hopefully moved and in place by early November. In preparation for this move, the NSF IT group and computing/business infrastructure is scheduled to move during the July 1-4th holiday period and so hopefully Fastlane for proposal submissions and reporting functions will be up and running before the GeoPRISMS target submission date of July 27th.

The GeoPRISMS solicitation

Early in the GeoPRISMS program, NSF implemented a phased funding model for large-scale field projects to rotate through the focus sites in an effort to target the limited available resources in a practical and cost-effective manner. The 2017 GeoPRISMS solicitation announces that the full cycle of this phased model is now complete, and that the program will now accept proposals for work at any primary site or for any of the themes. Proposals for field projects should be targeted towards gaps in existing data and clearly justify the need based on the GeoPRISMS Science or Implementation plans, or on the results of the 2015 GeoPRISMS mid-term review, available at www.geoprisms.org. NSF requests that anyone considering large field projects that involve ship time, significant resources, or where the fieldwork is a significant fraction of the budget (>15%), contact a Program Director before submission. Given that large field projects require significant out-year commitments of funds, and the program is moving towards the last few years of its decadal lifespan, it is likely that this is the last Target Date to which we will accept proposals of this scale. Smaller scale integration projects for any of the primary sites are strongly encouraged, particularly those that bring together multiple disciplines. The program also encourages projects that involve amphibious work - work that is done both onshore and offshore - which could involve either the synthesis of previous results or data, new laboratory or experimental work, new or evolving models, or field work. NSF continues to consider proposals that address thematic topics that are not site-specific.

Federal Budget Update

Congress signed the Consolidated Appropriations Act into law on May 8th 2017 which provides FY17 funding through September 30th for NSF at the level of $7.472 billion, essentially flat from the FY16 level (0.1% increase). This budget decision coming so late in the fiscal year has delayed several decisions on the 2016 GeoPRISMS competition but we hope to complete those decisions in the next month. Going forward the news is not so encouraging. As NSF is part of the Executive branch of the government, NSF has complied with the President's request and has submitted a FY18 budget request of $6.653 billion, an 11% decrease over FY17. As we all know from our civics lessons, the President proposes and the Congress appropriates, so we shall hopefully see by October what the final actual budget will be.

2016 GeoPRISMS funding round

As mentioned above, several proposal decisions from the last GeoPRISMS panel have been delayed due to government funding uncertainties. The list of potentially funded projects cover the Rift Initiation and Evolution theme and a wide range of focus areas from Eastern North America Margin to New Zealand to the East African Rift System and Alaska. Proposal success rate is strong, and comparable to past rounds.

Meetings and past year activity

Finally, this past year saw a lively GeoPRISMS rift-focused TEI in Albuquerque, and a National Academies workshop & resulting report on volcanic eruptions, entitled ERUPT: Volcanic Eruptions and Their Repose, Unrest, Precursors, and Timing. Most recently, the final report of the 2016 Subduction Zone Observatory workshop has just been released and submitted to NSF. This vision document entitled "The SZ4D Initiative" outlines an exciting and bold plan to integrate research across disciplines, US agencies and international partners in order to motivate science that underpins our understanding of the processes that underlie subduction zone hazards in four dimensions. The timing for all of these meetings and publications couldn't be better, as GEO welcomes a new Assistant Director for GEO: William Easterling, of Penn State. We look forward to showing him that the GeoPRISMS community is thriving, and full of ideas.

Maurice Tivey & Jennifer Wade
GeoPRISMS Program Managers, National Science Foundation

Late Stage Rifting and Early Seafloor Spreading History of the Eastern North American Margin

Anne Bécel

Lamont-Doherty Earth Observatory, Columbia University

During September-October 2014, the NSF-GeoPRISMS-funded Eastern North American Margin (ENAM) Community Seismic Experiment (CSE) collected deep penetration multichannel seismic (MCS) reflection profiles covering a 500 km wide section of the Mid-Atlantic passive margin offshore North Carolina, which formed after the Mesozoic breakup of supercontinent Pangea The ENAM-CSE data extend farther offshore than previous seismic surveys conducted in this area and encompass the full transition from continental breakup to mature seafloor spreading while specifically providing unique constraints on the events surrounding the final stage of continental rifting and the initial stage of seafloor spreading, which remain poorly understood. The results shown here demonstrate the ability of MCS data to image four distinct domains that highlight different basement characteristics and provide new insights on the degree of extensional strain localization experienced during continental breakup and how the earliest oceanic crust was formed after rifting.

Introduction

The Eastern North American Margin (ENAM) is a passive continental margin that was formed by the rifting of the Pangaea supercontinent and the opening of the Atlantic Ocean during the Late Triassic and Early Jurassic.

From offshore Nova Scotia to Florida, the ENAM has been classified as a volcanic-type margin (Marzoli et al. 1999). Multichannel seismic profiles have imaged seaward dipping reflectors (SDRs) that have been attributed to the subaerial eruption and subsequent subsidence of volcanic flows emplaced during the final phase of rifting (Austin et al., 1990). Seismic refraction profiles beneath the volcanic wedges have revealed a thick sequence of high seismic velocity lower crust rocks interpreted as igneous/magmatic underplating (Holbrook et al., 1994). The East Coast magnetic anomaly (ECMA) is a high-amplitude positive magnetic anomaly running along the length of the margin (Fig. 1) (Keller et al., 1954). The source of the ECMA has been primarily attributed to seaward dipping reflectors in the upper crust (Austin et al., 1990) and is interpreted as the limit between the continental crust and the normal oceanic crust. However, the exact nature and the width of the zone between the continental crust and normal oceanic crust remain uncertain. This zone is thought to either represent a new anomalously thick magmatic crust with higher velocity than lower oceanic crust with no continental crust present (Talwani et al., 1995) or a zone with volcanics on top of magmatic material intruded into extended continental crust or underplated beneath. The nature and the width of this zone are of fundamental importance to understanding the late stage rifting processes and over what time period the continental breakup occurred at this volcanic margin. Margins that experience a voluminous magmatism during rifting tend to have a more rapid continental breakup with a smaller zone of crustal extension (i.e. strain localization) and tend to develop more symmetric conjugate margins.

The Blake Spur magnetic anomaly (BSMA) is a positive, linear magnetic anomaly located 150-250 km to the east of the ECMA (Fig. 1). The BSMA is of lower amplitude than the ECMA but also consists of segments with several magnetic peaks separated by troughs. The age of BSMA is unknown but extrapolated ages range between 168-173 Ma. The nature and origin of this magnetic anomaly is still debated and different models have been proposed. BSMA is either thought to mark a ridge jump (Vogt, 1973), magmatic pulse associated to a plate re-organization (Klitgord and Schouten, 1986; Kneller et al., 2012) or a change in spreading rate/direction and asymmetry of incipient seafloor spreading during the early opening of the Central Atlantic (Labails et al., 2010). In the ridge jump scenario, the BSMA is thought to represent a sliver of West African rifted continental crust that experienced continental breakup magmatism and that was left on the Eastern North American margin after the early spreading center jumped east of the BSMA. This model implies that a now extinct mid-ocean ridge lies between ECMA and BSMA.

The Inner Magnetic (Jurassic) Quiet zone (IMQZ) lies between the ECMA and the BSMA (Bird et al., 2007). Because the magnetic anomalies are of very low amplitudes and variable in shape, the correlation of magnetic anomalies with magnetic reversals remains challenging in this zone (Fig. 1). Timing and location of breakup at the ENAM thus remain uncertain and the spreading rate of the earliest normal oceanic crust in the IMJQ is not well constrained.

Data acquisition and project goals

This project aims to extract information on the late-stage continental rifting including the relationship between the timing of rifting and the occurrence of offshore magmatism and early seafloor history of the Central Atlantic using multichannel (MCS) data from the ENAM-CSE. The MCS data were acquired on R/V Marcus Langseth using a 6600 cu. in. tuned airgun array and 636 channel 8-km-long streamer. The source and the streamer were both towed at a depth of 9 m for deep imaging. This project involves the multichannel seismic processing and interpretation of two offshore margin normal profiles (450-km-long and 370-km-long, respectively), spanning from continental crust ~50 km off the coast to mature oceanic crust 110 km east of the BSMA and a ~350-km-long MCS profile along the BSMA (Fig. 1). These primary MCS lines are also coincident with the ENAM seismic refraction profiles recorded on ocean bottom seismometers.

Results

The high-resolution MCS data provide detailed structure of the sedimentary cover and crust (Fig. 2 and Fig. 3). The initial images of the two margin normal profiles reveal several major changes in the basement character and roughness between the ECMA and the BSMA (Fig. 2) that have not been previously described. The four domains described below correspond to distinct magnetic anomalies that suggest that magnetization contrasts exist between those domains. The interpretation of the new observations from MCS data give new important insights into the late stage of rifting and rift to drift transition.

- From CDP 26500 to CDP 32500 (Fig. 2a and 2c), the top of the basement is smooth and less reflective than on the seaward part of the profile and it is also less distinguishable from the sedimentary layers above. The top basement characteristics suggest that it could correspond to smooth volcanic flows emplaced in shallow water conditions and coincide with the landward onset of the ECMA.

- From CDP 32500 to CDP 41700 (Fig. 2a and 2d), there is a step up in the basement and a drastic change in the basement roughness. In this area, the crust is highly tectonized by normal faulting forming tilted, faulted crustal blocks. This crust could be interpreted as highly extended continental crust due to the geometry of syn-rift sedimentary sequences in the basement half-grabens. This interpretation would be in conflict with the zone between the continent and the oceanic being purely magmatic and would suggest that continental crust could have been thinned by faulting before being intruded by igneous material. Alternatively, this crust could be oceanic crust formed at very slow spreading rates (<15 mm/yr). Very slow-spreading crust is known to be fragmented by normal faulting with large crustal blocks (long wavelengths). On the sole basis of basement architecture, we cannot fully support either of the two proposed hypotheses. Ocean-bottom seismometer (OBS) refraction data acquired during the ENAM-CSE and coincident with the MCS data used in this project will help to decipher the nature of the crust where tilted basement blocks are imaged.

- From CDP 41700 to CDP 51100 (Fig. 2a and 2e), the basement roughness appears to be that of a typical oceanic crust formed at a steady state slow spreading ridge.

- From CDP 51100 to CDP 62000 (Fig. 2a and 2e), starting at the BSMA anomaly and seaward, the top basement is very smooth and reflective and the BSMA anomaly appears to coincide with a step-up in top basement.

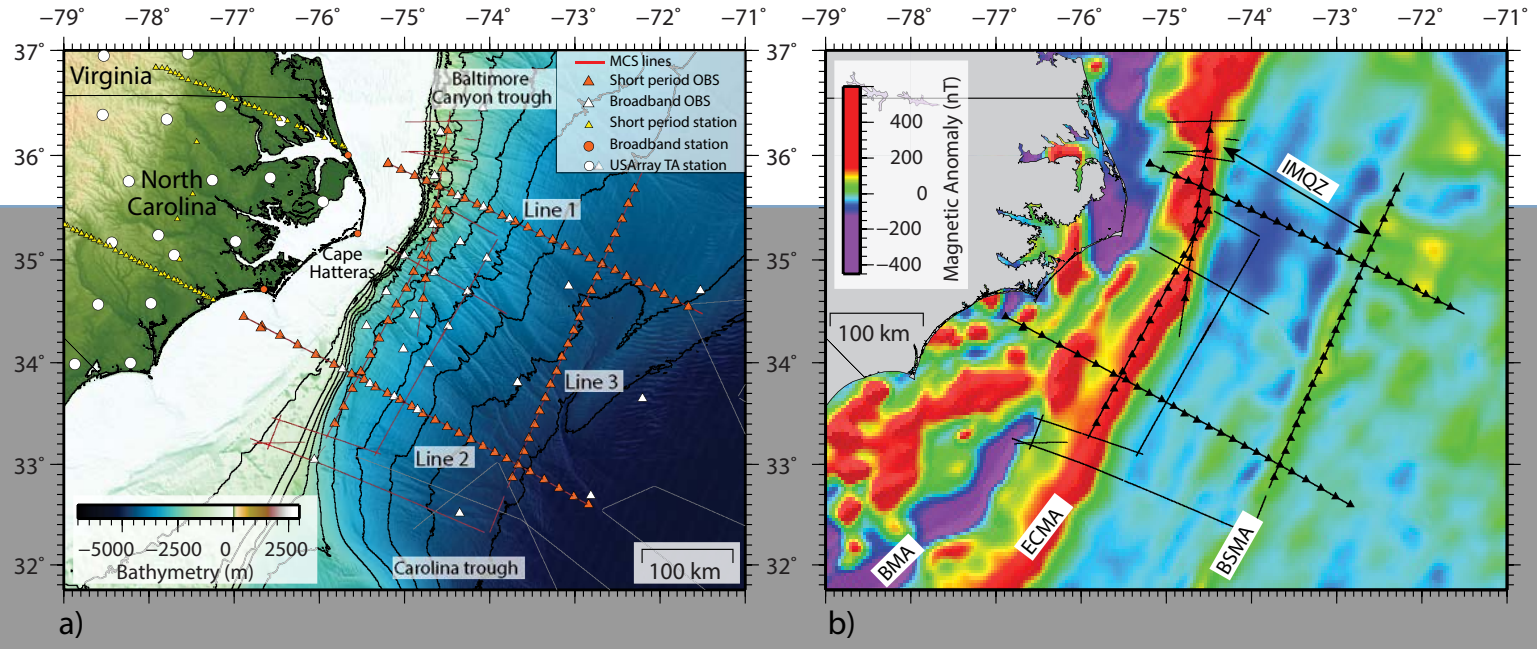


Figure 1. a) Elevation Map (Andrews et al., 2016) contoured every 500 m showing the location of the ENAM Community Seismic Experiment. Line 1 and ENAM Line 2 were chosen to characterize the deep structure of the Carolina Trough south of Cape Hatteras, and the Baltimore Canyon Trough north of Cape Hatteras, respectively whereas the Line 3 was chosen to characterize the structure of the crust and uppermost mantle to better understand the origin of the Blake Spur Magnetic anomaly. b) Magnetic anomaly map (Maus et al., 2009) of the North American Margin. ECMA: East Coast Magnetic Anomaly; BSMA: Blake Spur Magnetic Anomaly; IMQZ: Inner Magnetic Quiet Zone.

Along the BSMA, clear Moho (Mohorovic Discontinuity) reflections are observed 2.5-3 s (8.12-9.75 km assuming an average crustal velocity of 6.5 km/s) beneath the top basement (Fig. 3) and are relatively continuous. Abundant intracrustal reflections, primarily restricted within the oceanic lower crust, are also observed over crust formed at BSMA time but also in younger crust.

In the ridge jump scenario, the BSMA would represent thinned continental crust intruded by igneous material. However, the top basement is very reflective indicating a strong impedance contrast between the sediment layers and the top basement. This would be more in agreement with a top basement produced by submarine seafloor spreading at a mid-ocean ridge than subaerial or shallow water emplacement of volcanics within sediments that would reduce the impedance contrast as in Fig. 2c.

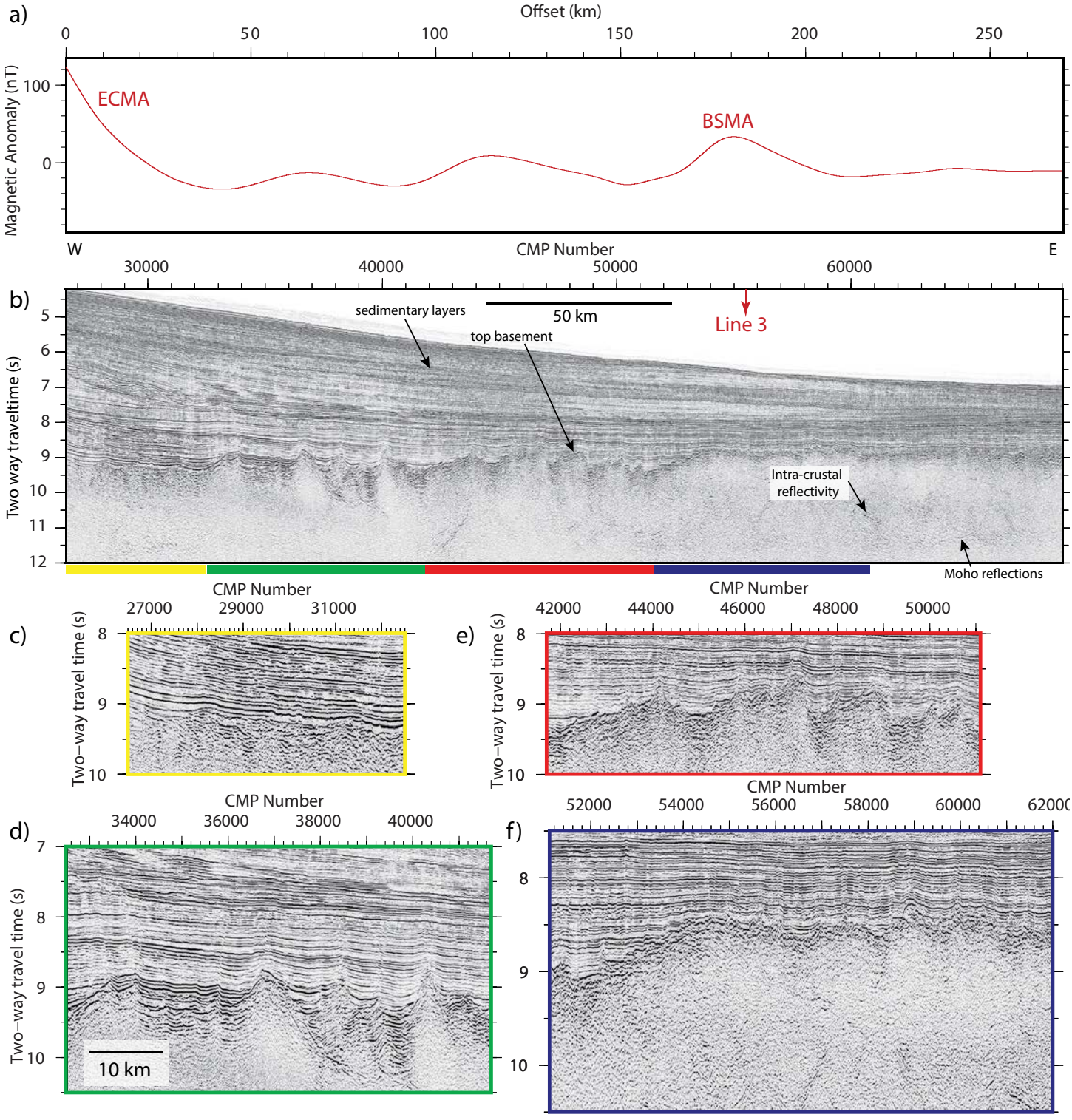


Figure 2. a) Magnetic anomaly profile coincident to the seaward part of ENAM-MCS Line 2 (Maus et al., 2009). b) Post-stack time migrated profile of the seaward part of ENAM-MCS Line 2 c) d) e) f) zooms into the four different domains discussed in the text and that display different basement characteristics.

The layering imaged within the lower crust (Fig. 2f) could indicate magmatic intrusives but the well-developed Moho would suggest no underplating. In addition, lower crustal reflections persist in younger crust beyond the BSMA suggesting that this crust is not continental crust that experienced pervasive melt migration during extension. There is also no evidence of a fossil spreading center between ECMA and BSMA.

A drastic increase in seafloor spreading rate and a change in the spreading in the vicinity of the BSMA could explain the change of the basement smoothness from rough to smooth and the basement relief but would not explain the thicker than normal oceanic crust. A magmatic pulse at BSMA time would produce a strongly magnetized upper oceanic crust and could explain the magnetic anomaly. The magnetic pulse would also be in agreement with the thicker than normal oceanic crust and smooth basement topography observed in the data.

The outcomes of the project described above clearly show that the MCS data from the ENAM-CSE provide important information for the study of late-stage rifting processes at this margin. Ultimately, results will be integrated with the landward part of the profiles (not shown here).

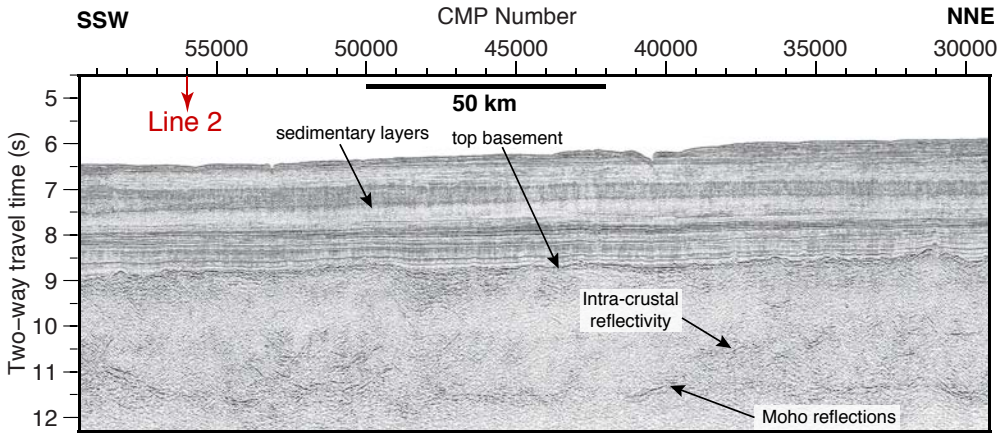


Figure 3. Part of pre-stack time migrated profile (ENAM-MCS Line 3) along the Blake Spur Magnetic Anomaly.

This project involves collaboration with Brandon Shuck and Harm van Avendonk at UTIG who are working on the offshore wide-angle reflection/refraction modeling coincident to the multichannel seismic lines used in this project. By combining constraints from the multichannel seismic profiles, refraction modeling and potential field studies, we hope to better understand implications for variations in crustal structures, faulting and magmatism seen in the MCS data at this margin and at a broader scale expand our knowledge of the continental breakup and early seafloor spreading at passive margins worldwide. Results from this project will also be integrated with two others GeoPRISMS projects recently awarded that aim to examine other datasets from the ENAM-CSE. ■

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Report on the NSF-GeoPRISMS Rift Initiation and Evolution Theoretical and Experimental Institute

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The GeoPRISMS Theoretical and Experimental Institute (TEI) for the Rift Initiation and Evolution (RIE) initiative was held February 8-10, 2017 in Albuquerque, NM. This meeting brought together 132 scientists with diverse expertise working on rifts and rifted margins around the world to discuss recent scientific advances, emerging questions, and to identify potential high-priority science for future GeoPRISMS RIE efforts. The meeting included a series of oral and poster presentations, pop ups and discussions. The workshop conveners have prepared a report that summarizes science results and future directions discussed at the workshop.

The GeoPRISMS Rift Initiation and Evolution (RIE) Theoretical and Experiment Institute (TEI) was held in Albuquerque, NM from February 7-10. The objectives of the meeting were to summarize progress and recent scientific advances related to the RIE initiative, identify high-priority science for future GeoPRISMS RIE efforts and promote community building and formation of new collaborations.

To meet those objectives, a diverse group of scientists was enlisted to serve on the convening team, give invited and contributed talks and to contribute to the meeting as attendees. The expertise of conveners, speakers and attendees spanned a broad range of interests connected with the RIE initiative, from deep geodynamical processes underlying rifting to surface processes controlling syn- and post-rift evolution. Scientists undertaking studies in the RIE primary sites (the East Africa Rift and the Eastern North American Margin) and working at other rifts and rifted margins were encouraged to contribute to all aspects of the workshop to ensure diverse perspectives. The meeting was attended by 133 participants, 59 of which were students and postdoctoral researchers. Besides attracting a large group of early career scientists, attendees included mid-career investigators who were relatively new to RIE science. Scientists from abroad were invited to attend to provide insights regarding the RIE primary sites and on rifts in general.

The meeting structure was designed to cover the broad spectrum of science included in the GeoPRISMS RIE science plan, to encourage interdisciplinarity and to bring in diverse perspectives. The main meeting had seven main oral sessions:

1. Rift evolution from initiation to post rift architecture
2. Geodynamics of rift and post-rift processes
3. Magmatism and volatile exchanges
4. Faulting and strain
5. Surface processes & feedbacks between deep/surface processes
6. Hazards associated with rifting environments

There was substantial time allocated for discussion and interaction; the meeting included several poster sessions at various times of day, two breakout sessions, one small-group discussion and plenary discussion after each oral session and throughout the meeting. As described in more detail below, the speakers successfully synthesized the state of knowledge on various aspects of rift evolution and of highlighting important outstanding questions. The breakouts and discussion were dynamic, generating excellent ideas and insights. The main meeting was preceded by a half-day student and postdoc symposium organized and led by three postdocs.

Overview of science presented at the meeting

Student-Postdoc Symposium

The student-postdoc symposium was held the afternoon before the main meeting and was led by Yelebe Birhanu (Bristol), James Muirhead (Syracuse), and Jean-Arthur Olive (LDEO). The organizers began the symposium with a presentation that provided an overview of the outstanding science questions related to RIE. These questions focused on the topics of rift initiation, the 4-D rift architecture, long- and short-term rift deformation mechanisms, rift volcanism, magmatism and volatile fluxes as well as surface processes at rifts and rifted margins. These topics were the focus of small group discussions later in the afternoon, and the discussion leaders summarized these discussions during the first day of the main meeting to all attendees. The symposium also included pop-ups by all participants on their RIE related research. Over sixty people attended the student-postdoc symposium, including nearly all students and postdocs at the meeting and a few representatives from the GeoPRISMS Office and GSOC, NSF and the convening team of the main meeting. The scientific discussions were followed by a career development panel discussion where students and postdocs had the opportunity to engage directly with scientists at a variety of stages in their careers.

Main meeting

The main part of the meeting began with a session on rift evolution from initiation to post-rift architecture. Roger Buck (LDEO) emphasized the role of magma throughout the life of rifts, from diking during rift initiation to the association of rifted margins with large magmatic outpourings and seaward dipping reflectors. Harm Van Avendonk (UTIG) reviewed insights on rifting processes from studies of both magma-poor and magmatic rifted margins, where recent studies show interesting variations in the distribution and timing of magmatism in relation with rifting, including provocative clues from ENAM on distribution of magmatism and highly thinned continental crust. Danny Brothers (USGS) focused on postrift evolution of rifted margins, including how sediment delivery and pre-failure configuration control evolution and evidence for active fluid venting, slope failure, and sediment compaction.

Over sixty early career scientists attended the student-postdoc symposium organized the day before the main meeting.

Session 2 focused on geodynamics. Jolante Van Wijk (NM Tech) provided an overview of numerical modeling approaches and the importance of testing and comparing models to both observations and other numerical solutions. Zach Eilon (Brown) synthesized geophysical observations from the Woodlark Rift in Papua New Guinea and showed evidence of limited melt, lithospheric removal and opening direction parallel anisotropy. Andrew Smythe (Penn State) showed how high-temperature thermochronology and diffusion speedometers can be used to assess mantle upwelling rates and how strain is vertically distributed during rifting. Robert Harris (Oregon State) showed high-resolution heat flow results from the Gulf of California and emphasized the role of fluid flow as well as conductive heat transfer. Colton Lynner (Arizona) showed new shear-wave splitting results from the ENAM community seismic experiment and suggests that 3-D edge driven flow at the edge of the margin can explain their observations.

Session 3 followed with talks on magmatism, volcanism and volatile exchanges. Cornelia Class (LDEO) gave an overview of the geochemical and petrological tools to identify magma and volatile sources in rift settings, highlighting the importance of using multiple geochemical systems to identify mantle components. Sara Mana (Salem State) showed chronological and geochemical data from the North Tanzania Convergence zone and highlighted the evidence for pulsed magmatism and a metasomatized mantle source. Juliane Hübert (Edinburgh) provided new insights on magma storage and pathways using magnetotelluric data in the Main Ethiopian Rift. Madison Meyers (U. of Oregon) emphasized the occurrence of large silicic volcanic centers in rift settings and showed how detailed work on volatiles recorded by melt inclusions allow for the quantification of magma ascent rates. Philip Kyle (NM Tech) ended the session with an overview of the magmatic history of the West Antarctic Rift.

Day 2 started off with the session on faulting and strain, where Cindy Ebinger (Tulane) provided a 'recipe for rifting' for cratonic and orogenic rifts where the difference in both crustal and mantle rheology are of critical importance for rift architecture and extension, including the possibly important but poorly known hydration state and distribution of volatiles at depth. Paul Umhoefer (Northern Arizona U.) showed how variations in inherited structures, strain partitioning, angle of obliquity and sediment input control extension in the Gulf of California – Salton trough plate boundary.

Group picture, outside Hotel Albuquerque.

Home institutions of the meeting participants.

Photo by J. Morgan

James Muirhead (Syracuse) showed the results from an interdisciplinary study in the East African Rift that better constrain the role and sources of fluids and mantle melting in the early stages of rifting and their connection to faulting. Hannah Mark (WHOI) provided new insights from modeling of observed seismic coupling coefficients that show how the thermal regime scales with seismic coupling in MOR and continental rifts. Elifuraha Saria (Ardhi) ended the session by providing an overview of geodetic constraints on crustal deformation in Africa emphasizing the fact that large parts of the continent are not adequately monitored geodetically.

Session 5 focused on surface processes and feedbacks in rifts, where Kyle Straub (Tulane) showed how geomorphology signals are stored in the stratigraphic and landscape record. His talk was followed by Jean-Arthur Olive (LDEO) who discussed the role of surface processes in the stabilization of half-graben structures. Erin DiMaggio (Penn State) talked about the connection between rift development as preserved in the stratigraphic record and the development of the Ledi-Geraru paleontological site. Liang Han (Virginia Tech) showed how rapid sedimentation in the Salton Trough resulted in the formation of new crust, delayed continental breakup and seafloor spreading, and how metamorphism of sediment can further delay final crustal breakup. Rob Gawthorpe (Colorado School of Mines) ended the session with insights on the evolution of the Corinth Rift, Greece from the onshore-offshore observations.

The final science session highlighted hazards in rifts and rifted margins. Karen Fontijn (Oxford) focused mainly on volcanic hazards in the East African Rift, emphasizing the low viscosity of rift magmas, the high potential for phreatic eruptions, and the abundance of large caldera systems as well as the role of hazardous CO_2 degassing. Atalay Ayele (Addis Ababa U.) highlighted the challenges in disaster risk management in Africa that are due to limited capacity in equipment and human resources and the general level of understanding of potential risk. He also pointed to recent successes such as capacity building efforts, advances in real-time data flows, and national workshops. Maurice Lamontagne (GSC) showed how earthquakes and tsunamis related to rifting are the main hazards in Eastern Canada and how detailed mapping of ancient fault structures provides key insights on earthquake mechanisms and distributions in the region. Sang Mook Lee (SNU) highlighted the geohazards of the East Sea and the Sea of Japan and their potential to affect nuclear power plant safety.

Collaborative opportunities were discussed with presentations on the RiftVolc initiative, connections between rifting and hydrology, EarthScope and Africa Array updates.

Science themes with opportunities for near-term future studies

The TEI was designed to provide ample opportunities for participants to ask questions and discuss scientific issues related to the presentations. This was achieved through a panel discussion following each session including all speakers. Additional focused discussions occurred during two breakout sessions and small group discussions, which focused on the identification of high priority science questions and work needed to tackle these questions.

The following major science themes emerged from discussions at the TEI. For each of these themes, discussions focused on exciting recent findings and opportunities for near-term research progress through the GeoPRISMS RIE TEI initiative.

1. Tracking fluids (volatiles and magmas) through the lithosphere and with time

The importance of fluids for a spectrum of interconnected processes throughout the life of rifts and rifted margins was a topic of significant interest at the meeting. Meeting presentations covered recent results that have revealed strong, nonlinear interactions between volatiles and faults (e.g., talk by Muirhead), the important influence of prerift and synrift metasomatic events on magmatism (e.g., talk by Sana), and the capacity of fluids to advect heat and strongly modulate the thermal structure of rifts (e.g., talk by Harris). Geochemical tracers can be used to constrain the modification of the lithosphere by magmatic events (e.g., talk by Class). New studies of rifted margins also reveal unexpected mantle structure and magmatism, hinting at active processes long after rifting (e.g., talk by Lynner).

These new science results point to several exciting near-term future science directions:

- Understanding the connections between deep volatiles and shallow observations, including constraining magma and volatiles residence times and pathways
- Developing a quantitative understanding of the impact of volatiles/magmatism on strain localization and rheology (connects to theme 2)
- Connecting general rheological models to morphological and process-based differences between magma-poor and magma-rich regions
- Investigating the origin and significance of post-rift magmatism on rifted margins

2. Controls on deformation and localization at different temporal scales

Elucidating controls on deformation and localization are central to understanding rift processes, and were another major focus of meeting presentations and discussions. Magma is clearly a great localizer of strain (e.g., talks by Buck, Ebinger), but magma is not present everywhere, at least not in abundance. In magma-poor locations, fluids, pre-existing structures and/or chemical heterogeneity may be important factors (e.g., talks by Van Avendonk, Eilon). Volatiles appear to influence crustal rheology and fault behavior (e.g., talks by Muirhead, Ebinger), but are still poorly understood. The role of pre-existing lithospheric structure in strain localization appears to vary among rift systems and at different scale lengths (e.g., talks by Lynner, Eilon).


Photo by L. Crossey

New numerical models and observations suggest that surface processes may also control strain localization (e.g., talks by Olive, Han; connects to theme 3). The slip behavior of rift faults (creeping, locked, etc.) is poorly known (e.g., talk by Mark), and there are few constraints on how it might change over time or with rift evolution (e.g., talk by Van Avendonk).

These new science results point to several exciting near-term future science directions:

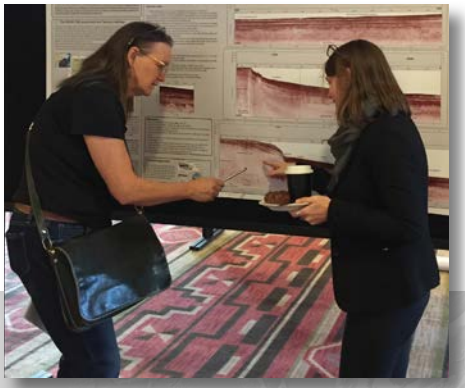
- Integration of rifting processes across a range of time scales from the earthquake cycle to geologic time
- Characterization of slip behavior of faults over time and space
- Understanding variations in temporal/spatial patterns of deformation between magmatic and magma-poor systems
- Comparing transient behavior in rifts (creep, slow slip) to subduction and transform zones
- Observing how volatiles are distributed through lithosphere (connects to theme 1) with an emphasis on how they impact rheology, faulting, and transient deformation
- Constraining mantle rheology on a variety of time scales and as a function of volatile abundance, metasomatism and melt extraction processes (connects to theme 1).

3. *Surface mass sedimentary fluxes and feedbacks with rifting*

Recent studies have demonstrated strong connections between surface processes and all stages of rift evolution. These include the formation of new crust through rapid sedimentation (e.g., talk by Han), the impact of erosion on fault evolution (e.g., talk by Olive), the structural control of sediment pathways during and long after rifting (e.g., talk by Gawthorpe), and the structural control of slope failure (e.g., talks by Brothers and Lamontagne). The vertical displacements and crustal architecture associated with extensional tectonics strongly influence the spatial and temporal distribution of depositional domains (e.g., talks by Straub, Brothers).

These results point towards several important near-term future science directions:

- Developing more comprehensive sedimentary histories of rifts to improve understanding of rift-related mass transport
- Improving conceptual and numerical models of sediment influence on extensional processes, including thermal and mechanical feedbacks (connects to theme 2)
- Utilizing the extant and paleolake systems for integrated investigations of landscape evolution.



Efforts needed to make progress on themes within GeoPRISMS

To address outstanding questions related to the themes above, the following future efforts were highlighted as particularly important.

Synthesis

Comparing among and within rifts is important to address many of the overarching RIE science questions and the specific questions within the themes above. A growing volume of data is now available in both primary sites and in other rift systems on everything from surface processes to magmatism and deep geodynamics. These observations include existing geophysical datasets on both EAR and ENAM from GeoPRISMS and other efforts, growing geochemical data and drilling data in various rifts. Particular themes discussed for syntheses were:

- Geochemical variations along/across ENAM/EAR
- Sediment mass fluxes from existing (limited) drilling data
- Geochronological data on magmatic/volcanic events and surface processes
- Crustal/lithospheric structure of rifts from existing geophysical imaging, with focus on comparisons between and within systems with variable magmatism
- Geochemical data from geothermal exploration projects (drilling) in volcanic and non-volcanic settings.

New data collection and experimental/numerical work

From discussion at the meeting, it is clear that new data and experiments are required to tackle many important science themes, and several key gaps emerged from discussions at the meeting. Below are examples:

- Studies of volatile systems to understand their distribution/abundance/residence time at various levels in the lithosphere. This would involve integrated geophysical imaging including but not limited to MT, seismic, and detailed geochemical studies such as melt inclusions, sampling volatiles at the surface, high density flux measurements, and other approaches.
- Experimental and numerical modeling directed at the impact of volatiles and lower crust/mantle lithosphere hydration state/compositions on deformation throughout the lithosphere,
- Observations to constrain the time scales of processes are needed. These include but are not limited to more geodetic observations to understand average rates and observe transient events as well as investigations of paleoseismology, deformed volcanic ash markers, and tectonic geomorphology to understand longer term accommodation of strain by events. On a longer time scale, better and improved geologic timing information is needed.
- New constraints on sedimentary fluxes in rifts including but not limited to cosmogenic dating techniques, river incision rates, and obtaining data from new drill cores.
- Advance the understanding of landscape evolution through better access to high resolution topographic data.

Go online to access archived presentations:
http://geoprisms.org/tei-rie-2017/

Call for GeoPRISMS Mini-Workshop Proposals at AGU 2017

Application Deadline: July 1st, 2017

We are pleased to announce that this year we will again be able to host a few Mini-Workshops at the 2017 AGU Fall Meeting (December 11-15). A Mini-Workshop is a research meeting that is held on the Sunday prior to the meeting. Examples of Mini-Workshops held in association with recent and upcoming national and international meetings can be found at:
http://geoprisms.org/meetings/mini-workshops/

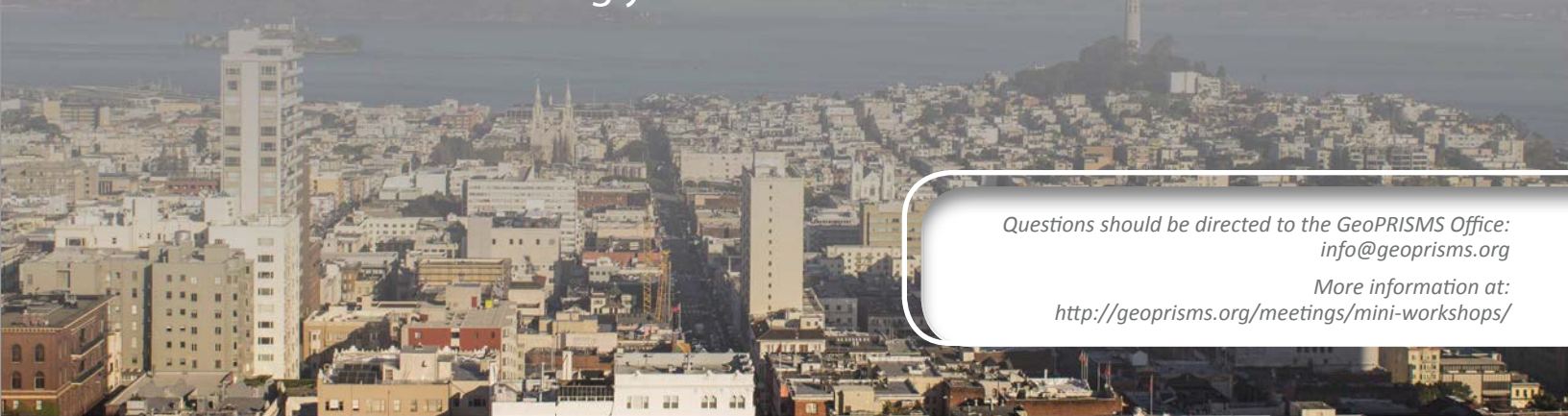
Mini-Workshops offer excellent opportunities to jump-start science discussions, as well as to coordinate implementation for future GeoPRISMS studies, both for primary sites and thematic studies. We encourage you to consider such an undertaking. The GeoPRISMS Office provides logistical support, a meeting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

If you would like to host a GeoPRISMS-related Mini-Workshop in association with the 2017 AGU Fall Meeting, we invite you to submit your proposal to the GeoPRISMS Office at info@geoprisms.org. The proposals will be reviewed and ranked by the GeoPRISMS Steering and Oversight Committee (GSOC). The number of Mini-Workshops is limited but we expect to be able to host two to three events.

The deadline for upcoming Mini-Workshop proposals is July 1, 2017. The proposal guidelines are described on the GeoPRISMS website at:
http://geoprisms.org/meetings/mini-workshops/

We encourage you to contact the GeoPRISMS Office with questions or for advice prior to submitting.

We look forward to hearing your ideas.



Questions should be directed to the GeoPRISMS Office: info@geoprisms.org

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

Installation of a magnetotelluric station in the Okmok Caldera. Photo credit: Kerry Key.

Collaborative Research: Magnetotelluric and Seismic Investigation of Arc Melt Generation, Delivery, and Storage beneath Okmok Volcano

Kerry Key (Scripps Institution of Oceanography) and
Ninfa Bennington (University Wisconsin-Madison)

Research Vessel Thompson loaded with seafloor magnetotelluric receivers, waiting to be deployed offshore Umnak Island.

It all sounded so easy when we were writing the proposal. Sure, we can deploy 54 seafloor magnetotelluric (MT) instruments around a remote Aleutian island, no problem, we have done lots of marine MT surveys before. Add on an array of onshore magnetotelluric and passive broadband seismic stations covering the flanks and caldera of a volcano that erupted without almost no warning back in 2008? Sure, that won't be too hard either since we will have a helicopter transporting the field teams and science equipment, and we can base our camp at a remote cattle ranch used by previous field teams studying Okmok volcano. So we worked up a budget, wrote the proposal text and submitted it to the July 2014 target date for proposal submissions to the National Science Foundation's GeoPRISMS program.

Fast forward to early January 2015 when we received an email from Bil Haq, then one of the two NSF Program Managers for GeoPRISMS, stating "Your proposal did well in the competition for GeoPRISMS funds and I plan to fund it at this time".

Yes!!!!! Woohoo!!!!!! Seriously, this was good news.

Then comes the word that the field work will start in mid-June. We were supposed to get everything in place for two short cruises and three weeks of onshore field work in just a few months. Time to get moving!

The Logistics

We started a seemingly endless chain of emails and conference calls to work out the logistics for the onshore field work. We would be working out of a field camp at Bering Pacific Ranch on the abandoned WWII military base Fort Glenn, located on the eastern flank of Umnak island. Our tasks were to get a helicopter, about fifty barrels of helicopter fuel, seismometers, magnetotelluric instruments, cooking supplies and food for about 160 person-days delivered by the start of field operations around June 20th. The tiny city of Dutch Harbor, conveniently located about 100 km away on neighboring Unalaska Island, is the country's largest fishing port by volume, so we planned to ship our stuff from the lower 48 states up to Dutch Harbor, where it would be consolidated and then shipped to Fort Glenn. Easy right?

Amazingly, this plan actually worked out. Once all the geophysical equipment, batteries, helicopter fuel, non-perishable food and cooking supplies arrived in Dutch Harbor, it was loaded onto the Island Packer, a small landing craft, and then ferried on a 60-km journey from Unalaska Island to a makeshift dock at the beach near Fort Glenn. Then two ranch hands transported it 5 km up to the field camp at the ranch.

By comparison, preparing for the marine part of the project was relatively straightforward since the Scripps lab does this routinely and all we had to do was get the marine MT equipment to the ship. By coincidence, our deployment cruise was scheduled on the RV Thompson, which happened to be passing through San Diego on its way north, so we lucked out and loaded the marine MT gear onboard for a free ride up to the Aleutians.

Marine MT deployment offshore Umnak Island. Photo credit: K. Key

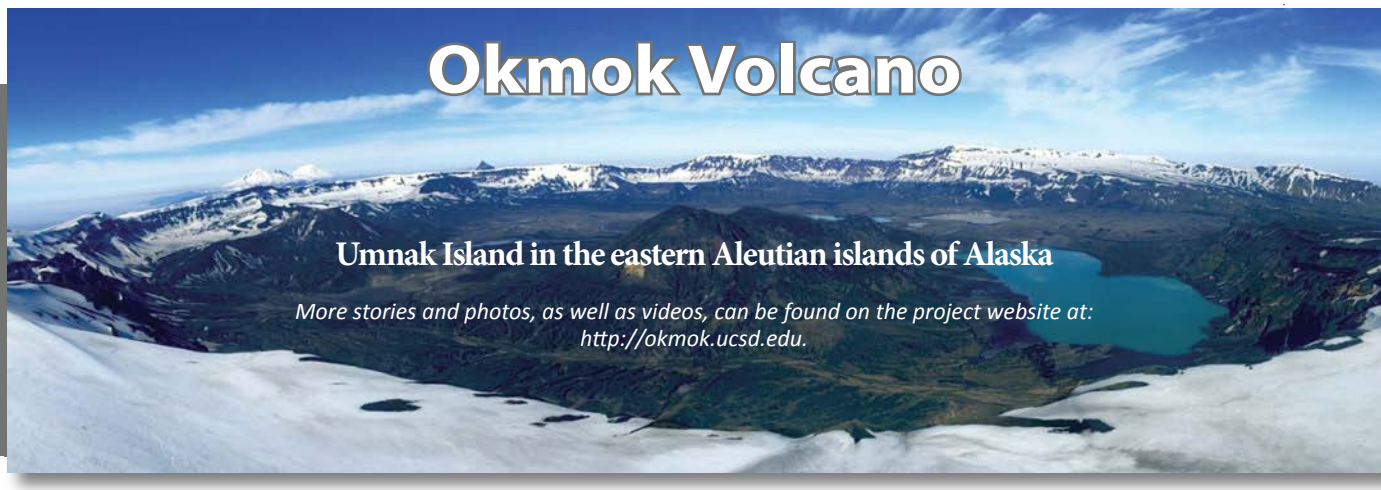
June 16-17, 2015 | Making it to Dutch Harbor

Dutch Harbor was also the port of departure for the marine MT deployment cruise so we flew into Anchorage and then boarded connecting flights to Dutch Harbor. While anywhere else in the US this would likely be an easy connection, flights to the Aleutian islands are unpredictable due to frequent low hanging clouds and fog. When the planes take off in Anchorage, they don't know how the weather will be in Dutch Harbor so they load enough fuel on board to make the return trip if visibility is so bad they can't see the Dutch Harbor runway. This was indeed the case for several of our connecting flights, and so it took a few attempts spread out over a few days for everyone to finally make it to Dutch Harbor. At the local grocery store Safeway, which was unexpectedly well stocked with a cornucopia of fresh produce, we gave the manager a lengthy shopping list of fresh produce, dairy, meat and seafood and he promised it would be delivered to the airport on the morning of June 22, where it would be loaded onto the charter flights taking us west to Fort Glenn.

June 18-21, 2015 | Deployment Cruise

We pushed off the dock around mid-day on the 18th and by 01:00 on the 19th the ship arrived at the first station, located on the northern end of the survey profile in the Bering Sea. By 10:00, we had already deployed seventeen seafloor MT receivers. The sky was filled with low hanging clouds so we couldn't see Umnak Island, but the lack of view was made up for by the lack of wind and almost no swell – perfect conditions for the maiden marine flight of our consumer-grade drone, allowing us to capture some 4K high definition videos of ship and the science team deploying MT receivers. While waiting in port during the previous days, we had done a lot of prep work, including putting batteries in the 54 data loggers for the MT receivers, synchronizing their crystal oscillator clocks with GPS time and programming them to startup around the time we predicted they would be on the seafloor. So now for each receiver deployment, all we had to do is mount the magnetic field induction coil sensors on the receiver frame along with the two long electric dipole arms, attach the external electronic compass, plug in all the sensor cables, secure the concrete anchor strap, test the acoustic release system, test the stray-line buoy's radio and finally attach the bright orange flag to the frame. There is a well-developed procedure for all these steps and checklist to make sure nothing is skipped, so it all goes like clockwork thanks to the careful efforts of the students, postdocs and technicians working either the noon-to-midnight or midnight-to-noon shifts (ship-time is not cheap so the vessel works 24 hours a day).

Visit the blog



The clouds partially lifted in the late afternoon of the 19th as we entered Umnak Pass, a narrow channel that separates Umnak Island on the west from Unalaska Island on the east. The MT deployment carried on like clockwork and by the 20th we were making way into the Pacific Ocean, which was starting to kick up with strong winds and some moderate swell. We finished the last MT deployment about twelve hours ahead of schedule so we decided to use the extra time to collect high resolution multibeam bathymetry on the forearc slope before heading back to Dutch Harbor. Our journey back to port went about the northern shore of Unalaska, and with luck the clouds lifted partially to give some nice views of Mount Makushin volcano. As usual, soon after the ship tied up most of the crew and science party headed to the local bar to re-equilibrate after a few days on a dry ship.

June 21-July 8, 2015 | Onshore field work

The next phase of the project started with flights from Dutch Harbor to Fort Glenn that transported the science party, two ranch hands, and the perishable food that Safeway had just delivered. From the gravel landing strip (left over from WWII) at Fort Glenn, a ranch hand drove the science party and food up to the camp house where we would stay. The camp house was basically three trailer units arranged in a u-shape with an aluminum roof overtop and a giant garage door on the open side of the U. One unit was a cooking trailer with full kitchen and dinner area. Another was a bunk house and the third was a bathroom, shower and laundry facility. While we weren't going to exactly be roughing it, nobody had stayed here in several years and everything was covered in mold and black volcanic dust, and the window sills were graveyards of giant fly corpses. We spent much of the first day cleaning up the place, stocking the kitchen and setting up workbenches for the geophysical equipment in the enclosed space in the middle of the three trailers. Sometime during the first day the helicopter arrived and everything was coming together for us to begin operations the next day.

Seismic station being installed inside Okmok caldera

Our seven-person science team would helicopter into and around Okmok volcano. Half of the crew carried out an onshore magnetotelluric survey collected in an array using a combination of long-period and wide-band MT systems, with nineteen stations within the caldera and ten stations outside. The remainder of our field team installed thirteen temporary broadband seismometers both in and around the volcano. The temporary seismic array recorded seismic data until its retrieval in summer 2016. In tandem with the Alaska Volcano Observatory's twelve permanent seismic stations, there were twelve seismic instruments within/at the rim of the caldera and fourteen seismic instruments outside the caldera.

Both the seismic and MT teams operated in parallel so the helicopter went back and forth ferrying the teams around. That meant we always had to be prepared to be left overnight (or longer) at field stations if the fog came in and the helicopter couldn't return to pick us up (luckily this never happened, despite a few close calls). We also had to be prepared for being chased by one or more of the ~7000 feral cattle that roam the outer flanks of the caldera. We quickly developed a protocol where after dropping off a team, the helicopter would fly in a 1-km circle around the station chasing away any nearby cattle. Despite this, there was an occasion where the seismic team had to make haste into a ravine to get away from an angry bull. While the MT systems only needed to record data for a few days and thus were all recovered by the end of the first field season, the broadband seismic systems were going to record seismic waves for the next year and would be picked up during the second field season.

July 9-14, 2015 | Recovery cruise

For the marine MT recovery cruise, we were on a different ship, the newly built RV Sikuliaq. Recovering the marine MT receivers meant driving up to them in the ship, sending an acoustic command that tells the instrument to let go of its anchor and then waiting for the instrument to rise to the sea surface. Once on the surface, the instrument's stray line buoy radios the ship with its GPS position. The ship then drives up to the floating instrument from the downwind side and once its alongside the ship, we toss a grapnel around the stray line and use that to attach the instrument to the ship's remotely operated crane, which then lifts it aboard. We successfully recovered all instruments except one that was deployed in a dicey location in Umnak Pass where there were strong currents that we suspect carried the instrument away after it released its anchor.

July 29 – Aug 6, 2016 | Recovery of seismic instruments

In summer 2016, we returned to Umnak Island to recover the seismic instruments. This time our operations were based on marine vessel Maritime Maid. Operations continued in a similar fashion to the previous field season with helicopter providing the team's transportation to and from Okmok. However, this year there was an added level of excitement as take-offs and landings were carried out on the ship's small helipad. Due to unusually cloudless blue skies and warm temperatures, we demobilized all thirteen seismic sites in a matter of several days. Amazingly, and quite happily, we found that the majority of stations were still up and running when returning to the sites for demobilization. After a rapid and successful field season, we departed from the wonderful Maritime Maid crew and made our way back home. ■

top left: Image from a drone video of a MT receiver being recovered on the RV Sikuliaq with Umnak Island in the background; top right: Seismometer recovery; bottom: Recovery team on board the Maritime Maid.

2017 GeoPRISMS NSF Awards

NSF Award 1664246

RAPID: Acquisition of a Delta Ray Isotope Ratio Spectrometer for Earth Science Research

Tobias Fischer (*fischer@unm.edu*)

NSF Awards 1654781, 1654804

Collaborative Research: Pre- and Syn-Rift Extension, Magmatism and Segmentation along the Eastern North American Margin

Beatrice Magnani (*mmagnani@smu.edu*), Lindsay Worthington (*lworthington@unm.edu*)

NSF Award 1654629

Along-strike Variations in Synrift Magmatism on the Eastern North American Margin

Donna Shillington (*djs@ldeo.columbia.edu*)

NSF Award 1654745

Evaluating Mechanisms for the Formation, Propagation and Evolution of Volcanic Rifts and Margins

Roger Buck (*buck@ldeo.columbia.edu*), Jean-Arthur Olive

NSF Award 1654586

Experimental Investigations on the Deformation Behavior of Sediment in the Shallow Region of the Nankai, North Sumatra, and Aleutian Subduction Zones

Hiroko Kitajima (*kitaji@tamu.edu*)

NSF Awards 1654518, 1654433, 1654557

Collaborative Research: Constraining the Flux of Magma and Magmatic CO_2 during Early-Stage Rifting in East Africa

Chris Scholz (*cascholz@syr.edu*) & James Muirhead, Tobias Fischer (*fischer@unm.edu*), Josef Dufek (*dufek@gatech.edu*)

All GeoPRISMS NSF Awards are available at:
http://geoprisms.org/research/list-of-awards/

Congratulations to D. Sarah Stamps (Virginia Tech) for winning the second edition of the GeoPRISMS Photo Contest at the AGU 2016!

Sarah took this fantastic photo of a GPS station installed on the Natron Rift of the East African Rift in Tanzania during a field campaign conducted in June 2016. The active volcano Ol Doinyo Lengai can be seen in the background. Sarah received a framed copy of her photo at the GeoPRISMS Townhall Meeting hosted at the AGU Fall Meeting.Be sure to visit the contest page at geoprisms.org to see all the photographs from this year.

Photo by D.S. Stamps

WINNER

GeoPRISMS Photo Contest

GeoPRISMS Steering and Oversight Committee Highlights

Spring 2017

March 16-17, 2017, NSF Headquarters, Arlington, VA

Edited by Anaïs Férot, GeoPRISMS Science Coordinator & Demian Saffer, GeoPRISMS Chair

Introduction

The annual GeoPRISMS Steering and Oversight Committee Meeting provides the GSOC members and NSF the opportunity to share updates on GeoPRISMS activities, research funding and outcomes, and to discuss and address program issues and planning. The Spring 2017 meeting included discussion of the program solicitation for FY18, the role of the GeoPRISMS Education Advisory Committee (GEAC), and the future of the Program after 2018, as well as a report from the GeoPRISMS Rift Initiation & Evolution Theoretical & Experimental Institute held in Albuquerque, NM. The committee also received updates on the recent GeoPRISMS office transition, current GeoPRISMS and GeoPRISMS-related research efforts via presentation of materials provided by PIs, the GeoPRISMS data portal, the draft Subduction Zone Observatory ("SZO"; re-dubbed "SZ4D") meeting report, and AGU workshops and activities.

NSF update

Acting Section Head Eva Zanzerkia, representing EAR Division Director Carol Frost, OCE Division Director Rick Murray, and Program Manager Jenn Wade (EAR) provided updates from NSF. Zanzerkia discussed the important and positive impact of GeoPRISMS on EAR-Geophysics and other NSF Core Programs, highlighting that GeoPRISMS is a great example of a successful program that combines collaborative, interdisciplinary, and synthesis aspects. These strengths are viewed as high value components in strategic planning for the EAR division and broadly within NSF. Her recommendation to GeoPRISMS scientists is to share their work with NSF, and send outcomes and impacts to show taxpayers why NSF and EAR are so essential.

OCE Division Director Rick Murray also expressed his appreciation for the role GeoPRISMS plays in engaging and contributing to the Earth and Ocean Sciences; working across boundaries can be administratively challenging but GeoPRISMS remains very successful and works very well. Murray also highlighted the value of societally relevant, collaborative basic science underway within GeoPRISMS. William Easterling will join NSF beginning June 1 as the GEO Assistant Director. Debbie Smith has joined NSF as a permanent full-time Program Officer in OCE Marine Geology & Geophysics.

Wade and Murray indicated that (at the time of the GSOC meeting), the Continuing Resolution (CR) for FY17 was to end in April; as of March 2016, NSF had only 50% of FY17 funds available to spend, with the rest pending a fiscal year federal budget. As a result of this significant budget uncertainty, decisions on GeoPRISMS and other FY17 awards were delayed by several months. NSF is moving to Alexandria, Virginia in early September 2017, so the close-out of FY17 budget is planned for June (instead of July, as is usually the case). The FY18 federal budget is considerably delayed as is usually the case during presidential election years. Since the time of the GSOC meeting, a continuing resolution was passed to carry through September 30, 2017. Overall, NSF is highly efficient in using their budget to support research and education; 94% of funds that NSF receives go out the door to investigators.

Wade provided further NSF GeoPRISMS program updates, noting that this year marked the end of the phased implementation for primary sites, with New Zealand now completed. NSF will open a new solicitation for FY18, with opportunities for synthesis efforts and field programs at a wide range of scales (see below). Wade also noted that there is substantial discussion within NSF with other programs, including PREEVENTS and EPSCOR, to leverage support for large projects. The EAR division has been reorganized into two major tracks: integrated programs, including GeoPRISMS, EarthScope, and IES; and disciplinary programs, including core funding programs. This re-organization has changed some responsibilities within NSF, but has not affected the programs themselves or levels of funding.

GeoPRISMS solicitation in FY18 and beyond

On the heels of the five-year "mid-term" review, both NSF and the GSOC recognized that the focus of the remaining funding solicitations will help to shape the legacy of GeoPRISMS, demonstrate the value of integrated multi-disciplinary science, and ensure integration across field sites and data types as the decadal program heads into its final years. The phased funding model – in which large field projects in certain sites are considered only in specific years - is now completed; an extra call for leveraging the Alaska Transportable Array was also completed in FY17. At the time of the GSOC meeting, the upcoming (FY18) solicitation was still in preparation. The draft solicitation specifically indicated that any major field projects should target gaps in existing data, and should provide justification that new data are necessary in order to make progress on key questions in the Science Plan. Targeted small-to-medium scale field projects would also be encouraged. In discussion of the funding solicitation, the point was also raised that there is strong support for proposals that use or integrate existing datasets; aligned with this idea, the draft solicitation also highlighted synthesis and integration projects.

The FY18 solicitation is now final and is available at:

https://www.nsf.gov/pubs/2017/nsf17549/nsf17549.htm?WT.mc_id=USNSF_25&WT.mc_ev=click. (see also p. 25 of this Newsletter).

Rift Initiation & Evolution Theoretical and Experimental Institute report

Donna Shillington and Tobias Fischer, conveners of the Theoretical and Experimental Institute (TEI) for the Rift Initiation and Evolution (RIE) Initiative that was held in Albuquerque, NM February 7-10, 2017, provided a report on the meeting to the GSOC. The objectives of the TEI were to:

- Summarize progress and recent scientific advances related to the RIE initiative;
- Identify high-priority science for future GeoPRISMS RIE efforts; and
- Promote community building and formation of new collaborations.

A group of scientists whose expertise spanned a broad range of interests connected to the RIE Initiative, from deep geodynamic processes underlying rifting to surface processes controlling syn- and post-rift evolution, was invited to convene the meeting, give keynote lectures, and contribute to the meeting as attendees. The complete report from the TEI was posted for community input earlier this Spring, and a final version appears in this edition of the Newsletter, on p. 8.

The TEI was attended by 133 US and international participants, including about 50% early career investigators (graduate students or postdocs), as well as a number of mid-career scientists with little or no previous engagement in the RIE initiative. A half day graduate student and postdoc symposium, attended by 65 grad students, postdocs, and a few senior scientists, was held the day before the conference. The main meeting included oral sessions spanning topics from rift initiation and evolution to geodynamics and surface processes (the full list of sessions and more details available at: http://geoprisms.org/tei-rie-2017/). Small group discussions were focused on the identification of high priority science questions and work needed to tackle these questions. Several poster sessions were also set up throughout the meeting, and pop-up sessions allowed attendees to introduce their posters and collaborative opportunities. The speakers and attendees covered a wide spectrum of expertise and perspectives; talks focused on the EARS and ENAM focus sites but also targeted other science within the RIE initiative.

Five high-priority science themes were identified from the discussions; within each of these, the workshop highlighted key recent findings and opportunities for near-term research progress:

1. Tracking fluids (volatiles and magmas) through the lithosphere and with time
2. Influence of pre-existing structures throughout rift development
3. Controls on strain localization
4. Time dependent rheology & dynamics
5. Surface mass fluxes & feedbacks with rift evolution

To address outstanding questions related to the themes above, the following future efforts were highlighted as particularly important:

- Collection of new geophysical, geochemical, geological data, particularly in the EAR
- Synthesis of information within and between rift systems
- Experimental (laboratory) work, possibly connecting to SCD

Allied programs and partner organizations updates

Terry Plank called in to provide update on the Subduction Zone Observatory (SZO) meeting that was held September 29 - October 1, 2016 in Boise, Idaho.

Among the 240 participants (made possible thanks to extra funding from NSF, USGS, and other international programs), 67 were early career, and 45 were from 21 non-US countries. Plank and Jeff McGuire were lead conveners for the SZO meeting, and organized the writing team to draft the workshop report.

GeoPRISMS Data Portal

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

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

GeoPRISMS references database of relevant publications is now available:

http://www.marine-geo.org/portals/geoprisms/references.php

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

GeoPRISMS Postdoctoral Fellowship
Deadline July 27, 2017
For details, visit the GeoPRISMS website:

http://geoprisms.org/education/geoprisms-postdoctoral-fellowships/

At the time of the GSOC meeting, the SZO report (re-dubbed "SZ4D" to capture the core idea that subduction zones are complex and require observations of processes in three-dimensions and over time) was in progress, to be released for community input in April. The report highlights a number of key themes for this initiative: (1) understanding processes that underlie geohazards at subduction zones; (2) integration of data sets and models that capture the four-dimensional evolution of key subduction processes; and (3) development of strong modeling and international collaboration elements. [The full SZ4D report has now been distributed and is available at: *https://www.iris.edu/hq/files/workshops/2016/09/szo_16/sz4d.pdf*]

GSOC also heard updates about a large number of allied projects underway or planned for the New Zealand primary site, supported through Integrated Ocean Discovery Program (IODP) and NSF programs beyond GeoPRISMS. These include: three IODP drilling expeditions – two focused on slow slip events, landslides, and slope failures along the northern Hikurangi subduction margin (Expeditions 372 and 275) and one on subduction initiation (Expedition 371); a newly funded NSF Integrated Earth Systems project combining paleoseismology, active-source seismology, and geodynamic modeling to link the deep structure of the subduction zone with surface processes, slow slip and the seismic cycle; and a 3-D seismic survey community experiment aimed at studying the impact of seamount subduction on the structure and evolution of the plate interface. All of these projects involve significant international collaboration and instrumentation and/or ship time contributions from international partners.

Sarah Penniston-Dorland provided an update on the NSF-PIRE project entitled "ExTerra Field Institute and Research Endeavor (E-FIRE)". ExTerra (Exhumed Terranes), is a self-organized group of geoscientists with the objective of investigating exhumed paleo-subduction zones to better understand the materials and processes in active systems. This large scale international project partners with a European collaborative research and training project (ZIP; "Zooming In between Plates"). The program includes support for eight PhD students and two postdocs; the two postdocs and seven of the eight students have started and have already presented posters and begun their research in collaboration with the US and European faculty. The first field institute will take place in the summer of 2017. [More info about ExTerra and E-FIRE at: *http://geoprisms.org/exterra/*]

Andrew Goodwillie provided an update on the GeoPRISMS Data Portal and recent improvements. He highlighted a number of new datasets contributed by PIs, including Gulf of California zircon U-Pb geochronology (data are available on EarthChem and GeoMapApp: *http://www.earthchem.org/library/browse/view?id=928*), an East African Rift System geodetic *velocity field* (2016.0a) compiled from continuous and survey mode GPS networks, and a suite of subduction zone residual gravity and residual bathymetry data sets for the Alaska-Aleutians, Cascadia, and Hikurangi margins. Also added was a suite of geodetic plate velocity solutions including EarthScope PBO and MIDAS solutions that cover the three GeoPRISMS primary sites in North America. Additionally, a new version of the basemap was released a few months ago, and includes 931 cruises and almost three million track miles. Goodwillie also noted that there is a new profile generation tool in beta form that can help with cruise planning by linking ship tracks to the bathymetry.

SCD and RIE initiative updates

GSOC members, with input from GeoPRISMS PIs, provided updates on a wide range of ongoing GeoPRISMS research projects. These updates provide a key opportunity for the GSOC and NSF Program Officers to see the breadth of exciting science underway within GeoPRISMS, recognize potential links with other NSF and major international efforts, assess progress toward key questions in the Science Plan, and identify science gaps and new opportunities. These updates provide an important opportunity for the GeoPRISMS community to demonstrate the value of interdisciplinary and societally relevant research to NSF Program Managers in the GEO directorate.

The GSOC received updates on active projects spanning both the RIE and SCD initiatives. The SCD updates included a thematic-focused post-doctoral fellowship

investigating the role of faults in the downgoing plate on forearc fluid and seismic processes through comparison of Central America, Cascadia, Nankai, and Alaska subduction zones; an effort to improve models of interseismic locking and slow slip events in Cascadia and New Zealand; a collaborative effort to understand the Aleutian megathrust from trench to base of the seismogenic zone through integration of laboratory, geophysical and geological data; a geodetic study to characterize the interseismic slip deficit in the Shumagin Islands, Alaska; and a study of fluid-mobile and volatile element (Cl, B, & Li) cycling through the forearc of the Hikurangi margin, New Zealand. It also included a wide range of ongoing studies of the Aleutian arc, with investigations focused on: the geochemical and magmatic evolution of Aleutian arc on the Alaska Peninsula; the ages and geochemical comparison of coeval plutons and volcanics from the central and eastern Aleutian arc; the geodynamic evolution of the Aleutians and adjacent Pacific and Bering Sea; magnetotelluric and seismic signatures of arc melt generation, delivery, and storage beneath Okmok volcano (see report from the Field in this issue); the origin, storage, ascent and eruption of volatile-bearing magmas in Aleutian volcanoes; the role of oxygen fugacity in calc-alkaline differentiation and the creation of continental crust at the Aleutian arc; and characterizing magma ascent and eruption in the Aleutian arc.

RIE initiative updates included a summary of ongoing science stemming from the ENAM community Seismic Experiment undertaken in 2014, which collected marine seismic reflection and refraction data, on-land seismic refraction data, and broadband seismic data onshore (EarthScope) and offshore (using the OBSIP array). These datasets are all open access. A suite of projects were funded in FY16 and FY17 to work on the data, including studies of the role of mantle melts on evolution of rifted margin lithosphere; investigation of rift evolution from basement architecture; and analysis of shear-wave splitting. The updates underscored that the early returns on the ENAM community experiment are very positive, the community is engaged, and science proposals using the community dataset have clear and distinct questions. RIE updates also included a theoretical and experimental study focused on emplacement of regularly spaced volcanic centers in the East African Rift;development of a community velocity field for East Africa; and geochemical analyses to constrain the temporal evolution of mantle plume contributions to magmatism in the Turkana Depression.

Plans for upcoming meetings

GeoPRISMS will be at the 2017 AGU Fall Meeting in New Orleans with a Townhall on Monday evening and planned Mini-Workshops for Sunday, December 10; a call for Mini-Workshop proposals has been sent out to the Community - the GSOC will select the successful mini-workshop proposals in late summer. The GSOC also discussed early planning for an Integration & Synthesis TEI recommended as part of the mid-term review of the program, which will likely be held in late 2018. The TEI will integrate ongoing work and results across themes and/or between focus sites, with the goal of identifying advances on the cross cutting science themes in the Science Plan, and defining emerging questions. As plans for this major workshop materialize, announcements will go out via the listserv and the GeoPRISMS website, so please stay tuned.

GeoPRISMS Program
[Program Solicitation NSF 17-549]
Target date: July 27, 2017

http://www.nsf.gov/pubs/2017/nsf17549/nsf17549.htm

This revision describes the completion of the "phased funding model" that had been in place, implements a requirement to contact Program Directors before submitting proposals for large field projects, encourages integrative projects at all scales, and removes a one-year call for large proposals to leverage the Transportable Array (TA) in Alaska/Aleutians.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 17-1), which is effective for proposals submitted, or due, on or after January 30, 2017.

Questions should be directed to:
PO Jennifer Wade: jwade@nsf.gov; (703) 292-4739 or Maurice Tivey: mtivey@nsf.gov; (703) 292-7710

Status Report on the GeoPRISMS Data Portal: May, 2017

Andrew Goodwillie and the IEDA Database Team

Lamont-Doherty Earth Observatory, Columbia University

The GeoPRISMS data portal (*http://www.marine-geo.org/portals/geoprisms/*) was established in 2011 to provide convenient access to data and information for each primary site as well as to other relevant data resources. Since the last newsletter report, highlighted below are recent contributions of data sets and field program information of interest to the GeoPRISMS community. Many of the data sets described are also available in GeoMapApp (*http://www.geomapapp.org/*)under the *Focus Site* and *DataLayers* menus.

East African Rift System

An updated East African Rift System geodetic velocity field (2016.0a, *http://www.marine-geo.org/tools/search/entry.php?id=EARS_King*) compiled from continuous and survey mode GPS networks was contributed to the Data Portal by Bob King, Michael Floyd, Rob Reilinger, and Becky Bendick. Containing data obtained between 1994 and December 2015, the data set is part of a wider Africa/Arabia/Eurasia velocity field derivation.

Japan

Sabine den Hartog made available her experimental data on the friction properties of exhumed fault gouge from Japan's Shikoku Island (*http://www.marine-geo.org/tools/search/entry.php?id=ExpInvestig:Lab_denHartog*).

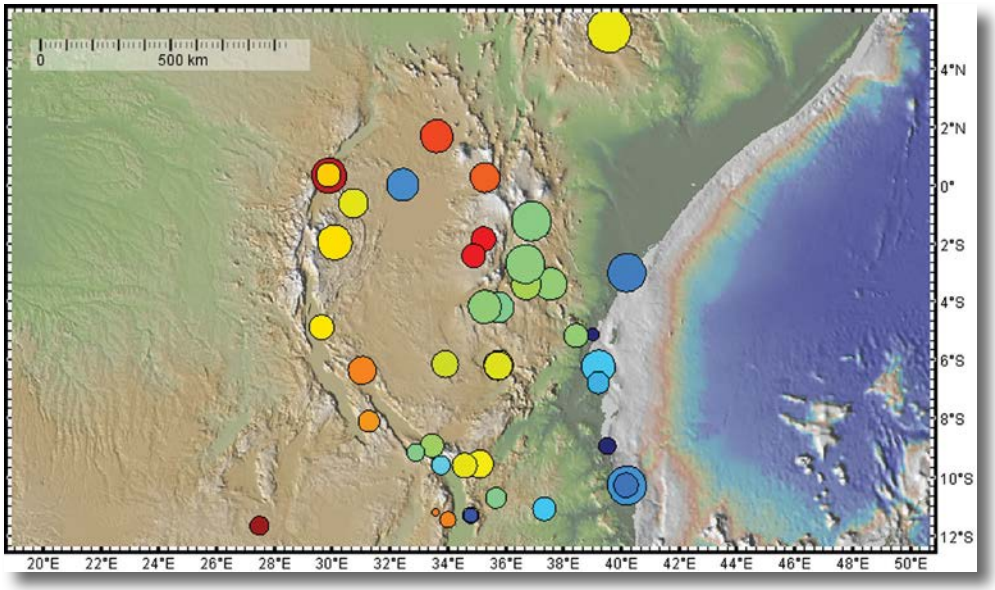


Figure 1. The King et al. EARS 2016.0a velocity field in a no-net-rotation frame with station symbols coloured on the North component of velocity and scaled on East velocity. Warm colors are faster velocities. The built-in background elevation map is the 30m-resolution ASTER land topography. Image made with GeoMapApp. All of the data sets shown are accessible through the GeoMapApp menus.

Cascadia

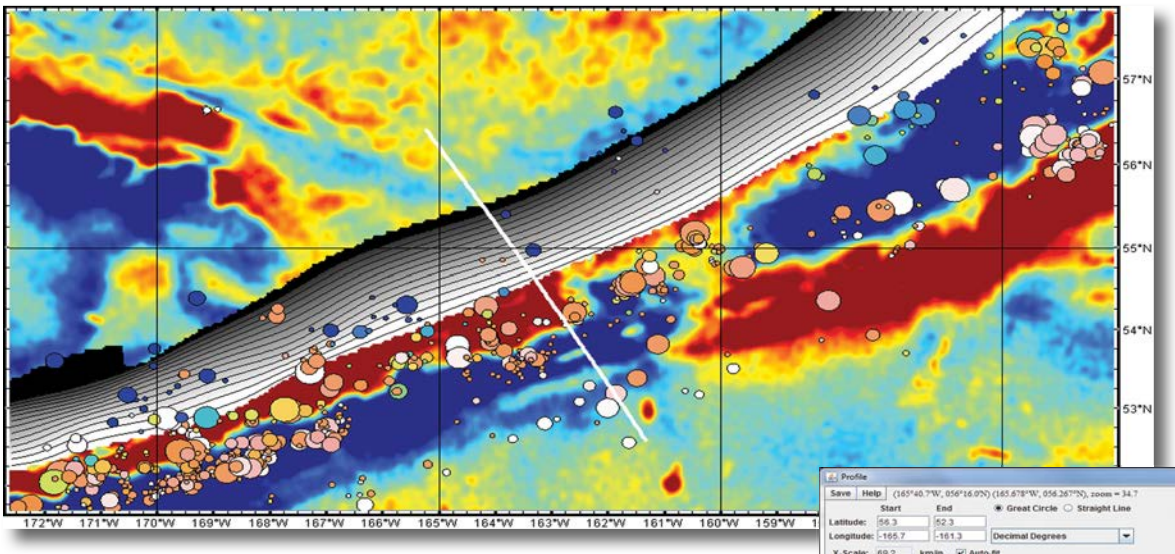
A GeoMapApp webinar focused upon available data sets in the Cascadia region was broadcast and is now available on YouTube (*https://www.youtube.com/watch?v=DpX-igx5T7c*).

Cascadia, Alaska-Aleutians and Hikurangi margins

Subduction zone residual gravity and residual bathymetry data sets from Dan Bassett and Tony Watts from their 2015 G-Cubed papers were contributed for the Alaska-Aleutians (Fig. 2), Cascadia and Hikurangi margins (*http://www.marine-geo.org/tools/search/DataSets.php?data_set_uids=24025,24026,24027,24028,24029*). Also added was a suite of geodetic plate velocity solutions including EarthScope PBO and MIDAS solutions that cover the three GeoPRISMS primary sites in North America.

The GeoPRISMS Data Portal team is here to serve the community

Please contact us at info@marine-geo.org



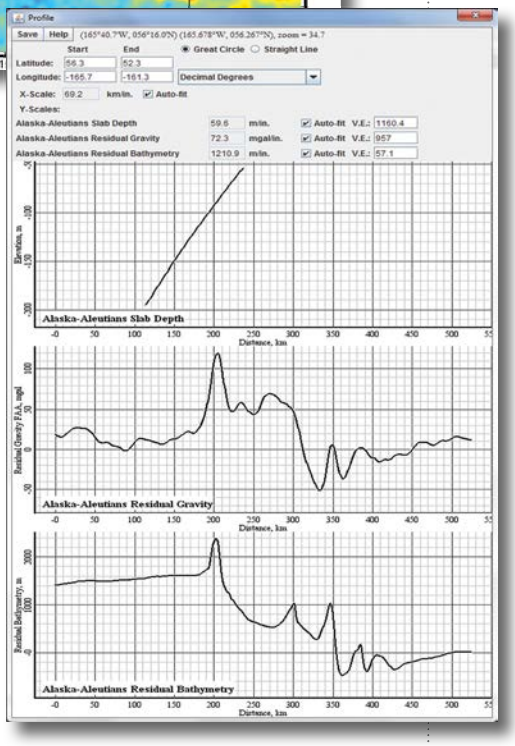


Figure 2a (top). For the Shumagin Gap area in the Aleutians primary site, the residual gravity free-air anomaly of Bassett and Watts (2015) is shown. Dark blue represents anomalies < -50 mgals and dark red depicts anomalies > 50 mgals. The contoured grey-shaded structure trending across the image is the depth to the top of the subducting slab from Syracuse and Abers (2006). Circles are the epicentral locations for earthquakes greater than magnitude 5.0 from the USGS-ANSS catalogue. The symbols are colored on depth, with warmer colors showing deeper foci, and scaled by magnitude. The white line in the center of the image shows the location of the stacked profiles presented in Fig 2b. Image made with GeoMapApp. All of the data sets shown are accessible through the GeoMapApp menus. An enhanced GeoMapApp Save Session function allows the layering and visualisation parameters of all of the displayed data sets to be stored for future use.

Figure 2b (right). New in GeoMapApp version 3.6.4 is the capability to generate a co-registered vertical stack of up to four profiles. Here, the Bassett and Watts residual bathymetry and residual gravity are in the lower and middle panel respectively and the Syracuse and Abers depth to the top of the subducting slab is in the top panel.

GeoPRISMS Data Portal Tools and Other Relevant IEDA Resources

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

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

GeoPRISMS Bibliography – (*http://www.marine-geo.org/portals/geoprisms/references.php*) With more than 1,140 citations, many tied to data sets, the references database can be searched by primary site, paper title, author, year, and journal. The citations can be exported to EndNote™. Submit your papers for inclusion in the bibliography – just the DOI is needed! *http://www.marine-geo.org/portals/geoprisms/ref_submit.php*

Contribute Data - (*http://www.iedadata.org/contribute*) The web submission tools support PI contributions of geophysical, geochemical, and sample data. File formats include grids, tables, spreadsheets, and shapefiles. Once registered within the IEDA systems, the data sets become available to the broader community immediately or may be placed on restricted hold. Additionally, PIs can choose to have a DOI assigned to each submitted data set, allowing it to become part of the formal, citable scientific record. ■

GeoPRISMS at AGU Fall Meeting - Mini-Workshop Reports

December 12-16, 2016 AGU Fall Meeting, San Francisco

GeoPRISMS provides the opportunity for groups of researchers to meet and discuss GeoPRISMS Science or planning activities at the AGU Fall Meeting. Here is the report from the Mini-Workshops organized at the 2016 AGU Fall Meeting.

Magmatic Systems in Extensional and Compressional Settings

Conveners: Cindy Ebinger (Tulane), Christelle Wauthier (PSU), Cliff Thurber (Wisconsin), Maya Tolstoy and Einat Lev (LDEO), James Muirhead (Syracuse), Josef Dufek (Georgia Tech)

A diverse and enthusiastic community of scientists interested in magmatic systems in a variety of settings attended the pre-AGU GeoPRISMS mini-workshop to discuss and plan future research initiatives in light of new studies in continental and mid-ocean rift zones, and in volcanic arc settings. The over-arching goal of this mini-workshop was to facilitate community-building, and to provide a relaxed setting for early-career scientists in particular to communicate their results, and their ideas on future directions.

Three review talks on the physics of crustal magmatic systems (Joe Dufek, Georgia Tech), active deformation (Diana Roman, Carnegie) and time-averaged deformation (Colin Wilson, Victoria University of Wellington) in rifts and arcs established context. Joe's talk outlined the time and length scales of processes, and critical parameters controlling magma movement and eruptions: crustal state-of-stress, rheology of crust surrounding magma body, thermodynamics and heat transfer of the magma body, and magma composition and volatile content. He highlighted the need for multi-disciplinary observations at key locales, the focus-site hallmark of GeoPRISMS. Diana focused on magmatic systems in compressional settings where fluid and gas pathways tend to be closed.

Seismicity may track hydraulic fracture accompanying the upward migration of magma and gasses, enabling some constraint on flux rates, and potentially, rheology of the intruded rocks. Diana's summary demonstrated the need for long-term monitoring at volcanoes. Colin drew on precise dating and field relations to understand the 'chicken and egg' question of tectonic or over-pressure as the trigger for large-volume intrusion and eruption episodes in back-arcs and rift zones. He suggested that critical insights will come from quantification of extrusive to intrusive ratios as the community develops eruption forecast models, and considers the relative importance of buoyancy forces, overpressures, open or closed fault systems, and dynamic triggering from distant earthquakes.

Participants and conveners at the pre-AGU GeoPRISMS mini-workshop discussing future research initiatives in continental and mid-ocean rift zones, and in volcanic arc settings.

Photos by A. Férot

Graduate students and post-docs introduced themselves and their research in three-minute pop-ups. The future planning aims were achieved through small group discussions focused on specific questions, with questions and questioners changing every fifteen minutes. Groups were assembled to achieve breadth and diversity of perspectives. This series of "café-style" discussions on a specific questions enabled scientists to share perspectives on: (1) Magma and volatile transfer and their role in strain localization during plate boundary deformation, and (2) The role of tectonic stressing on volcanic eruption cycles and magma emplacement.

The café questions facilitated comparison and contrasts between arcs, back-arcs, and continental rift zones, and facilitate discussions with numerical modelers keen to understand the role of magmatism and volatile release in lithospheric deformation processes. Participants shared experiences with data and models from Alaska, East Africa, Cascadia (including Juan de Fuca ridge processes), and Hikurangi, New Zealand focus sites, and looked forward to guide new research initiatives.

Question 1 | Einat Lev | *What are the physics of Open Vent Systems, and their responses to external triggers?*

Question 2 | Cindy Ebinger | *How do hot and cooled intrusions into continental and slow-spreading oceanic crust influence state of stress and rheology (e.g., underplate, foundering, along-axis propagation)?*

Question 3 | Cliff Thurber | **a)** *What are the characteristic forms of the magma transport and storage areas at various depths?* **b)** *What controls the magma residence time at depth and its migration toward the surface?*

Question 4 | Christelle Wauthier | *What are the feedbacks between local tectonics and magmatic/volcanic processes in triggering volcanic eruptions and unrest nearby magma bodies, dikes, fault slip, megathrust shaking?*

Question 5 | James Muirhead | *How can we use variations in the flux and chemistry of volatiles and fluids, in combination with deformation data, to constrain different magmatic, volcanic, and tectonic processes?*

Question 6 | Maya Tolstoy | *What do precursory signals tell us about the physical mechanisms triggering eruptions?*

Question 7 | Joe Dufek | *The rate of crustal production and development of crustal structure is ultimately sensitive to the degree of fractionation versus crustal melting that occurs in thermally mature systems. How can we quantify the heat budget in different levels of the crust subject to variable intrusion histories?*

Developing better understanding of the link between tectonics and magmatism was discussed in almost every group. Discussion focused on tectonics role in modifying intrusion histories, and also the dual role of tectonics and magmatism on the thermal state of the crust (the discussions mostly focused on extensional environments). A common theme of these discussions was the integration of different datasets that better define the current and past rates of deformation in regions as well as measurements indicating the current state of magma bodies including pre-eruptive seismic, deformation, gas flux measurements, and geochemical measurements of erupted magmas. Models that make predictions that have implications (and can be tested) by multiple datasets were discussed as a way of integrating measurements.

The full workshop report and summaries of feedback from each group to each of the questions outlined above are available at: http://geoprisms.org/meetings/mini-workshops/agu2016-volcanoes/

EarthScope-type Canadian Cordillera Seismic Array and GPS Network

Conveners: Rick Aster (Colorado State U.), Pascal Audet (U. of Ottawa), Katherine Boggs (Mount Royal U.), Julie Elliott (Purdue U.), Roy Hyndman (Pacific Geoscience Centre), Michael Schmidt (U. of Calgary), Derek Schutt (Colorado State U.)

On Sunday, December 11, an international and interdisciplinary group of about fifty researchers met in San Francisco under GeoPRISMS support to discuss emerging interest in a Canadian Cordillera Earth Observation Network. The network is conceived to holistically image broad Earth systems along the Pacific Plate Margin and Canadian Cordillera between Alaska and the U.S. Pacific Northwest. This initiative emerged out of four workshops and a planning meeting held in multiple locations in Canada over the last year, working with a broad range of U.S. and international collaborators. The workshop pulled together interested researchers from across the U.S. and Canada, including representatives associated with from GeoPRISMS, IRIS, UNAVCO, NSF, industry, academic institutions, and a wide range of Canadian institutions.

After brief introductions by GeoPRISMS Chair Damien Saffer (Penn State) and workshop Chair, Rick Aster (Colorado State U.), Roy Hyndman (Pacific Geoscience Centre) began a sequence of overview talks, by outlining the fundamental tectonic questions ranging from ridge subduction at the north end of the Cascadian forearc, to the Yakutat mini-Himalaya collision along the Gulf of Alaska, to the Canning-Mackenzie overthrust in the Beaufort Sea. Hyndman noted the mainly dextral slip along the Queen Charlotte Fault has a recently revealed partitioned thrust component, as was recently illustrated by the 2012 Mw 7.8 Haida Gwaii earthquake which created a notable (but very sparsely observed) tsunami.

Pascal Audet (U. of Ottawa) presented an overview of existing seismic and other geophysical studies within the Canadian Cordillera, and pointed out the very significant geographic gaps in coverage. Broadly speaking, the proposed project can build on the exceptional legacy of LITHOPROBE across Canada. However, resolution of crustal and mantle structure across the region, and the understanding of seismicity and deformation, is comparable at best in many subregions to that of the western U.S. prior to the deployment USArray.

Talks by Lindsay Worthington (U. of New Mexico) and Julie Elliott (Purdue U.), described the complex tectonic collisional and transpressional setting of the Gulf of Alaska plate margin. The eastern edge of the Yakutat Block is currently poorly defined, and seems to be driving deformation well into the interior of northern Canada, resulting in a (presently very poorly imaged) Canning-Mackenzie overthrust in the Beaufort Sea, and the arcuate thrust belt of the Mackenzie Mountains, 700 to 1000 km from the plate boundary. Additionally, Julie Elliott pointed out the wide range of scientific and societal contributions that could be made by a larger permanent GNSS network in the region, including examining the deep earth, hydrosphere, cryosphere, atmosphere, industry, surveying/land use, agriculture, and natural hazards.

Mladen Ndemovic (Dalhousie U.) presented on the need for marine seismic surveys and instrumentation from the north end of the Cascadia forearc to the Alaskan Panhandle, as well as in the Beaufort Sea.

David Eaton (U. of Calgary) described induced seismicity in the Western Canadian Sedimentary Basin (WCSB) along the eastern margin of the Canadian Cordillera and its link with hydraulic fracturing. The importance of elastic stress changes in contributing to induced seismicity in the WCSB and improved understanding of induced seismicity could lead towards improving our general understanding of earthquakes, and to the conditions under which fracking can create appreciable earthquakes.

Kristin Morell (U. of Victoria) outlined the need for LIDAR, paleo-trenching, and detailed fieldwork to define active faults on Vancouver Island. Nicole West (Central Michigan U.) provided an overview of the critical zone, and the need for critical zone monitoring in a range of tectonic and environmental regimes not covered in the US NSF-funded Critical Zone Observatories. It was noted that the critical zone is also the near-surface "geotechnical zone" which defines many aspects of seismic hazard, as well as a general zone of high-frequency seismic wave propagation complexity.

Frank Vernon (UC San Diego) and Eric Donovan (U. of Calgary) discussed motivations and benefits of a full geophysical suite of instrumentation at some sites, including for atmospheric sciences and ionosphere/magnetosphere/space physics. Donovan suggested opportunities for collaboration with the Canadian and European Space Agencies through the SWARM program as an example of a multi-national non-traditional research network that could be emulated within the proposed array.

Community discussion after the talks focused on possible next steps for international coordination to move potential projects forward. These details include timely exploration of partnerships that can strongly leverage funding, logistical, and potentially available equipment partnerships in step with the planned sunsetting of current EarthScope USArray and other efforts in Alaska and far northwestern Canada.

Photos by A. Férot

Conveners and participants of the GeoPRISMS Mini-Workshop discussing emerging interest in a Canadian Cordillera Earth Observation Network.

Distinguished Lectureship Program

2017 - 2018

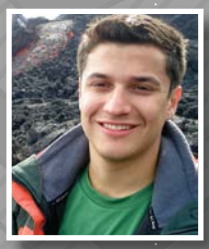
The GeoPRISMS Office is happy to announce the annual Distinguished Lectureship Program for academic year 2017-2018 with an outstanding speakers list. Distinguished scientists involved with GeoPRISMS science and planning are available to visit US colleges and universities to present technical talks and public lectures on subjects related to GeoPRISMS science.

Want to host a speaker? Apply before July 10!

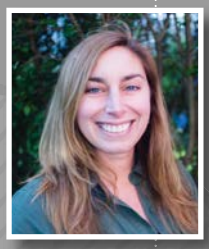
Any US college or university wishing to invite a GeoPRISMS speaker may apply via the GeoPRISMS website before July 10, 2017. Institutions that are not currently involved with GeoPRISMS research are strongly encouraged to apply, including those granting undergraduate or masters degrees, as well as those with PhD programs. Institutions may request a technical and/or public lecture. The GeoPRISMS Office will cover airfare for the speaker's travel and will coordinate travel and off-site logistics. Host institutions are responsible for local expenses for the duration of the visit.

Visit the GeoPRISMS website to apply or learn more about the speakers & talks available

CYNTHIA EBINGER
Tulane University



ESTEBAN GAZEL
Cornell University



HEATHER SAVAGE
LDEO, Columbia U

BRANDON SCHMANDT
University of New Mexico

GeoPRISMS is now on YouTube! Subscribe and watch lectures given by the GeoPRISMS Distinguished Speakers in the past years.

Questions?
Email info@geoprisms.org
For more information, visit the GeoPRISMS Website at:
http://geoprisms.org/education/distinguished-lectureship-program/

GeoPRISMS Student Prize for Outstanding Presentations

2016 AGU Fall Meeting, San Francisco

Congratulations to the winners of the GeoPRISMS 2016 AGU Student Prize! As in previous years, the judges were greatly impressed by the quality of the entrants this year and awarding individual prizes to just a few in such an outstanding field was very difficult. Here we honor two prize winners and four honorable mentions. Thank you to all the entrants and judges for making this contest possible and worthwhile.

Poster Presentation Winner

Dan Rasmussen – LDEO, Columbia University

Run-up to the 1999 sub-plinian eruption of Shishaldin Volcano unveiled using petrologic and seismic approaches

Coauthors: Terry Plank, Diana Roman, Amanda Lough, Pete Stelling, Robert Bodnar, Erik Hauri

From the Judges: "Daniel gave a really terrific presentation and enthusiastically provided thoughtful answers to questions from audience around his poster" "true integrative combination of petrological, geochemical and geophysical data" "excellent presentation, integrating many different types of observations to identify precursory signals in the run up to a well studied eruption"

From the Student: "I am honored to receive the GeoPRISMS student presentation award. GeoPRISMS is a fantastic program that brings together scientists from different disciplines, at all stages of their careers, to study the dynamic processes occurring at plate boundaries. I am grateful to be a part of this community."

Oral Presentation Winner

Suzanne Birner – Stanford University

Records of upper mantle oxygen fugacity gleaned from high-density sampling of basalts and peridotites at ultraslow ridges

Coauthors: Elizabeth Cottrell, Jessica Warren, Katherine Kelley, Fred Davis

From the Judges: "Suzanne's talk was polished and elegant" "She presented a geological mystery (the observation that ridge basalts tend to record higher fO_2 than ridge peridotites) which she has resolved for rocks sampled at the Southwest Indian Ridge" "This was my favorite talk of the meeting!"

From the Student: "I'm honored to receive this recognition from GeoPRISMS! I very much appreciate everything GeoPRISMS does for the community, especially its dedication to helping students, and I look forward to further involvement with the GeoPRISMS community and related research in the future."

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

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

Honorable Mention

Joshua Davis – UTIG, Austin

Cold rocks make more melt: Numerical models of melt generation during continental extension

Coauthors: Luc Lavier

From the Judges: "Very organized and well-practiced talk" "Joshua was able to clearly explain the interesting and counterintuitive results of his research" "The rifting simulations were impressive and Joshua's narration was seamless and confident."

From the Student: "Thank you GeoPRISMS for this recognition. I'm honored to participate among this community and look forward to future collaborative efforts."

Honorable Mention

Helen Janiszewski – LDEO, Columbia University

Shoreline-crossing shear-velocity structure of the Juan de Fuca Plate and Cascadia Subduction Zone from surface waves and receiver functions

Coauthors: Jim Gaherty, Geoff Abers, Haiying Gao

From the Judges: "Helen is very knowledgable about her research" "The project represents an important and novel contribution to imaging the structure of Cascadia, integrating onshore & offshore observations" "She really knows her material and is clearly aware of the strengths and weaknesses of her work"

From the Student: "I am honored to have my research recognized within the GeoPRISMS community. I am grateful to the organizers of this program for their support of student research, and look forward to continuing participation in GeoPRISMS research."

Honorable Mention

Hannah Mark - MIT-WHOI

Seismic coupling at divergent plate boundaries from rate-and-state friction models

Coauthors: Mark Behn, Jean-Arthur Olive, Yajing Liu

From the Judges: "Extremely well constructed and delivered presentation" "Elegant explanation of the basis of this modeling study and the overall controls on seismic coupling" "[...] findings have implications for fault behavior associated with continental rifting"

From the Student: "I am honored to have my work recognized by GeoPRISMS and I appreciate the great opportunities offered by the program for young scientists to participate. There's so much interesting science that can be tackled in a multi-disciplinary community like this one, and I'm excited to see what new insights on plate boundary processes will come out of the next few years of research."

Honorable Mention

Sarah Jaye Oliva - Tulane University

Deciphering the role of fluids in early stage rifting from full moment tensor inversion of East African earthquakes

Coauthors: Cindy Ebinger, Steven Roecker, Derek Keir, Donna Shillington, Patrick Chindandali

From the Judges: "Sarah did a really nice job of explaining her work. It was also great to see how well she understood her methodology, and how much she is thinking about how to improve the work via more robust discussion of errors" "Sarah is very smart, explains her research extremely well and thinks "outside the box" for her interpretations" "Nice analysis and presentation of poster"

From the Student: "I'm pleasantly surprised and honored to be recognized and I'm very thankful for the sense of community and the support that GeoPRISMS provides, especially to junior scientists like myself. I look forward to taking part in this community!"

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GeoPRISMS Mini-Workshop at the AGU Fall Meeting 2015 "From rifting to drifting: Evidence from rifts and margins worldwide

GeoPRISMS will be at the AGU Fall Meeting 2017!

Visit the GeoPRISMS website for more information about GeoPRISMS activities www.geoprisms.org