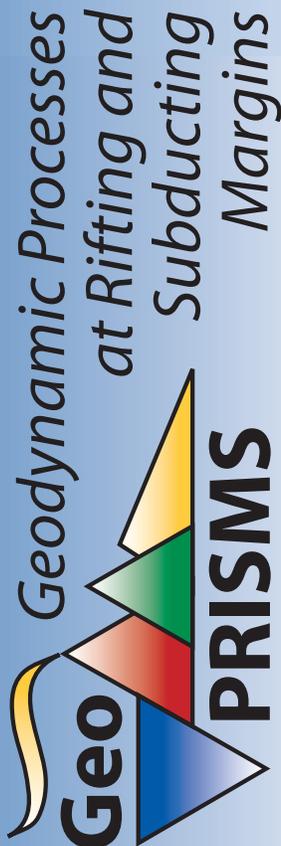


GeoPRISMS Newsletter

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GeoPRISMS and 2012-2023 Scientific Ocean Drilling Strategies

John Jaeger and Liz Screatton (University of Florida)

Scientific ocean drilling provides vital access to the marine subsurface and is crucial for achieving GeoPRISMS objectives. In turn, GeoPRISMS science comprises key components of the 2013-2023 International Ocean Discovery Program (IODP) science plan. As IODP embarks on this ambitious plan starting in 2013, the GeoPRISMS community needs to engage in the new program and propose exciting and compelling drilling proposals to address the scientific challenges.

GeoPRISMS Science and U.S. Priorities in 2013-2023 IODP

There is strong synergy between GeoPRISMS and IODP science objectives, which cover a wide suite of continental margin processes. GeoPRISMS researchers have been an integral part of the planning process for 2013-2023 Scientific Ocean Drilling Program. Most recently, the U.S. community was tasked with identifying priorities within the future program through an online survey and with 73 representatives who assembled for the Building U.S. Strategies for 2013-2023 Scientific Ocean Drilling workshop on April 30 to May 2, 2012 in Denver, Colorado. Of the 433 survey respondents, 105 identified themselves as involved in GeoPRISMS.

The IODP science plan is organized around four research challenges: Climate and Ocean Change; Biosphere Frontiers; Earth Connections; and Earth in Motion. Within each challenge, input from the community guided prioritization, which is summarized below for GeoPRISMS-focused questions. Understanding natural hazards, including subduction zone earthquakes and tsunamis, was identified as a top priority within the Earth in Motion challenge. Recent large earthquakes and tsunamis

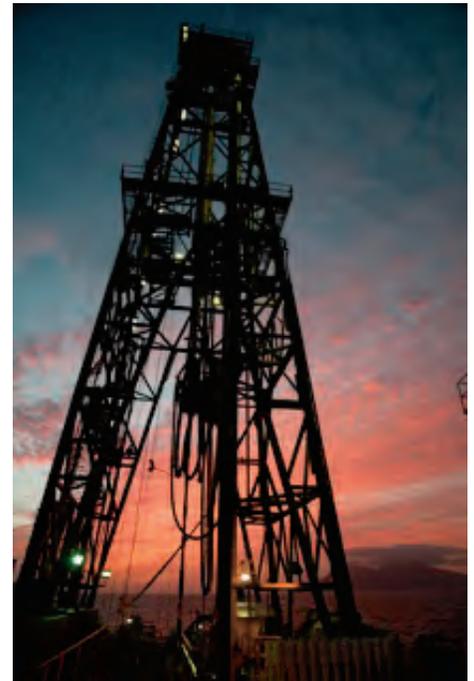


Figure 1. Sunrise viewed through the drilling derrick of the D/V JOIDES Resolution during Expedition 340, Lesser Antilles Volcanism and Landslides.

have highlighted the need for better understanding of submarine geohazards, and current offshore and onshore studies have produced mature hypotheses. IODP is positioned to provide offshore leadership, as scientific drilling is the only means to access deep archives of past events or active fault zones in critical offshore regions. This is also a topic of considerable interest to society at large. Earthquake research has comprised an important part of the current phase of scientific ocean drilling, particularly through the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE). Deep drilling and observatory work are key parts of NanTroSEIZE, but many objectives also can be addressed through shallower coring, sampling, and logging while

drilling. Future expeditions to other subduction zones, or adding single sites to drilling plans, can provide a more global view of earthquake processes and insights into different slip mechanisms. The link between IODP and GeoPRISMS is particularly strong in the GeoPRISMS primary sites offshore the Pacific Northwest, Alaska, and New Zealand.

Within the Earth Connections challenge, subduction zone initiation, volatile cycling, and the generation of continental crust were identified as high priorities. Material from Earth's surface is recycled into Earth's interior at subduction zones. Subduction of oceanic lithosphere also results in the release of volatiles, melting in the mantle, and some of the world's most hazardous volcanic eruptions, earthquakes, and tsunami. Determining how subduction initiates, volatiles are recycled, and oceanic island arcs are constructed are key to understanding the evolution of the solid Earth system and, in particular, how the building blocks of continental crust are formed. Whereas drilling with the JOIDES Resolution can contribute significantly to studies of subduction initiation and volatile recycling, drilling by Chikyu is required to test directly the generation of continental crust by drilling deep into arc middle crust. Expeditions using the JOIDES Resolution to target the forearc oceanic crust can constrain how mantle melting evolves during subduction initiation.

Interdisciplinary science has always been a hallmark of the scientific ocean drilling programs, and strong interconnections among scientific themes were apparent in the survey results that are highly relevant to GeoPRISMS Subduction Cycles and Deformation (SCD) and Rift Initiation and Evolution (RIE) science. At the workshop, participants expanded on these relationships in cross-theme breakout groups that explored serpentinization, carbon storage in gas hydrates, and the linkages between eruptions and volatiles, mountain-building and global climate, tectonics

and sea level, and seafloor fluid flow and seawater–crust exchanges and the biosphere.

Structure of the New Program

The new ocean drilling program is geared to be flexible in the scope of science that can be done, from single sites to multi-leg expeditions, in order to encompass the diverse interests of our community. As in the previous program, there are three platforms available to the GeoPRISMS community. However, to streamline operations within the new program, each platform (JOIDES Resolution, Chikyu, and Mission Specific Platforms) will be operated independently by its respective country or consortium. A cross-platform panel, called the IODP Forum will provide a venue for all entities in the new program to exchange ideas and evaluate the scientific progress of the program. See <http://www.iodp.org/new-program> for details about the architecture of the new IODP.

What does this new management structure mean for GeoPRISMS scientists interested in using one of these platforms for their science? For the U.S. community, there will be little change in the way they participate. Proposals for all platforms will still be submitted through a new Support Office to the internationally-staffed advisory structure for review by the Proposal Evaluation Panel. U.S. scientists will continue to have access to Chikyu and MSP through berth-sharing agreements and will be heavily involved in the new IODP advisory structure. As in the past, samples and data will also be available to all community scientists.

One important difference in the new program is that governing boards for each platform will develop their own operations schedule based upon proposals received from the Proposal Evaluation Panel. For the JOIDES Resolution, the governing board will include representation of all partners contributing to JOIDES Resolution operations, members of the international science community (who

will make the scientific decisions), and the vessel science operator. The composition and mission of the governing boards for the Chikyu and MSPs are similar to the JOIDES Resolution model.

Optimizing operational efficiencies by integrating multiple science objectives into expeditions or series of expeditions is a new paradigm for the scientific ocean drilling community. For the JOIDES Resolution, this also means developing more efficient ship tracks that minimize transits and maximize science output in relation to time and cost. This strategy requires consideration of the geographic distribution of highly-ranked drilling proposals and several years advance notice to the scientific community about the expected operating regions of the JOIDES Resolution.

For the Chikyu, an international planning workshop "CHIKYU+10" will be held in April 2013 to engage the community in a discussion of potential future scientific missions using the ship within the context of the new science plan and the post-2013 framework for scientific ocean drilling platform utilization and international collaboration. Workshop outcomes will be considered by JAMSTEC in long-range planning for Chikyu operations.

The JOIDES Resolution is scheduled to end the current IODP program in the western Pacific Ocean. It is the intent of the US program to have the ship remain in the western and southwestern Pacific and Indian Ocean region through FY2016. Beyond that, the JOIDES Resolution shiptrack will be driven by proposal pressure, with a target of reaching all ocean basins within the decadal program.

How can GeoPRISMS scientists participate in the new IODP program? Many avenues are open: propose drilling targets; organize or participate in workshops that help guide geographic of topical areas of interest; apply to sail on expeditions; volunteer to serve on panels and governing boards. For those considering submitting a drilling proposal, all

levels of science are welcomed. The review process has been streamlined to result in a shorter evaluation period for proposals in the system. In many ways, proposal pressure will drive the ship and help provide guidance for future shiptracks. The community is strongly encouraged to submit drilling proposals to provide for a breadth of high-priority drilling targets in all ocean regions. To maximize operational efficiencies, the JR will entertain a diverse range of drilling proposals, from the standard multi-week expeditions devoted to focused

research initiatives to single sites that can be occupied along ship transits.

Initial submission may be preproposals, which are short (<2700 words) and do not require detailed site-specific documentation.

Following the proposal evaluation panel meeting, feedback will be provided as to whether a full proposal is encouraged, a workshop is recommended, or the preproposal is found unsuitable. If a full proposal is recommended, sufficient site characterization data will be needed

at the time of, or close to, submission. For the new paradigm of optimizing operational efficiencies to work, a diverse portfolio of drilling projects is needed, which GeoPRISMS is ideally suited to help provide. For more information on how to submit a proposal, see: http://www.iodp.org/doc_download/3501-iodp-proposal-guide-primer-v3. If you have a compelling scientific target that can be addressed with scientific ocean drilling, submit a preproposal or full proposal. The next deadline is March 1, 2013!

Interested in finding out more? Join us at the Mini-Workshop during AGU! “IODP Opportunities in GeoPRISMS Subduction Studies”

Thursday, December 6, 2012, 6:00 – 9:30 pm
Fillmore ABC, Grand Hyatt San Francisco (345 Stockton Street)

Conveners: R. Stern¹, D. Scholl², J. Jaeger³, T. Plank⁴
(¹Univ. Texas, Dallas; ²U.S. Geol. Survey; ³Univ. Florida; ⁴Columbia Univ.)

Description: A workshop to explore how best to use IODP drilling to support GeoPRISMS Subduction Cycles and Deformation science objectives, and especially to make use of the D/V JOIDES Resolution for studying the Cascadia and Aleutian primary sites. Topics will include summaries of recent expeditions, future drilling targets, proposal development, including workshops, and engaging early career geoscientists in these efforts. For more info: www.geoprisms.org/iodp-mini-workshop-2012.html

Call for Nominations for five active leading members of the international scientific community to serve on the new JOIDES Resolution Facility Board

The next Phase of scientific ocean drilling, the International Ocean Discovery Program (IODP) “Exploring the Earth beneath The Sea”, will begin in October 2013. The science plan “Illuminating Earth’s Past, Present and Future” is the guiding scientific document for the new IODP. The new program maintains an overarching international umbrella to assess progress on achieving its long-term scientific objectives and to foster coordination among the platform providers, while the three platforms (JOIDES Resolution, Chikyu, and mission-specific platforms) will be operated independently by their respective countries or consortia. Each platform provider will have its own facility board that will be responsible for an effective contribution to the IODP Science Plan within available resources. See <http://iodp.org/new-program> for more information about the structure of the new IODP.

The JOIDES Resolution Facility Board will be responsible for developing and approving annual operations, regional tracks for the JR, monitoring the advisory panels, approving annual program plans, and developing and monitoring policies for data collection, publications, and core curation associated with the JOIDES Resolution. See <http://iodp.org/new-program> for the call for nominations and full terms of reference and member roster for the JOIDES Resolution Facility Board.

Interested scientists should apply through the U.S. Science Support Program of the Consortium for Ocean Leadership. See the website for specific application requirements. The deadline to apply is 4 January 2013. The final selection will be completed by late January 2013.

From the GeoPRISMS Chair

Julia Morgan, GeoPRISMS Steering and Oversight Committee Chair (Rice University)

Once again, my newsletter report coincides with the conclusion of a workshop, this time the GeoPRISMS Planning Workshop on the East African Rift System (EARS). Our first workshop on an international primary site was predictably stimulating and informative, with more than 100 participants from 14 different nations, including 6 African countries. In addition, 40 students and postdocs attended, injecting their enthusiasm and excitement about new research opportunities into all discussions. This second workshop for the RIE initiative, paired with the ENAM meeting that took place last fall, solidifies the directions for integrated studies at rift zones, both modern and ancient. The final planning workshop for the SCD initiative New Zealand primary site has now been scheduled for April 15-17, 2013 in Wellington, NZ, jointly sponsored by GeoPRISMS and the NZ Ministry of Science and Innovation (MSI); see the back cover for website. These last two planning meetings are critical for re-establishing our international collaborations, which played such an important role in the successes of the MARGINS Program.

However, we must realize that the research objectives outlined for each primary site are extraordinarily ambitious; and in combination, they are tremendous! It is unrealistic to expect the annual budget of ~\$5M for the GeoPRISMS Program to support all the great research that has been iterated at these workshops. Thus, to achieve the program's goals and to ensure a lasting impact, the GeoPRISMS community must strategize its approach to meet these grand science objectives. The first component of this is to pursue as many different funding paths as possible. Several new NSF programs, including cross-divisional and cross-directorate ones, define important new funding opportunities for members of the GeoPRISMS community (see box below for examples). In addition, Core

funds within the divisions remain an important resource to support science projects that contribute to the broader mission of GeoPRISMS.

But importantly, GeoPRISMS is poised to carry out high-quality, interdisciplinary research at all of the chosen primary sites because of the strength and creativity of the community that drives it. As with MARGINS before it, GeoPRISMS is much more than a funding program. It is a broad community of informed researchers who can recognize and leverage collaborative opportunities, engage international and agency partners, and deploy community resources for the benefit of the larger program. It is these attributes that make GeoPRISMS so much more than the sum of its parts.

Further opportunities to develop and strengthen our international partnerships are also afforded by the renewal of the next decade of IODP (International Ocean Discovery Program) (see page 1). Ocean drilling has long been a key element in carrying out MARGINS and GeoPRISMS science objectives, and now is the time for the community to invest in new drilling proposals, workshop proposals, and more, to drive the program to work for GeoPRISMS. GeoPRISMS will host an informational mini-workshop at AGU on future IODP opportunities for SCD science Thursday evening, Dec. 6. Please plan to join us to learn how you can participate.

A variety of marine and onshore geophysical programs have also taken place at the Cascadia primary site, funded by GeoPRISMS, EarthScope, MG&G, and EAR. The Cascadia Initiative OBS recovery is complete, with data now available for researchers to work on. The next deployment of instruments is underway. The recent COAST survey over the Cascadia accretionary prism yielded excellent seismic reflection data, available to

interested investigators on an open-access basis (see page 11). Add-on wide-angle surveys promise improved earthquake relocations and imaging of the Cascadia plate interface. Further updates about these operations and others, and the next stage of science planning for Cascadia, will take place at a mini-workshop on Sunday evening, Dec. 2, just before AGU – join us to hear more!

Also for the first time this year, GeoPRISMS and EarthScope will co-sponsor an Early-Career Investigators (ECI) networking luncheon. This will provide a unique opportunity for ECIs to discuss research interests and explore potential collaboration based on shared GeoPRISMS and EarthScope geographic locations and themes, and to develop collaborations prior to next July's NSF proposal deadlines.

In addition to the mini-workshops and luncheons mentioned above, GeoPRISMS will be active at AGU in other ways. The GeoPRISMS Townhall and Community / Student Forum will take place on Monday, Dec. 3, at 6 pm at the Westin Market Street, Metropolitan III Ballroom. Come talk to your colleagues, program officers, members of GSOC and GEAC, and especially, chat with student presenters in a relaxed and informal setting. These gatherings provide stimulating and interactive opportunities to discuss topical issues of interest to GeoPRISMS, accompanied by fine food and beverages.

GeoPRISMS Education and Outreach efforts continue to grow. The student symposia held before the last two community workshops were among the largest so far, and the high-level of student and postdoc participation in the meetings that followed is inspiring. The popular Distinguished Lectureship Program received many applications this year, and our 8 esteemed speakers will visit 36 schools over the next academic year. Coming

up is the GeoPRISMS Outstanding Student Presentation competition at AGU, which highlights some of the most interesting science underway on GeoPRISMS-related topics.

A new development in the GeoPRISMS E&O is the recently funded NSF TUES project “*Bringing NSF MARGINS/GeoPRISMS Continental Margins Research Into the Undergraduate Curriculum*”, led by several members of the GeoPRISMS Education Advisory Committee, along with key MARGINS/GeoPRISMS researchers and *On the Cutting Edge* geoscience faculty. The objective of this project

is to prepare the next generation of MARGINS mini-lessons, specifically to integrate a decade of successful MARGINS research into upper level undergraduate geoscience curricula. We invite interested members of the GeoPRISMS community to participate and contribute to this effort, described in more detail on page 26.

Finally, I would like to welcome three new staff members to the GeoPRISMS Office: Susi Haveman, who serves as Program Assistant, and August Costa and Anaïs Férot, who share the Science Coordinator/Science Writer responsibilities for the office. I also

would like to extend my thanks to Ramon Arrowsmith for his service on the GeoPRISMS Steering and Oversight Committee (GSOC) and in particular for helping to solidify GeoPRISMS ties with EarthScope. Moreover, I would like to thank all the many other members of GSOC and GEAC who have been instrumental in running recent workshops and student symposia, along with other volunteers from the community. I am most grateful for all of their contributions, and look forward to work with all of you over the next year to finalize the GeoPRISMS Science Plan.

Potential Funding Opportunities for GeoPRISMS-Related Proposals

Interdisciplinary Research in Hazards and Disasters (Hazards SEES) [Solicitation 12-610]

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504804

<http://www.nsf.gov/pubs/2012/nsf12610/nsf12610.htm>

Full Proposal Deadline(s): February 04, 2013

The overarching goal of Hazards SEES is to catalyze well-integrated interdisciplinary research efforts in hazards-related science and engineering in order to improve the understanding of natural hazards and technological hazards linked to natural phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters. The goal is to effectively prevent hazards from becoming disasters.

Integrated Earth Systems (IES) [Solicitation 12-613]

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504833

<http://www.nsf.gov/pubs/2012/nsf12613/nsf12613.htm>

Full Proposal Deadline(s): November 14, 2013 and annually thereafter

Integrated Earth Systems (IES) is a program in the Division of Earth Sciences (EAR) that focuses on the continental, terrestrial and deep Earth subsystems of the whole Earth system. The overall goal of the program is to provide opportunity for collaborative, multidisciplinary research into the operation, dynamics and complexity of Earth systems at a budgetary scale between that of a typical project in the EAR Division’s disciplinary programs and larger scale initiatives at the Directorate or Foundation level.

Frontiers in Earth System Dynamics (FESD) [Solicitation 12-547]

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503525

<http://www.nsf.gov/pubs/2012/nsf12547/nsf12547.htm>

Preliminary Proposal Deadline: July 2, 2012 (final call in 2014)

Full Proposal Deadline: March 4, 2013 (final invitation in 2015)

The Earth is often characterized as “dynamic” because its systems are variable over space and time, and they can respond rapidly to multiple perturbations. The goals of the Frontiers in Earth System Dynamics (FESD) program are to: (1) foster an inter-disciplinary and multi-scale understanding of the interplay among and within the various sub-systems of the Earth, (2) catalyze research in areas poised for a major advance, (3) improve data resolution and modeling capabilities to more realistically simulate complex processes and forecast disruptive or threshold events, and (4) improve knowledge of the resilience of the Earth and its subsystems.

GeoPRISMS - EarthScope Science Workshop for Cascadia Report

Portland, Oregon, April 4-6 2012

Workshop Conveners: Geoff Abers (Lamont-Doherty Earth Observatory), Ramon Arrowsmith (Arizona State University), Joan Gomberg (US Geological Survey), Andrew Goodliffe (University of Alabama), Adam Kent (Oregon State University), Katie Kelley (University of Rhode Island), Harvey Kelsey (Humboldt State University), Julia Morgan (Rice University), Josh Roering (University of Oregon), Anne Trehu (Oregon State University) and Kelin Wang (Pacific Geoscience Center)

Background and Motivations

GeoPRISMS and EarthScope co-sponsored this science workshop on Cascadia, held April 4-6, 2012 at the World Trade Center in Portland, OR, as a joint effort to foster communication and collaboration among researchers with diverse interests in Cascadia. The broader goal was to inform and revise guiding documents for both communities. The following is a synopsis of the workshop, which is summarized more completely in a workshop report which can be found on-line at <http://www.geoprisms.org/past-meetings/207-cascadia-apr2012.html>.

The Cascadia subduction zone, which cuts through three US states and western Canada (Figure 1), is the only region of the lower 48 states that is capable of producing a M_w 9 earthquake and has the greatest potential for volcanic eruptions in the conterminous US. A trove of new geological, geodynamic, and geophysical data has recently been collected and more will be forthcoming in the next several years, thanks in part to NSF investments in EarthScope and the onshore/offshore ARRA-funded Amphibious Array Facility (AAF) of the Cascadia Initiative (CI) [See GeoPRISMS Newsletter, Issue 27 for more information]. The Cascadia margin was also chosen as a Primary Site of the NSF GeoPRISMS program during the Subduction Cycles and Deformation (SCD) Initiative Implementation Workshop in 2011, and is thus recognized as a focal point of interest to a broad base of scientific communities. With so many other onshore and offshore research efforts in process or planning stages, the time was right to hold a science workshop to build synergies among communities, disciplines, and agencies with scientific interests in the area.

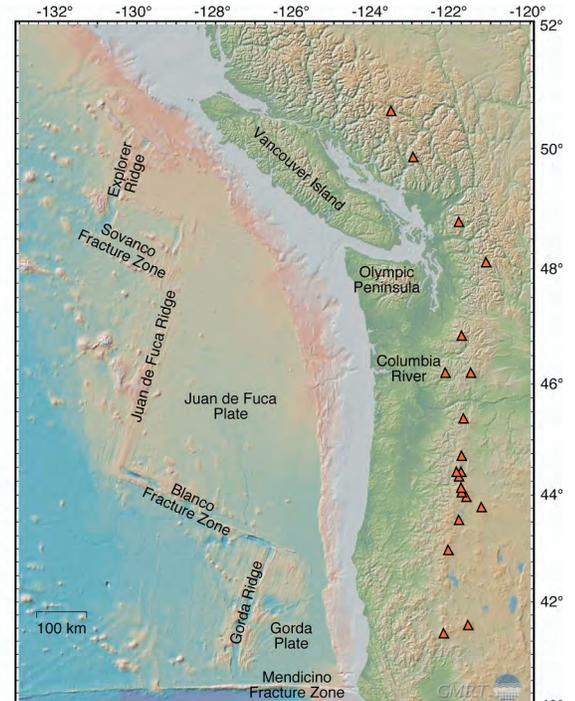
Figure 1. Bathymetry & topography of the Cascadia margin and associated tectonic elements. Significant arc volcanoes indicated by orange triangles. Map generated using GeoMapApp.

Ongoing/future scientific efforts in Cascadia will benefit greatly from communication and coordination among these diverse groups.

The workshop took as its starting point the Cascadia SCD portion of the GeoPRISMS Science and Implementation Plans (<http://www.geoprisms.org/science-plan.html>) and the EarthScope Science Plan (<http://www.earthscope.org/ESSP>). The primary goals of the workshop were to: (i) to clarify common research objectives within Cascadia; (ii) to address the range of interacting tectonic, magmatic, and surficial processes acting along the convergent margin; and (iii) to update implementation plans and timelines for GeoPRISMS and EarthScope research, considering available resources and infrastructure. A key additional goal of the workshop was to tap a broad cross-section of researchers working in Cascadia, or interested in future opportunities, and to foster interaction and discussions leading to new collaborations and understanding. This specifically included entraining early-career scientists (students, postdocs, and new faculty) interested in furthering Cascadia science.

Overview

The workshop was attended by nearly 180 participants (Figure 2), including ~60 graduate students and post-docs, for two days of talks and discussion



in Portland, OR. The workshop aimed to provide a platform for review and synthesis of the current state of Cascadia science, involving a wide range of topics from tectonics to geophysics/geochemistry to sedimentation and beyond, and an open forum for discussion of the future directions of scientific research in Cascadia. A student symposium took place on the day before the workshop, introducing graduate students and post-docs to the Cascadia system through a series of talks and a regional field trip. The 2-day workshop was organized into a series of broad plenary talks to provide an overview of the Cascadia subduction system, interleaved with topical break-out sessions, short presentations on hot-topic science, poster sessions, and plenary discussions.

The first day opened with plenary presentations on the tectonics, volcanism, faulting, and deep structure of the Cascadia subduction system, followed by updates on the current major projects ongoing in the Cascadia



Figure 2. Participants at the GeoPRISMS-EarthScope Cascadia Workshop in Portland, April 2012.

region. A set of evening discussion sessions (Special Interest Groups, or SIGs), focused on these major projects, providing opportunities for informal discussions of the details of each project, and helped define pathways for future research to link in to these efforts. The second day of the workshop opened with a plenary session on sedimentary processes in Cascadia, followed by two sets of special interest group (SIG) break-out discussions targeted at communities with interests in particular scientific questions or processes relevant to Cascadia. These discussions were followed by shorter plenary presentations on the geohazards specific to the Cascadia margin, and reports by each of the breakout groups summarizing the main discussion points in each session. The workshop wrapped up with a presentation from the student participants in the workshop, and an open plenary discussion outlining a “roadmap” to the future of Cascadia science.

For the GeoPRISMS community, one of the key objectives of the Cascadia workshop was to obtain input to refine the directions of GeoPRISMS

research in Cascadia. In particular, the outcomes of the breakout and plenary discussions at the workshop will be incorporated into an updated version of the GeoPRISMS Implementation Plan (IP) for the Cascadia Primary Site (e.g., <http://geoprisms.org/science-plan.html>). This document provides guidance to principal investigators interested in submitting proposals for funding under the NSF GeoPRISMS Program. Although proposals for research in Cascadia have been accepted under the GeoPRISMS solicitation since 2010, input from the community to clarify the research priorities for GeoPRISMS in Cascadia has been limited, with a strong emphasis on projects linked to the Cascadia Initiative.

Thus, a main goal of this workshop was to open an interdisciplinary dialog that would enable an integrated view of the Cascadia subduction zone, to solicit and incorporate feedback on science implementation in Cascadia from a broad-based community, and to provide focus and guidance for subsequent GeoPRISMS proposal solicitations.

For the EarthScope community, this workshop provided an integrative scientific dialogue building on the transformative observations from its augmented geodetic, magnetotelluric, and seismological facilities in Cascadia. Numerous science targets identified in the EarthScope Science Plan (<http://www.earthscope.org/ESSP>) were illuminated in the presentations and discussions from the workshop. Initial research results from jointly NSF-funded EarthScope and GeoPRISMS projects were presented and momentum for additional joint proposals was evident and encouraged. In addition, IRIS and UNAVCO as the respective managers of the seismological and geodetic facilities of EarthScope are currently developing proposals for 2013-2018 operations and maintenance. The community discussions about science targets, priorities, and opportunities for coordination with other programs such as GeoPRISMS provide essential fodder for these necessarily integrative proposals.

Student Symposium

An important aspect of any scientific meeting is the engagement,

preparation, and inspiration of the next generation of scientists and leaders. The student symposium, held before the workshop and attended by thirty-three students and two postdocs from thirteen universities, brought together representatives from this vital demographic, coordinated by Andrew Goodliffe (University of Alabama) with help from the GeoPRISMS Office and several workshop conveners and participants. Introductions to the GeoPRISMS and EarthScope Programs were followed by overviews of the geology and geophysics of the Cascadia region. The students and postdocs then took over the stage, giving one-slide descriptions of their research. Those presenting posters had an opportunity to highlight the work that they would be presenting later in the meeting.

In the afternoon, Ray Wells (USGS) and Ian Madin (Oregon Department of Geology and Mineral Industries) led a fieldtrip through the Portland metropolitan area. Participants got to see a spectacular Columbia River Basalt outcrop, evidence of mass wasting, a panorama of the Portland Basin and rocks from the Boring volcanic field flow. The field trip ended at the Zoo station of the Portland MAX light rail system where a spectacular core (recovered during the construction of the 3-mile-long tunnel) is displayed.

In the evening, following the icebreaker for the Cascadia workshop, symposium participants participated in a lively group dinner at Kell's Irish Pub. Several workshop scientists joined the group and shared insights about their career path and the GeoPRISMS/EarthScope programs.

Workshop Program

The workshop was structured around several key topics:

- *Cascadia Crustal Evolution and Deformation*
- *Earthquakes and Other Faulting Processes*
- *Large-scale and Deep Processes*
- *Sediment Transport, Accretion, and Subduction*

Each topic was provided several

keynote presentations, all of which can be found on the meeting website. These presentations led to stimulating plenary and break-out discussions.

The *Cascadia Crustal Evolution and Deformation* session highlighted the geological evolution of the Cascadia margin (Ray Wells, Figure 3), the pre-Quaternary magmatic history of Cascadia (Anita Grunder) and the history of recent magmatism and volcanism (Kathy Cashman).

On the topic of *Earthquakes and Other Faulting Processes*, a primary focus of both EarthScope and GeoPRISMS research at Cascadia, three different perspectives were offered, including new observations from the recent Tohoku earthquake and ongoing and planned work in Japan (Shuichi Kodaira), paleoseismic studies of past megathrust earthquakes along the Cascadia margin (Rob Witter), and recent seismicity and tremor activity along the Cascadia margin (Ken Creager).

The session on *Large-scale and Deep Processes* focused on the large-scale processes that control subduction system dynamics, with an emphasis on those processes that occur deep with the subduction system, such as the thermal-petrologic-fluid flow structure and dynamics of subduction zones (Ikuko Wada), the geodynamic framework of the Pacific Northwest, in light of new data obtained from seismic tomography and other sources (Gene Humphreys), and magma generation in Cascadia, in particular, reasons for the anomalously hydrous magmas in this hot system (Tom Sisson).

A session on *Sediment Transport, Accretion, and Subduction* addressed the Cascadia forearc as a setting for the transport of sediment from the Coast Ranges through the estuaries offshore to the accretionary prism and the abyssal plain, with topics ranging from the driving forces for erosion initiated through wedge dynamics (Mark Brandon), to deformation of sediment in the offshore accretionary wedge (Lisa McNeill) to the mechanisms and processes of delivery of sediment to

the continental slope and abyssal plain by turbidites (David Piper).

Workshop attendees also participated in stimulating poster sessions addressing a wide range of Cascadia and related research topics (Figure 4). Poster-viewing time was provided during both days of the meeting schedule, and posters were well attended during these times, as well as at other times during the meeting.

Volunteers served as judges for the excellent posters that many of the students and postdocs presented. Although all of the presentations were of high quality, three posters rose to the top. These were: Allison Koleszar (postdoc, Oregon State University); Jason Patton (Ph.D. candidate, Oregon State University); and Wanda Vargas (M.S. student, Cornell University). Each student received a copy of the book "In Search of Ancient Oregon: A Geological and Natural History", by Ellen Morris Bishop.

Special Interest Group (SIGs) discussions during the workshop to discuss scientific topics, targets, and research approaches relating to specific processes or approaches, for example, Deep Subduction Zone Structure, Megathrust Structure and Processes, Outer Forearc Structure and Segmentation, Geodetic Processes, Magmatism and Volcanic Processes, Volatile Processes and Cycles, and Sedimentary Processes. Each session was asked to address the following questions: (a) What are the key exciting scientific questions that can be addressed in Cascadia? (b) What infrastructure exists in Cascadia research to address them? (c) What knowledge gaps remain to be filled; what are future research directions? And (d) What challenges exist, and how can they be overcome? The follow-up break-out reports guided the closing discussions on the final day of the workshop.

In addition, several Implementation Interest Groups broke-out to review the status of ongoing projects, and to brainstorm about future efforts specific to Cascadia. Topics included Cascadia

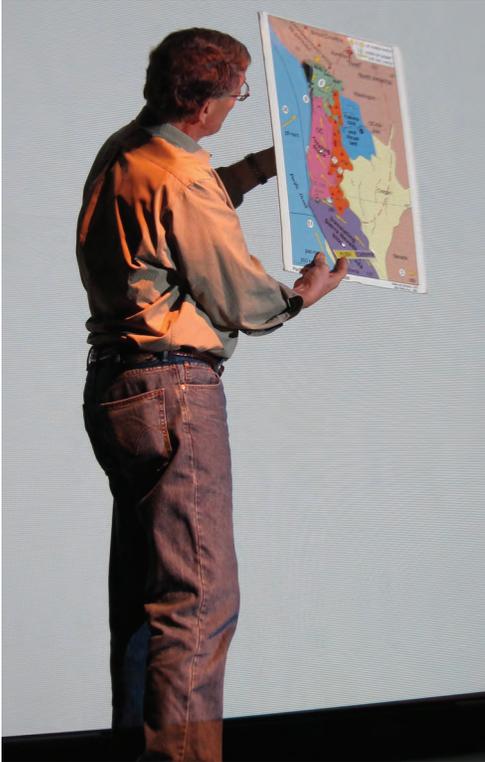


Figure 3 (left). Ray Wells demonstrates present-day Cascadia plate motions.

Figure 4 (right). Attendees participated in animated conversations during poster sessions.

Initiative & Amphibious Arrays, Volcano Imaging, Geohazards, Energy & Mineral Potential, and Education & Outreach. Similar questions were posed to these break-out groups, including: (a) What infrastructure exists for Cascadia; what are associated opportunities? (b) What major research products and data streams will be available? (c) What gaps remain to be filled; what are the future directions for research? (d) What challenges exist, and how can they be overcome? Additional presentations addressed the important and diverse topic of Cascadia Geohazards, including those related to earthquakes, tsunamis and volcanoes. They also addressed the major new direction of earthquake early warning.

Throughout the workshop, students participated in plenary and breakout sessions, enthusiastically contributing to discussions. During lunches and in the evening, when most workshop participants had long since left the convention center, the symposium participants were still found hard at work. The students and postdocs ultimately developed a consensus statement emphasizing their take

on the key aspects of the Cascadia system and the important scientific breakthroughs yet to come (Figure 5).

Roadmap to the Future – Science Implementation at Cascadia

Throughout the meeting, several key issues emerged from the presentation and discussions. A selection of these is listed below, and collectively they constitute a roadmap for refining the Cascadia science implementation plan. In most cases these issues cut across traditional discipline boundaries, and our understanding of them is impacted by multiple datasets.

- *The nature of segmentation along the subduction zone.* Diverse data sets (geophysics, seismicity, volcano age and distribution, geochemistry, geodesy and paleogeodesy, etc.) reveal that the subduction zone is segmented along strike. Key uncertainties remain. Is the segmentation the same for different data sets? What are the ultimate controls of segmentation evident in different data? What is the influence of the incoming plate on segmentation? What is the in-

fluence of the inherited crustal structure and composition of the upper plate?

- *Earthquakes and the turbidite record.* Inferences have been drawn from turbidite records that earthquakes rupture only part of plate boundary ($M > \sim 8$ events) have regularly occurred in southern Cascadia with the northern portion rupturing only in entire-boundary, $M 9$ earthquakes. These suggestions warrant further study as they have important impacts on hazard estimates and our basic understanding of the earthquake cycle along the plate boundary.
- *The hot and dry slab paradox.* Uncertainty remains in reconciling the geochemical and petrological estimates of volatile fluxes in Cascadia with thermal models that predict a hot and dry subduction system. At present, measurements of pre-eruptive water contents seem relatively normal (compared to other arcs) in Cascadia basalts, however thermal models predict

early dehydration and devolatilization. This remains an enigma for Cascadia. The relationship between timing of dehydration, extent of dehydration and the role of volatile fluxes in magmatism remains unclear.

- *Distribution of volcanism.* What are the ultimate controls on the distribution of volcanism in Cascadia? Specifically, what parameters influence the formation of large central volcanoes that occur along the arc versus the more dispersed monogenetic volcanism that characterizes the regions between the larger volcanoes? Can this distribution be linked to the slab, structures in the mantle wedge, or in the upper plate? How do the relatively localized back-arc volcanic complexes (Simcoe, Newberry, Medicine Lake) relate to the arc system? What are the roles of mantle fluxes, solid/fluid flow vectors, and crustal magma processing?
- *Role of surrounding regions.* Cascadia did not develop in isolation, and important questions remain regarding the evolution of Cascadia in relation to surrounding geologic provinces? These include the Yakima fold and thrust belt, the Basin and Range, The High Lava Plains, Klamath/Sierra block, the Yellowstone hot spot trail and the Juan de Fuca ridge. How have the interactions between these geologic provinces changes through time to influence the formation and evolution of the North American continent?
- *Imaging the physical properties deep within the crust and upper mantle.* Different models of subduction processes, including the transition from stick-slip to stable

sliding along the megathrust and the migration of magma through the crust, are difficult to image geophysically. How can traditional techniques for imaging subsurface seismic velocity and electrical conductivity be improved to better image these processes? How can better images be integrated with other geophysical and geochemical observations?

- *Sediment transport.* The transport of sediment from the subaerial forearc to offshore is a response to tectonic processes. Also, the sediment records of such transport provide insight to the past tectonic events. Specific questions relate to the role of subduction zone earthquakes in initiating landslides, in mobilizing sediment sources and in modulating estuaries as sediment storage compartment or conduits for offshore sediment delivery. Can records from lakes, es-

pecially landslide-dammed lakes, be archives of erosion history in the Coast Ranges? How effective are carbon and other biomarkers in tracing sediment through watersheds to the offshore and can these methods, along the sediment transport data, be applied to determine sediment mass balances for Coast Range watersheds located at different latitudes along the Cascadia margin?

These topics, arising from discussions at the Cascadia workshop, informed the implementation plan developed for the Cascadia margin, specifically to guide proposals submitted to the GeoPRISMS Program, but of broad interest to the research community. The full workshop report for the Cascadia Science Workshop and the final GeoPRISMS Implementation Plan can be accessed and downloaded from the meeting website: <http://www.geoprisms.org/past-meetings/207-cascadia-apr2012.html>

Interested in hearing more about COAST and other Cascadia marine studies? Join us at the AGU mini-workshop!

“Marine Geophysics in the Cascadia Primary Site”

Sunday, December 2, 2012, 6:00 – 9:30 pm

Fillmore ABC, Grand Hyatt San Francisco (345 Stockton Street)

Conveners: W.S. Holbrook¹, G. Abers², M. Tolstoy², S. Carbotte², A. Trehu³, H. Tobin⁴,
D. Toomey⁵, K. Keranen⁶, P. Johnson⁷

(¹Univ. Wyoming; ²Lamont-Doherty Earth Observatory; ³Oregon State Univ.; ⁴Univ. Wisconsin; ⁵Univ. Oregon; ⁶Univ. Oklahoma; ⁷Univ. Washington)

Description: A review of several recent marine and “amphibious” geophysical activities in the Cascadia Primary Site, accompanied by planning for future work, to leverage the current momentum from recent projects and provide the underlying context for the next decade of interdisciplinary studies of the area.

More info visit:

www.geoprisms.org/agu-mini-workshops.html

COAST: Cascadia Open-Access Seismic Transects

Steve Holbrook (University of Wyoming, Laramie), Graham Kent (University of Nevada, Reno), Katie Keranen (University of Oklahoma, Norman), Paul Johnson (University of Washington, Seattle), Anne Trehu (Oregon State University, Corvallis), Harold Tobin (University of Wisconsin, Madison), Jackie Caplan-Auerbach (Western Washington University, Bellingham) and Jeff Beeson (Oregon State University, Corvallis)

The Cascadia margin, where the Juan de Fuca and Gorda plates subduct beneath North America, poses substantial (but poorly understood) earthquake and tsunami hazards to the Pacific Northwest. Several major scientific infrastructure and research initiatives are focusing effort on the Cascadia margin. These include GeoPRISMS, EarthScope, encompassing the Plate Boundary Observatory (PBO), the Cascadia Initiative of ocean-bottom seismometers (OBS) with extensive onshore seismometers and geodetic stations associated with the Amphibious Array Facility (http://www.earthscope.org/about_us/aasc), the Ocean Observatories Initiative (OOI) and NEPTUNE/CANADA cable observatories, and the SeaJade OBS program off Vancouver Island. GeoPRISMS has selected Cascadia as a focus site, and the first deployment of the Cascadia Initiative OBSs included a concentration of instruments off Grays Harbor, Washington (see GeoPRISMS Newsletter Issue 27, 2011). Here we report on a recently completed, open-participation/open-access geophysical survey of the Cascadia margin off central Washington, which provides new opportunities to participate in Cascadia studies.

The COAST (Cascadia Open-Access Seismic Transects) survey comprised a successful, two-week cruise of the R/V *Langseth* in July 2012 that acquired diverse geophysical data, including multichannel seismic reflection, multibeam bathymetry, gravity, and magnetic data in a high-priority corridor of the Cascadia margin off Grays Harbor. The scientific goals of this project include (1) constraining the position of the plate boundary, which is poorly known in this region; (2) imaging downdip variations in the character of the subduction thrust across the transition from aseismic creep to seismogenic rupture; (3)

quantifying pore fluid pressure, fluid budgets, and upstream inputs to the zone of episodic tremor and slip; and (4) determining the geological controls on methane distribution in the forearc.

Substantial shipboard processing efforts produced seismic sections processed through post-stack migration, as well as bathymetric data that provide nearly complete coverage of the forearc region (Fig. 1). Shipboard processing of the data provides the following initial observations:

(1) The Pleistocene accretionary wedge is well imaged and shows landward-vergent thrust faulting throughout our survey area. An outboard series of ramp-and-thrust

structures gives way to a region characterized by folds that separate “oases” of undeformed sediment.

(2) The oceanic basement reflection is strong and clear outboard of the deformation front but becomes much weaker beneath the Pleistocene wedge. At this stage of processing it is not clear whether this reflects inaccurate processing, loss of energy by scattering off a complex surface, or (more intriguingly) a physical change in the plate boundary structure.

(3) Where it is imaged beneath the margin, the top of oceanic crust appears gently dipping beneath the Pleistocene wedge, then bends into

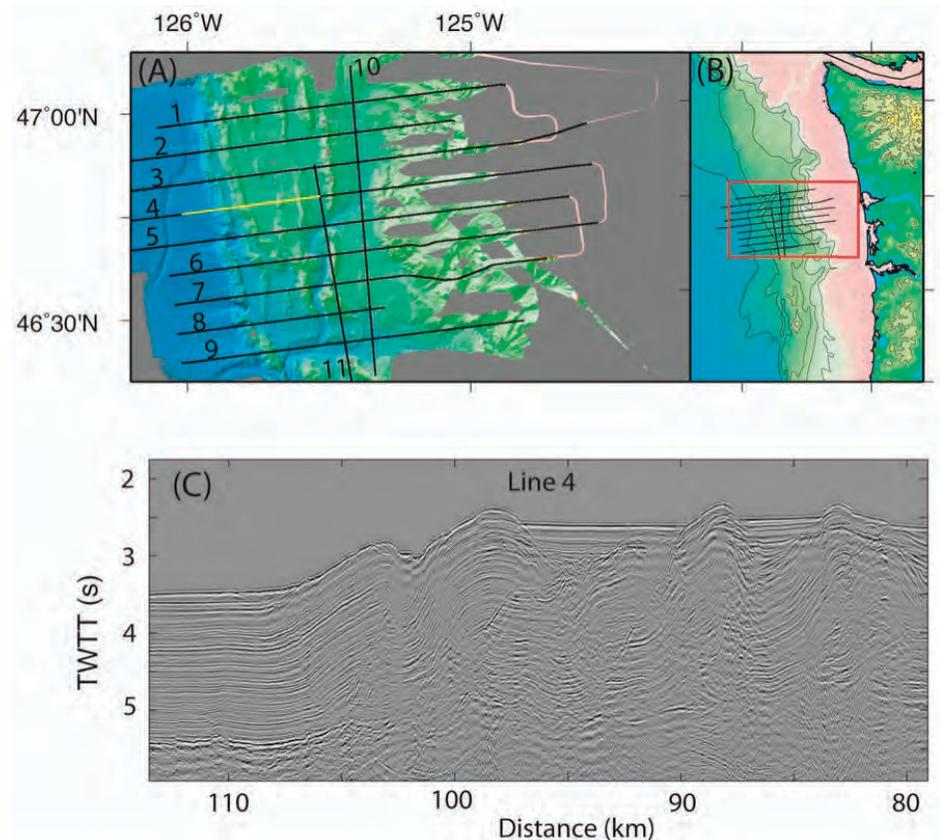


Figure 1. (A) Map of COAST track lines (labeled 1-11), plotted on multibeam bathymetric grid acquired during MGL1212. (B) Inset map showing location of COAST survey on Cascadia continental margin. Bathymetry contoured at 500 m intervals. (C) Example of post-stack time migration across deformation front on Line 4 (yellow line, Fig. 1A).

a steeper inclination beneath the Miocene wedge.

(4) A widespread methane hydrate system, indicated by bottom-simulating reflections, exists in the outer wedge and upper slope of the study area. Increased amplitudes of the Bottom Simulating Reflection (BSR) in tilted sediments suggest that fluid flow along bedding planes controls methane flux.

The COAST program was the first *Langseth* cruise conducted as an open-participation/open-access cruise. Participants were selected by an open application process, through which seventeen members of the science

party were selected from over 60 applicants. Of the twenty members of the visiting science party, eight had not previously been aboard a research vessel, and an additional five (13 total) had never participated in a marine seismic reflection survey. A robust daily shipboard education program included science lectures, scheduled tutoring on seismic processing, and informal data interpretation.

All cruise data are open-access and available immediately. Raw geophysical and seismic data can be downloaded from the LDEO web site (www.marine-geo.org/tools/search/entry.php?id=MGL1212). Seismic

sections processed shipboard through post-stack time migration can be downloaded from the UTIG seismic data base (www.ig.utexas.edu/sdc/cruise.php?cruiseIn=mgl1212). The cruise report can be downloaded at: steveholbrook.com/research/cascadia2d/. We encourage all interested parties to make use of the COAST data in any way desired, including writing proposals to process and analyze the data, integrating the data with other recent and ongoing Cascadia initiatives, and incorporating the data and images in the classroom.



GeoPRISMS AGU Townhall and Community Forum

Monday, December 3 at 6PM

Metropolitan Ballroom III

Westin San Francisco Market Street, 50 Third Street

Join us for the GeoPRISMS Townhall Meeting and Community / Student Forum at the 2012 AGU Fall Meeting. The event is open to all with interests in the GeoPRISMS Program and GeoPRISMS (or MARGINS) research. Come hear all about the latest goings-on in GeoPRISMS, including reports on the most recent primary site planning meetings (Cascadia, East African Rift System) and field activities, and upcoming events and opportunities to become involved.

Bring your students along as well!

Student entrants for the GeoPRISMS Prize for Outstanding Student Presentations are also invited to display their AGU posters (or poster versions of their AGU talks) and discuss their research with event participants. This will be a great opportunity for students to share their results further and to interact with a wide spectrum of GeoPRISMS scientists.

There will be ample time to mingle, and refreshments will be available. Among those present will be Julia Morgan (GeoPRISMS Chair), members of the GeoPRISMS Steering and Oversight Committee, and Program Managers for GeoPRISMS from the National Science Foundation (NSF).

For more information about the the AGU Townhall, Student Prize Competition, Mini-Workshops, and GeoPRISMS-related sessions:

<http://geoprisms.org/agu-townhall.html>

Fluid Flow, Material Transfer & Deformation in the Forearcs of Convergent Margins

Geological Society of America Penrose Conference - March 26-31, Il Ciocco, Lucca, Italy

D. Fisher (Pennsylvania State University); P. Vannucchi (Univ. of Florence, Firenze); C. Ranero (CSI, Barcelona)



Figure 2. Penrose Conference Attendees on the patio of Il Ciocco Hotel in Tuscany.

The GSA Penrose Conference (<http://www.geosociety.org/penrose/12italy.htm>) was held March 26-31 at Il Ciocco, a venue in the hills overlooking the town of Barga, Italy at the foot of the Apuane Alps (see meeting website <http://www.geosociety.org/penrose/12italy.htm>). The meeting location was ideally suited for field trips, including a 2-day pre-meeting field trip that focused on the sub-Ligurian thrusts and associated underthrust sediment section and a one-day post-meeting trip in the Apuane Alps that related to the exhumed metamorphic rocks of the underthrust continental margin. The purpose of this Penrose Conference was to explore recent developments related to deformation, fluid flow, and mass transfer in the forearc of convergent plate boundaries and their potential relationships to earthquake phenomena and seismogenesis. The meeting included onshore studies, marine observations and insights from geodynamic modeling. A number of time scales were considered from the short-term secular variations of the seismic cycle to the long-term evolution of structure and topography. The conference brought together 64 scientists from 15 different countries. Talks and posters were grouped into four themes:

- Short and Long Time Scales of Deformation,
- Structure of Margins and Relationship to Seismicity,
- Deformation Processes and Seismicity in the Forearc, and
- Fluids and Forearc Properties.

Short and Long time Scales of Observation

This session included talks and poster presentations that addressed deformation and deformation rates in forearcs at a range of time scales. The session began with a keynote presentation by K. Wang that explored the variations in stress and deformation that accompany the earthquake cycle, with systematic variations in the nature of upper plate seismicity and the GPS velocity field (relative to the upper plate) over the duration of the interseismic period. Other related issues that generated discussion were the significance of normal faults in forearcs and the potential for dynamic weakening at high velocities where rate-state friction behavior may not apply. Talks in this session addressed the evolution of splay faults and the conditions for splay fault reactivation, the interpretation of the regional velocity field in Central America, and the rupture characteristics of tsunamigenic earthquakes that lead to

rapid slip in the shallow updip region of the forearc. Overall, this session emphasized that the shallow segment of plate boundary faults has complex behavior and can both store elastic strain and slip coseismically during large earthquakes.

Structure of Margins and Relationship to Seismicity

This session included talks and poster presentations with examples from convergent margins around the world, including the Sumatra, Nankai, Middle America, Makran, Aleutian, Mediterranean, Columbia, Ecuador, Hispaniola, and Apennine margins. The session began with a keynote talk by J.-Y. Collot that focused on structures within the underthrust sediment sequence observed in a high resolution seismic reflection profile of the Ecuador margin. Extensional structures are observed at shallow depths that give way to shortening features further down dip. It was noted that extensional structures are typical of the early history of underthrust rocks. Such structures were also observed, for example, on the pre-meeting field trip in blocks that were contained within the strata that were incorporated in the plate boundary shear zone beneath the Ligurian units. There was a discussion that followed this session about when the term “subduction channel” is appropriate when referring to the material that is underthrust beneath the forearc. Introduced in the literature by Shreve and Cloos in 1988, the term originally referred to a deforming channel along the plate boundary where combinations of shear flow and pressure-driven flow could lead to a variety of behaviors, including two-way flow regimes where material is exhumed by return flow beneath the forearc wedge. During the discussion, there was debate that ended inconclusively- about how narrowly the term “subduction channel” should

be defined and whether it is a useful term when referring to the subducting sediments at relatively shallow depths where much of the slip may be restricted to a narrow shear zone. The discussion made apparent the need for higher geophysical resolution at depth to resolve these issues.

F. Tillmann presented a second keynote address that emphasized the segmentation of the subduction interface both along-strike and downdip as illustrated by seismicity along many convergent margins. He also showed the difficulty of using past performance as an indicator of future behavior. There were numerous examples of the impact that lateral variations in the incoming plate have on the deformation and fluid flow in the upper plate. New studies of the Mediterranean basin described the feedbacks between sedimentation, accretion, backarc basin formation, slab rollback, and the seismic hazard potential of the segmented arcs that make up this plate boundary. N. Bangs presented preliminary results of a recent 3-D seismic survey of the forearc wedge offshore Costa Rica that showed depth-related variations in structural style with extension at shallow levels and contraction at deeper levels.

Deformation Processes and Seismicity in the Forearc (and deeper)

This session began with a keynote presentation by S. Lallemand on how the deformation of the downgoing oceanic plate, the state of stress of the upper plate as an indicator of elastic strain accumulation and/or the "subduction channel" plays a role in the seismogenesis of subduction zones, with a global assessment of the upper and lower bounds of the seismogenic zone in terms of slab dip plate velocity and age of plate at the trench. The role of seamounts in seismogenesis and deformation of the upper plate was emphasized by several speakers and poster presenters as seamounts appear to show a complex behavior as nucleation points to earthquakes or barriers to rupture propagation. One topic of discussion that generated great interest is the relationship

between permanent deformation such as normal or thrust faults with a long complicated slip history and the stress variations associated with the earthquake cycle. S. Willett presented a keynote talk where he used thermomechanical numerical models of forearc basin evolution to show that strata infill geometry could be used to evaluate the competition between sedimentation, which stabilizes the forearc, and the deformation that occurs outboard of the stable region. There was some consideration of the impact of tectonic erosion and accretion on seismicity in subduction zones, as well as new estimates of erosion rates based on forearc subsidence from the recent CRISP-IODP drilling offshore Costa Rica that are significantly faster than previous estimates. Overall, this session involved contributions on deformation processes from Nankai, Tohoku, Costa Rica, and New Zealand.

Fluids and Forearc Properties

One of the highlights of this session was new high-resolution bathymetry data from the Costa Rica Margin (E. Silver, J. Kluesner) that was used to identify scarps and seeps that indicate focused fluid flow. There were posters in this session that presented results of consolidation experiments on fluid flow parameters, coupled models of fluid flow and transport, analysis of velocity porosity relationships in different parts of the forearc system, and field studies of fluid alteration.

Pre-Meeting Field trip in the Ligurides

The two-day pre-conference field trip, led by F. Remitti and P. Vannucchi, focused on the east side of the Apennine chain, which corresponds to the shallowest part of the complex built by west-directed subduction. In this region, the late Cretaceous-middle Eocene intraoceanic accretionary prism, built at the front of the European plate and represented by the External Ligurian Units, sits on top of Oligo-Miocene foredeep turbidites of the subducting Adria plate. Sandwiched between the two, there are more-or-less chaotic units

of early Cretaceous-middle Miocene rocks forming the Sestola-Vidiciatico Tectonic Unit interpreted as the early-middle Miocene interplate shear zone object of the trip. During the first day, the field trip was organized around providing examples of the offscraped and frontally accreted oceanic and trench sediments forming the Ligurian prism, as well as the slope sediments unconformably deposited on top. On the second day, the field trip examined the units that were forming the plate boundary shear zone underthrust beneath the Ligurian units and overthrust above the Adriatic foredeep turbidites. We concentrated on the deformation of these units as well as on the evidence for incorporation of blocks from the upper plate dissected by faults that record layer parallel extension.

Post-meeting Field trip in the Apuane Alps

The post-meeting field trip, led by G. Molli, provided the opportunity to examine structures and strain indicators from Apuane metamorphic rocks of the continental margin that were deforming at the same time of the Sestola-Vidiciatico Tectonic Unit. These units were underthrust and underplated in the early-middle Miocene, and finally exhumed during the development of extensional structures starting from the late Miocene. Special emphasis was given to the deformed breccias from spectacular quarries of the Carrara marble. The role of fluids and fluid-rock interaction during underplating and exhumation was discussed in the context of extensional deformation.

Acknowledgments

We would like to thank the Tectonics Program of the National Science Foundation for support of graduate students and early career faculty. We would also like to acknowledge the European Geosciences Union (EGU) for the support to P. Vannucchi and R. von Huene as EGU ambassadors.

GeoPRISMS Steering and Oversight Committee Highlights, Spring 2012

March 8-9, 2012, NSF Headquarters, Arlington, VA

Edited by Charles Bopp, GeoPRISMS Science Coordinator & Julia Morgan, GeoPRISMS Chair

Introduction

The Spring 2012 GeoPRISMS Steering and Oversight Committee Meeting focused on reviewing the recent Planning Workshops for Alaska and Eastern North America (ENAM) primary sites, and revisions to the associated sections of the Implementation Plan (IP). Significant discussion took place about the role that community experiments might play in carrying out GeoPRISMS Science, along with the GSOC's responsibility in managing them. Finally, GSOC offered updated advice to NSF regarding GeoPRISMS funding priorities based on the outcomes of the workshops.

NSF Update

James Beard joined NSF as the OCE-ODP liaison to GeoPRISMS. Donna Blackman, new to MG&G, will help with GeoPRISMS. EAR director Bob Detrick and GEO director Tim Killeen have left NSF.

The new GeoPRISMS solicitation is now live. GeoPRISMS funding remains stable at ~\$5 M. Twenty proposals were submitted during the last GeoPRISMS call (July 2011); ten were funded, most relating to Cascadia.

This spring, NSF OCE struggled with significant budget issues. As a result, approximately 25% of those submitting proposals to the MG&G call on February 15 were given the option to withdraw their proposals for this review cycle, and to resubmit them in August. This action was prompted by a 5% budget cut in all OCE programs, an above-average mortgage on MG&G core funds, the large number of field programs proposed, among other factors. This situation is not expected to continue, and does not affect any other NSF programs. GeoPRISMS sequestered funds were not affected.

Implementation Planning Workshops and IP Updates

Implementation Plans (IP) for the Alaska-Aleutians and ENAM primary sites are being prepared, following the two fall workshops. [These IP's have been released and can be found at <http://www.geoprisms.org/science-plan.html>.] Both IPs are very ambitious, true to the breadth of interests expressed at the workshops. The IPs are expected to increase proposal pressure as desired. They will also serve as guidance for proposals submitted to other programs. Based on the MARGINS experience, community workshops will play a big role in further focusing research directions, guiding strong interdisciplinary and collaborative research.

Funding Strategies and Priorities

The GSOC discussed updates to research priorities for the new GeoPRISMS solicitation, based on the outcomes of the recent workshops (Alaska and ENAM). GSOC reiterated the importance of allowing for a mix of both large and small proposals, encompassing field, data, lab, and theory, and both community-driven and PI-driven experiments. This will allow the most flexibility for innovative and unexpected projects.

Following completion of updated IPs for the Alaska and ENAM primary sites, proposals should be accepted for all North American primary sites, ensuring high proposal pressure. Data assessment and assimilation projects for all primary sites also should be accepted this year, although NSF requested clarity in the definition of data assessment and assimilation. Proposals to carry out thematic studies would be acceptable if they can be justified within the context of the active primary sites.

GSOC re-emphasized that proposals

need to be accepted to work on the Cascadia AAF data, which becomes available in May.

Cascadia Initiative Update

The Cascadia Initiative/Amphibious Array Facility (AAF) has completed the year 1 deployment: 62 instruments are now on the ground, and 8 are pending. Year 2 will see retrieval of the instruments and redeployment to the south. Years 3 and 4 deployments are open to some revision, after data from previous years are analyzed. A white paper submitted to the Cascadia workshop lays out options for deployment in the vicinity of the triple junction, which should be solidified soon.

Data evaluation is an issue in advance of the upcoming redeployments. Science proposals are not being accepted, subject to the Dear Colleague Letter (DCL) issued by NSF, although proposals to do quality control (QC) and reorientation are. Science proposals may be considered after the data have been recovered, but this may be too late to make decisions about the next deployment. One solution is a RAPID proposal to evaluate the data. Alternatively, combined QC and science proposals could be submitted. Proponents should talk to their program officers.

Cascadia Workshop Planning

The joint GeoPRISMS-EarthScope science workshop on Cascadia, to be held in early April, attracted a large number of applications, including many local investigators and lots of students and postdocs. The main goal of the workshop is to bring people up to speed and to develop much stronger interdisciplinary research efforts and collaborations. The most important outcome will be an outline or roadmap for future research, with a 3-5 year timeline. [The Cascadia Science

Workshop outcomes is at <http://www.geoprisms.org/past-meetings/207-cascadia-apr2012.html>.]

Community Experiments & Expeditions

GSOC recommendations for GeoPRISMS community experiments were discussed. Advantages of being designated a community experiment include recognition as a high-priority effort to achieve GeoPRISMS goals, support for mini-workshops and working group meetings, and access to communications and data distribution channels through the GeoPRISMS Office. The GSOC can (1) provide feedback to proponents if requested, (2) assess how/if the proposal meets the criteria of a community experiment, and (3) consider requests for out-of-cycle proposal submission under unusual circumstances. [A revised list of GSOC recommendations has been posted on-line at: <http://www.geoprisms.org/community-projects.html>.] GSOC emphasized that NSF must also commit to fund science proposals to use open-access data from community experiments.

The Community Expedition concept is designed to facilitate GeoPRISMS research by providing a means to share logistics for multiple projects, for example, coordinating transportation and timing for field operations (e.g., boats, air transportation to remote islands etc.) The GSOC and GeoPRISMS Office can help the community self-organize, coordinate submission of related proposals, hold planning workshops to facilitate coordination, and disseminate plans and logistical information on-line.

AGU 2011 Activities

GeoPRISMS was very busy at AGU, as in previous years. There were many GeoPRISMS-related and – sponsored sessions, encompassing hundreds of presentations. The Monday GeoPRISMS Townhall and Community / Student Forum was very well attended, despite the somewhat remote location. Three mini-workshops were also held at the Grand Hyatt, with good attendance. These

were reviewed in the Spring 2012 Issue of the GeoPRISMS Newsletter.

Magmatic Rifting and Active Volcanism Conference 2012 Report

GeoPRISMS sponsored several attendees to attend the *Magmatic Rifting and Active Volcanism Conference 2012*, given its relevance to upcoming East African Rift System (EARS) efforts; The Afar Consortium is a collaboration between British and Ethiopian scientists, with American and French participation. This collaboration was spurred by a large dike intrusion in 2005; the conference represented a synthesis of that program. Presentations reviewed active magmatism and deformation in the area, geophysical evidence for lithospheric structure and melt, the timing and composition of magmatism and deformation. The workshop demonstrated high levels of societal relevance, with a new program on geohazards at Addis Ababa University, and important mineral and energy resources. Geotourism was also highlighted as an opportunity for the area.

EARS Primary Site Workshop Planning

The EARS planning workshop needs to occur soon, to build on established momentum, including a range of current NSF funded projects in the area. Research in EARS also requires significant ramp-up time, and the research community needs reassurance that this effort will go forward. There needs to be significant African involvement in both planning and research. Workshop conveners were decided. [The EARS workshop took place Oct 25-27, 2012 in Morristown, NJ.]

New Zealand Primary Site Planning Workshop

A planning workshop for the New Zealand primary site should be held within the year. This is likely to be a smaller workshop (60-70 attendees, with particular emphasis on seismogenesis (slow slip along the Hikurangi margin), surface processes

(building on S2S), and subduction initiation. The international community needs to be engaged in this effort, and will be critical to the success of the workshop. The workshop should be held in New Zealand, to engage as many New Zealand researchers as possible. [The New Zealand workshop has been scheduled for April 15-17, 2013 in Wellington, NZ.]

USGS - GeoPRISMS Interactions

John Haines, Coordinator of the Coastal and Marine Geology Program of the USGS, provided an overview and perspective on USGS – GeoPRISMS interactions and future opportunities. He noted that marine geoscience at the USGS is not as healthy as it should be, and collaborating with programs such as GeoPRISMS can strengthen both parties. The role of the USGS is to do good science that is relevant to society. GeoPRISMS can help to fill out the “research” aspect of these efforts, in particular, because the USGS lacks ships, offshore seismic facilities, drilling, etc. GeoPRISMS has done a great job engaging USGS researchers in its activities; the USGS would like to engage GeoPRISMS researchers. The Extended Continental Shelf (ECS) surveys are one obvious project-level connection. The USGS director (Marcia McNutt) would like to see stronger programmatic collaborations, e.g., where the USGS helps to support of UNOLS fleet, or provides technical support where possible. Basic research in marine geohazards offers strong opportunities for enhanced academics and USGS collaborations. Open data access and data sharing are also important.

Initiative Updates

Ongoing RIE and related projects include:

- Shillington et al, working in northern Malawi, continue to pick events to better constrain the geometry of seismically active faults in the hanging wall of the local rift system.

Ongoing SCD and related projects include:

- Magneto-telluric data have been collected along the CAFE transect in Cascadia, and a proposal is pending to densify MT data on-land. An offshore extension of that line has been proposed.
- Naliboff (postdoc with Billen) is modeling crustal deformation to test the serpentinization process due to plate bending when approaching the trench.
- The SERPENT experiment across the Nicaraguan trench (Key, Constable, Evans, Lizarralde) shows more conductivity as the plate begins to bend into the trench. Anisotropy also increases toward the trench. This work has been submitted for publication.
- Syracuse's analyses of earthquakes in Central America have been extended to the west to look for continued correlations between seismic velocities and geochemical variations.
- Tudge (postdoc with Tobin) is working on Vp-porosity relationships along the Nankai margin to constrain how physical properties change throughout the system.
- Jicha (with Singer and Kay) is looking at magma compositions on Aleutian arc samples, a reconnaissance study using existing samples.
- Kelley and Cottrell continue to work on new methods to constrain the processes responsible for the redox conditions of arc magmas. In contrast to hypotheses, they find that arc magmas become reduced, closely associated with sulfur loss due to degassing.
- Chadwell has recently been funded for one year to review deformation data and models for Cascadia to decide where to put offshore instruments. He is testing

new, inexpensive wave glider technology to do submarine geodesy.

- The newly funded Mount St Helens project (Bachman et al.) is just getting started, with co-funding from EarthScope and strong USGS partnership. The end-product will be the largest, best-imaged volcano in the world, with an emphasis on how magma is focused at volcanoes. Lots of background work still has to be done, along with permitting.

Ongoing S2S and related projects include:

- Kniskern's study of sediment flux and the partitioning of organic material in Waipaoa, NZ is progressing well. Several others are wrapping up.
- Roering started a numerical modeling project of hillslope processes in Oregon and Waipaoa, to understand the causes and magnitudes of landscape lowering.
- Blair was funded to study carbon cycling at subduction margins, specifically Hikurangi, Cascadia, and Alaska-Aleutians, using samples from core repositories as well as from the upcoming Alaska IODP cruise.
- Mohrig's delta dynamics project, recently funded through FESD, is recognized to have direct relevance to GeoPRISMS objectives.

GeoPRISMS Data Portal and Updates

Andrew Goodwillie provided an update about the GeoPRISMS data portal and capabilities. The data management plan tool has been developed and is proving very useful, allowing people to quickly generate the documents required by all new NSF proposals. A web-based data submission tool has also been added; each submitted dataset gets a unique DOI. New samples can also be registered. A data compliance reporting tool is

also available, which can be quickly assessed and approved by NSF program managers. New references and datasets have been added. Suggestions from the community are always welcome.

Education and Outreach Update

AGU Outstanding Student Presentation There were two clear prize winners this year, and four high-quality honorable mentions. *[The recipients are listed in the Spring 2012 issue]*

The Distinguished Lectureship Program continues to be highly subscribed, with 8 speakers scheduled to visit 27 schools this academic year. Schools should be reminded that the speakers are "Distinguished Lecturers". A list of "Best Practices" should be prepared and shared with the host schools. *[A Best Practices webpage can now be found at <http://www.geoprisms.org/dlp-best-practices.html>]*

The EarthScope-sponsored *Earth Science E&O Provider Summit*, a two-day meeting held in Tempe, Arizona in February 2012, was designed to enable coordination among the many different organizations that provide Earth Science education and outreach programs, to help define common formats, diminish redundancy, and increase the efficiency of deploying such resources. MARGINS/GeoPRISMS efforts in developing and disseminating mini-lessons were commended, noting that the Earth Science E&O community would benefit from this program continuing and expanding.

GeoPRISMS' bid to NSF to support a new REU program was unsuccessful. The decision to resubmit will be made after the proposal reviews have been received and digested.

Other Business

Ramon Arrowsmith was thanked for his efforts on behalf of GSOC, in particular, for helping to solidify GeoPRISMS ties with EarthScope. The next GSOC meeting was tentatively scheduled in association with the upcoming EARS workshop.

GeoPRISMS Data Portal Status Report: October 2012

Andrew Goodwillie and the MGDS/IEDA Database Team, Lamont-Doherty Earth Observatory, Columbia University

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

Since the last newsletter report, information on field programs of interest to the GeoPRISMS community has been added to the data portal and to GeoMapApp, as highlighted below. In addition, the database group participated in the GeoPRISMS-EarthScope Cascadia science meeting, holding a workshop to help increase awareness of database resources.

Alaska-Aleutians

Via GeoMapApp (www.geomapapp.org), instrument location information for the 1999-2001 BEAAR (Broadband Experiment Across the Alaska Range, PIs Geoff Abers, Doug Christensen and Roger Hansen) and the 2006-2009 MOOS (Multidisciplinary Observations of Onshore Subduction, PIs Geoff Abers, Doug Christensen and Jeff Freymueller) seismic experiments are now available as shown in Figure 1.

Cascadia

Information was added to the portal for a number of recent field programs. For a two-ship imaging experiment

on the Juan de Fuca plate, Suzanne Carbotte's team onboard Langseth cruise MGL1211 shot 2-D MCS lines and shot to onshore seismometers operated by groups led by Geoff Abers, Anne Trehu and Helene Carton. They also shot to OBSs that were tended by a team led by Pablo Canales onboard R/V Oceanus. That survey was followed by the first open-access community experiment to be run on Langseth: NSF-RAPID-funded cruise MGL1212. Under the direction of chief scientists Steve Holbrook, Katie Keranen and Graham Kent, 2-D MCS lines were acquired on the Cascadia margin to help refine the future location of a 3-D seismic survey (Fig. 2). Cascadia Initiative Year 2 OBS operations have continued throughout the summer. Starting with Oceanus cruise OC1205A led by John Collins, 23 OBSs were recovered. In July 2012, chief scientists Maya Tolstoy and Richard Allen oversaw the deployment of half a dozen trawl-resistant OBSs and the recovery of two dozen Year 1 OBSs. The short 4th cruise of Year 2, OC1208A, under Emilie Hooft and William Wilcock's leadership was used to deploy 25 OBSs. Information and links to data for Tim Melbourne's Pacific Northwest Geodetic Array (PANGA) is also provided through the GeoPRISMS data portal.

ENAM

Law of the Sea bathymetric survey

RB1202 (chief scientists Armstrong, Calder, Gardner, and Johnson, all at UNH) imaged the Cape Fear Slide and Hatteras Transverse Canyon (Fig. 3).

GeoPRISMS Data Portal Tools and Resources

- **Search For Data** Customised GeoPRISMS search. Search by key word, NSF award number, data sets related to publications, or within a geographical box.

- **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. We also have developed a tool to help PIs show compliance with NSF data policies.

- **GeoPRISMS Bibliography** (www.marine-geo.org/portals/geoprisms/references.php) This integrated, searchable GeoPRISMS bibliography currently contains more than 380 references related to GeoPRISMS science, with papers tied to associated data sets. The lists of publications can be exported to EndNote™.

- **GeoMapApp and Virtual Ocean** GeoMapApp (www.geomapapp.org), a free map-based data exploration and visualisation tool, currently stands at version 3.3.0. generate custom maps. Explore built-in data sets and import your own data tables, spreadsheets,

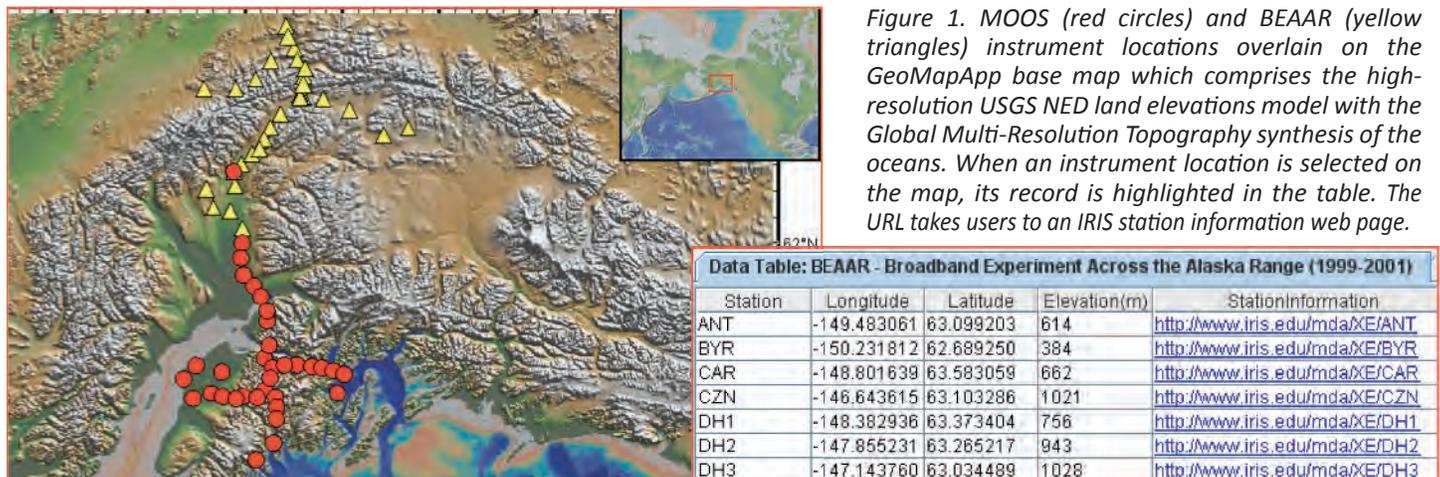


Figure 1. MOOS (red circles) and BEAAR (yellow triangles) instrument locations overlain on the GeoMapApp base map which comprises the high-resolution USGS NED land elevations model with the Global Multi-Resolution Topography synthesis of the oceans. When an instrument location is selected on the map, its record is highlighted in the table. The URL takes users to an IRIS station information web page.

grids, images and shapefiles. Recent enhancements include an updated Petrological Database (PetDB) portal; an updated Digital Seismic Reflection portal that includes access to MCS and SCS profiles collected by USGS; the ability to specify a start and end location for the profiling tool; and,

capability to use different symbols to plot built-in and imported tabular data sets. Multimedia audio-visual tutorials are available on the GeoMapApp web page and on YouTube™. Virtual Ocean (www.virtualocean.org), version 2.5.6, offers GeoMapApp-style capabilities in 3-D.

- **GeoPRISMS MediaBank** (media.marine-geo.org) Access GeoPRISMS-related images including photos from field expeditions. Please send compelling images to be considered for the gallery!

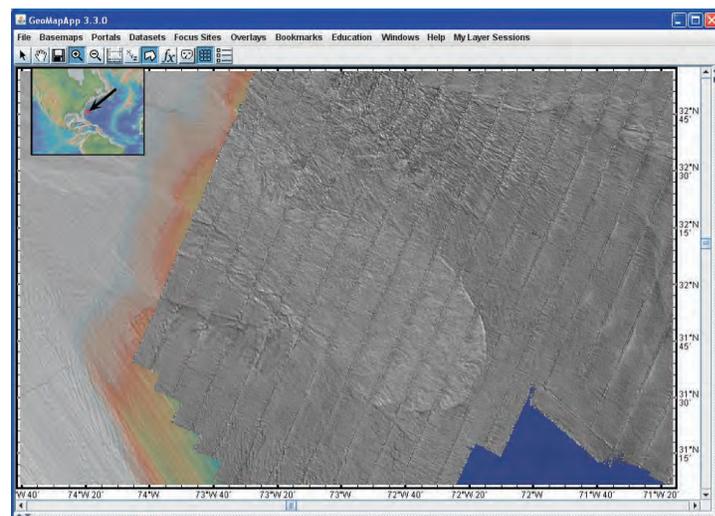
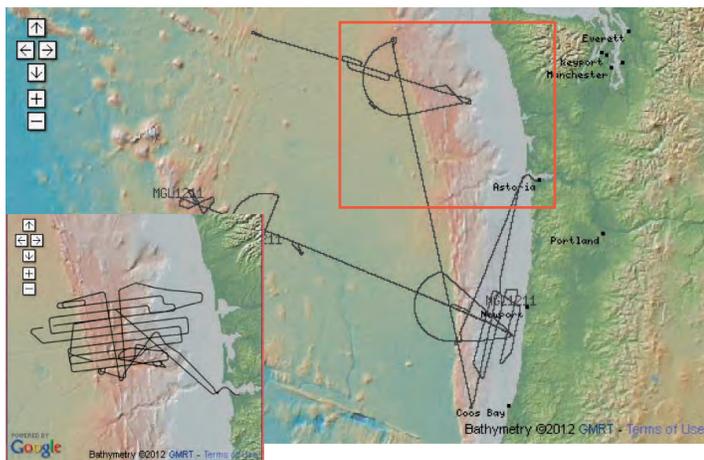


Figure 2. Main map: MGL1211 cruise track line over the Juan de Fuca plate and Cascadia margin. The red rectangle displays the area covered by the inset map (left) showing MGL1212 survey lines. Figure 3. Backscatter data from July 2012 cruise RB1202 clearly distinguishes the lobate tongue of the Cape Fear slide carbonate debris (center of map) from the choppy acoustic signal returned from the siliciclastic sediment of the Hatteras system depositional lobe lying directly to the north (top center of map). The backscatter data is overlain on gridded high-resolution Law of the Sea bathymetry data collected over recent years and seen in the western portion of the map.

GeoPRISMS Data Portal

www.marine-geo.org/portals/geoprisms

Visit the GeoPRISMS data portal to find information for each primary site:

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

GeoPRISMS references database of relevant publications is now available:

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

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

Join us during AGU!

“Early Career Investigators Networking Luncheon”

Tuesday, December 4, 2012

11:30 – 1:30 pm

Bayview Room, Grand Hyatt San Francisco
(345 Stockton Street)

Organizers: H. Colella¹, D. Sumy², A. Frassetto³, D. Schutt⁴, M. Benoit⁵
(¹Miami Univ. of Ohio; ²U.S. Geol. Survey; ³IRIS; ⁴Colorado State Univ.; ⁵College of New Jersey)

An opportunity for Early Career Investigators (ECIs) to discuss research interests and explore potential collaboration based on shared GeoPRISMS and EarthScope geographic locations and themes, and develop collaborations prior to NSF proposal deadlines in July 2013. (Jointly sponsored by GeoPRISMS and EarthScope.)

www.geoprisms.org/agu-mini-workshops.html

Education & Outreach Update: Bringing NSF MARGINS/GeoPRISMS Continental Margins Research Into the Undergraduate Curriculum

Julia Morgan, GeoPRISMS Chair, and Members of GEAC

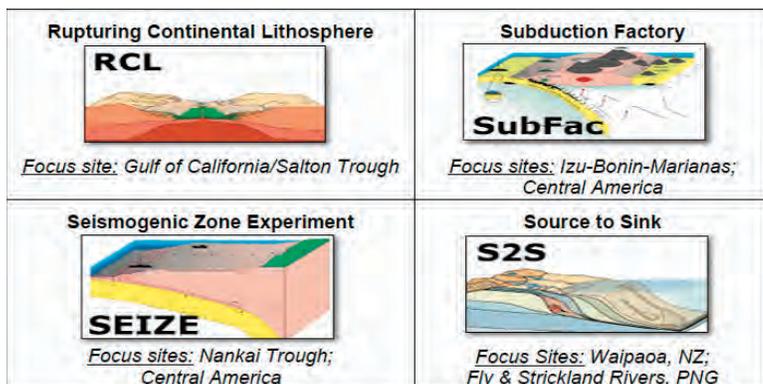


Figure 1. MARGINS initiatives & associated focus sites.

The GeoPRISMS Office and several members of the GeoPRISMS Education Advisory Committee (GEAC) have been funded by the NSF TUES Program (Division of Undergraduate Education) to prepare the next generation of MARGINS mini-lessons, specifically to integrate a decade of successful MARGINS research into upper level undergraduate geoscience curriculum. This project brings together present and former members of GEAC (and its MARGINS predecessor, MEAC), other prominent scientists from the MARGINS community, as well as curriculum experts from On the Cutting Edge, a community of geoscience faculty dedicated to improving teaching and student learning. This integration of leading scientists and curriculum experts will produce high quality science curricula informed by current educational research and practices.

The project will be carried out in three phases, as follows:

- Phase 1 - summarizing the relevant highlights of the decade of MARGINS science, identifying gaps in the existing MARGINS mini-lesson collection (<http://serc.carleton.edu/margins>), and designing additional mini-lessons to provide a more coherent and complete collection. This effort will take place via a series of webinars, a

virtual workshop, and additional electronic interaction.

- Phase 2 - designing and implementing an assessment plan for the mini-lessons, as well as placing the mini-lessons into multiple course frameworks to form coherent course segments. An assessment consultant will lead the assessment effort during a face-to-face workshop. Participants will then test the curriculum at their home institutions during that academic year.
- Phase 3 - summarizing and evaluating results, compiling and distributing products, and publishing results. The results of the assessments will be reviewed at a face-to-face workshop, and plans made for dissemination.

The products will consist of organized resources for upper level undergraduate courses that have undergone a rigorous testing and assessment process, as well as broad distribution and publication in geoscience and education journals and meeting presentations. This multi-institutional effort to disseminate interdisciplinary MARGINS science results will offer scientists a powerful means for increasing the impact of your research, while creating a portable curricular resource to edu-

cate and engage geoscience students across a range of courses and institutional types. By disseminating the highlights of MARGINS science through high-impact teaching resources, we will help transform the education of a broad and diverse audience of undergraduate geoscience students.

MARGINS TUES Project Leads

- Julia Morgan, GeoPRISMS Chair (Rice University)
- Andrew Goodliffe (U. Alabama)
- Jeff Marshall (Cal Poly Pomona)
- Ellen Iverson and Cathy Manduca (SERC, Carleton College)
- Jenn Beck (EvalArts Consulting)

MARGINS TUES Science Team Leads

- Robert Stern, SubFac Initiative (U. Texas, Dallas)
- Casey Moore, SEIZE Initiative (U. California, Santa Cruz)
- Rebecca Dorsey, RCL Initiative (University of Oregon)
- Steve Kuehl, S2S Initiative (Virginia Institute of Marine Science)

Join, Participate, Contribute!

The organizers and team leads of the project seek members of the MARGINS and GeoPRISMS community to join this effort, and to contribute their expertise to the development and testing of these curriculum materials. Participants will earn a nominal stipend for their contributions. A call for participants will be issued over the next months. If you are not able to participate directly, please consider sharing your accessible research results, data, and more, with the development teams, so they can prepare the most up-to-date materials as possible.

Visit: <http://geoprisms.org/mini-lessons.html>



**GeoPRISMS AGU
Townhall and
Community Forum
Monday, Dec 3
at 6 PM**

**Metropolitan Ballroom III
Westin San Francisco Market
Street
50 Third Street**

Program update from NSF & GeoPRISMS Chair, including reports from recent meetings plus information regarding upcoming research opportunities

Event is open to all with interests in the GeoPRISMS program.

For more information visit:
geoprisms.org/agu-townhall.html

GeoPRISMS Mini-Workshops at AGU

Application Deadline: November 26, 2012

“Marine Geophysics in the Cascadia Primary Site”

Pre-AGU: Sunday, December 2, 2012, 6:00 pm – 9:30 pm
Fillmore ABC, Grand Hyatt San Francisco (345 Stockton Street)

Conveners: *W.S. Holbrook¹, G. Abers², M. Tolstoy², S. Carbotte², A. Trehu³, H. Tobin⁴, D. Toomey⁵, K. Keranen⁶, P. Johnson⁷*

¹Univ. Wyoming; ²Lamont-Doherty Earth Observatory; ³Oregon State Univ.; ⁴Univ. Wisconsin; ⁵Univ. Oregon; ⁶Univ. Oklahoma; ⁷Univ. Washington

Description: A review of several recent marine and “amphibious” geophysical activities in the Cascadia Primary Site, accompanied by planning for future work, to leverage the current momentum from recent projects and provide the underlying context for the next decade of interdisciplinary studies of the area.

“IODP Opportunities in GeoPRISMS Subduction Studies”

During AGU: Thursday, December 6, 2012, 6:00 – 9:30 pm
Fillmore ABC, Grand Hyatt San Francisco (345 Stockton Street)

Conveners: *R. Stern¹, D. Scholl², J. Jaeger³, T. Plank⁴*

¹Univ. Texas, Dallas; ²U.S. Geol. Survey; ³Univ. Florida; ⁴Columbia Univ.

Description: A workshop to explore how best to use IODP drilling to support GeoPRISMS Subduction Cycles and Deformation science objectives, and especially to make use of the D/V JOIDES Resolution for studying the Cascadia, Aleutian and New Zealand primary sites. Topics will include summaries of recent expeditions, future drilling targets, proposal development including workshops, and engaging early career geoscientists in these efforts.

“Early Career Investigators Networking Luncheon”

During AGU: Tuesday, December 4, 2012, 11:30 – 1:30 pm
Bayview Room, Grand Hyatt San Francisco (345 Stockton Street)

Organizers: *H. Colella¹, D. Sumy², A. Frassetto³, D. Schutt⁴, M. Benoit⁵*

¹Miami Univ. of Ohio; ²U.S. Geol. Survey; ³IRIS; ⁴Colorado State Univ.; ⁵College of New Jersey

Description: An opportunity for Early Career Investigators (ECIs) to discuss research interests and explore potential collaboration based on shared GeoPRISMS and EarthScope geographic locations and themes, and develop collaborations prior to NSF proposal deadlines in July 2013. (Jointly sponsored by GeoPRISMS and EarthScope.)

**Mini-workshops & luncheons are free of charge & open to all.
(Attendance may be limited; first-come, first-served.)**

Visit the GeoPRISMS website for further information and to register:
<http://www.geoprisms.org/agu-mini-workshops.html>

For questions contact the GeoPRISMS Office: info@geoprisms.org



GeoPRISMS Sponsored & Related Sessions at the 2012 AGU Fall meeting

The complete AGU Fall Meeting program can be daunting so the GeoPRISMS office has compiled a list of GeoPRISMS-related sessions that may be of special interest for the GeoPRISMS community. For more information, visit the GeoPRISMS website <http://www.geoprisms.org/agu-sessions.html>

AGU key code: The capital letter indicates the session's theme while the two following numbers respectively indicate the day of the meeting (1 for Monday, 2 for Tuesday, etc.) and the time that the session starts (1X: 8-10am, 2X: 10.20-12.20pm, 3X: 1.40-3.40pm, 4X: 4-6pm). Please refer to the AGU meeting program to confirm date and time of the sessions (<http://fallmeeting.agu.org/2012/scientific-program/>).

Compiled by the GeoPRISMS office

T51H, T52B, T53C: Initiation and Evolution of Rift Systems (Cosponsored by: EP, G, OS, S, V)

Conveners: Margaret Benoit, Robert Evans, Peter Flemings, Pete N Hollings, Carol A Stein, Suzan van der Lee
Friday, Dec 7

Description: Continental rifts and passive margins record the interplay of surface, crustal, and mantle processes. We seek contributions that emphasize multidisciplinary approaches to illuminate how these systems evolve. We will focus on the following processes: rift evolution; the architecture of rifted margins during and after breakup; and mechanisms and consequences of fluid and volatile exchange between the Earth, oceans, and atmosphere at rifts. We will explore these questions both onshore and offshore. We encourage submissions that emphasize studies of two end-member sites, the Eastern North American Margin and the East African Rift, but submissions on other rifted regions are welcome." and "Current understanding of failed continental and oceanic rifting events in the geologic record. Although continents have successfully rifted apart, with extension eventually resulting in seafloor spreading, in many cases continental lithosphere was intruded, thinned, and extended but did not break apart. There is considerable interest in comparing and contrasting rifts to assess how they started, progressed, and either succeeded or failed. Various seismic experiments around the world, including Earthscope studies in central North America, as well as a mineral boom near North America's failed Midcontinent Rift make this session topical. We welcome presentations on this topic from any discipline."

T41G, T43C: Magmatism and Extension during Continental Rifting (Cosponsored by: S, V)

Conveners: Donald Forsyth, Ian Bastow, David Ferguson
Thursday, Dec 6

Description: Rifting is commonly associated with magmatism, which varies with space,

time and geodynamic setting. In East Africa, where the geological record preserves a long history of rift development, the locus of strain has shifted over time from a broad zone of mechanical extension to a narrower zone of magmatism, reminiscent of a mid ocean ridge. In contrast, in the Basin and Range, extension and volcanism have been maintained over a relatively broad area for 15My and the links between magmatism and extension are less clear. We invite contributions from geoscientific studies that constrain the structure and dynamics of all regions of extension with a view to understanding better the manner in which strain and magmatism develop during rifting.

T44A, T51B: New Insights Into Continental Rifting: From Transtension in the Walker Lane and Salton Trough to Seafloor Spreading in the Gulf of California (Cosponsored by: G, S, V)

Conveners: Neal Driscoll, John Hole, Gary Fuis, Joann Stock
Thursday, Dec 6 & Friday, Dec 7

Description: Recent and ongoing research in the Gulf of California - Salton Trough - Walker Lane corridor provide new constraints into extensional deformation, from the initiation of rifting through full rupture and sea-floor spreading. This corridor provides an opportunity to examine competing hypotheses for the structural controls of rift architecture and evolution. Presentations will report on a decade-long effort in the Gulf of California as well as more recent research in the Salton Trough and Walker Lane. This session will bring together terrestrial and marine geophysicists, geochemists, and geologists to foster new understandings in continental extension.

T22D, T23E: The Cascadia Margin From Inside and Out (Cosponsored by: G, S, V)

Conveners: Alan Levander, Joshua Roering, Glenn Spinelli, Kelin Wang
Tuesday, Dec 4

Description: Studies of the Cascadia subduction zone are beginning to reveal the history of the margin and the processes

that control its behavior and evolution. Understanding this system requires the integration of geologic, geochemical, geodetic, seismic, and geophysical observations and models. Key topics relevant to the Cascadia margin include: the mechanics of great earthquakes and the earthquake deformation cycle; origins and implications of episodic tremor and slip; spatial and temporal variations in volcanism and volcanic processes; sediment production and dispersal variations along the margin, and the stratigraphic signature of geologic events. This session calls together researchers working in Cascadia for an integrated understanding of a dynamic margin.

T51D, T53E, T54A: The Dynamics of Island Arcs and Backarc Spreading Centers (Cosponsored by: S, V)

Conveners: Nobukazu Seama, Douglas Wiens, Robert Stern, Maria Seton
Friday, Dec 7

Description: Island arcs and backarc basins represent one of the most complex and important solid Earth systems. This session will highlight contributions from the petrologic, geochemical, geophysical imaging, and geodynamical modeling communities regarding the dynamics and interactions between the subducting slab, mantle wedge, arc volcanoes, and backarc spreading segments. Topics will include volatile and chemical cycling, the formation of forearc, arc, and backarc crust, mantle flow, and magma formation and transport. We encourage contributions from both modeling and observational approaches, as well as results from recent field and geophysical studies of the Izu-Bonin-Mariana, Tonga-Lau, Aleutian, and other island arc systems.

T13A, T13B, T21F, T22A, T23G: Anatomy of Ancient and Active Shallow Megathrusts (Cosponsored by: S)

Conveners: Kohtaro Ujiie, Matt Ikari, James Sample, Harold Tobin
Monday, Dec 3 & Tuesday, Dec 4

Description: The surprising rupture characteristics of the March 2011 Tohoku

earthquake has led to re-evaluation of shallow megathrust behavior. The processes and conditions controlling near-trench coseismic slip for this and other megathrust systems must be investigated at all scales using many approaches, including focuses on the physical and frictional properties of deforming materials, the mineral assemblages, fluid-rock interactions, the geometry of the megathrust and associated faults, and heat and fluid flow. These studies should facilitate comparison among conditions before, during, and after rupture. We encourage contributions using field and experimental approaches applied to active convergent margins and ancient analogs worldwide.

T21C, T24B: Fluids and Hydrous Phases in Subduction Zones (Cosponsored by: MR, S, DI, V)

Conveners: Mainak Mookherjee, Manuele Faccenda, Ikuo Katayama, Maureen Long
Tuesday, Dec 4

Description: Fluids released through dehydration of hydrous phases play a crucial role in generating melts and related geochemical signatures in subduction zone settings. The released fluid also rehydrates mantle wedge, affecting its rheology and dynamics. What are the geophysical signatures for hydrous phase and fluids? Can we detect mantle hydration? How much water is transported to the Earth's deep interior via subduction? How does the balance between the transport of water in subduction zones and its release via volcanism affect mean sea level over geological time scales? We welcome contributions (including but not limited to experimental, numerical, field and seismological studies) that will enhance our understanding of the subduction zone dynamics.

V21C. V21C.* A Comprehensive Understanding of the Melting Processes at Subduction Zones I

Conveners: Haiying Gao, Peter Van Keken, Ikuo Wada, Emily Johnson
Tuesday, Dec 4 & Wednesday, Dec 5

Description: Melt generation and volcanism at subduction zones may result from several possible processes: hydration of the mantle wedge by fluid released from the slab, reheating of downgoing sediments/crust, and upwelling induced by subduction. Each process predicts a different pattern of melt generation and can thus be distinguished with high-

resolution seismic imaging resolved from ambient noise study (e.g., in the Cascades). A comprehensive study of geophysics, geodynamics, volcanology and geochemistry is needed. This session invites contributions focusing on the understanding of the melting process in the crust and upper mantle at subduction zones, with particular interests in the Cascades.

V31E, V33C: Metamorphic and Magmatic Processes at High Pressure: Cosponsored by MSA (Video On-Demand) (Cosponsored by: MR, DI, T)

Conveners: Bradley Hacker, Peter Kelemen, Craig Manning
Wednesday, Dec 5

Description: Acquisition of laboratory thermodynamic or crystallographic data to constrain phase equilibria and element partitioning. New experimental approaches to studying petrologic processes at high pressure. Application of such data, techniques, or field studies to understanding metamorphic and magmatic processes on Earth and other planets.

Sessions of Interest to GeoPRISMS

DI23A, DI33B, DI34B: Mantle Flow and Subduction Dynamics (Cosponsored by: S, T, V)

Conveners: Ikuko Wada, Mark Caddick, Robert Moucha, Lijun Liu, Kelsey Druken
Tuesday, Dec 4 & Wednesday, Dec 5

S33A, S43H, S44A: Numerical Modeling of the Mega-earthquakes: Their Scale and Complexity (Cosponsored by: NH, T)

Conveners: Hideo Aochi, Satoshi Ide, Shuo Ma, Evan Hirakawa

Wednesday, Dec 5 & Thursday, Dec 6

S33B, S41D, S42B, S43I, S44B: Slow Slip and Tremor (Cosponsored by: T)

Conveners: Heidi Houston, David Shelly, Audrey Ougier-Simonin, Abhijit Ghosh, Aaron Wech, Yajing Liu
Wednesday, Dec 5 & Thursday, Dec 6

T33H, T41A: Active Caribbean Plate Margins: Integrating studies for earthquake and tsunami hazard (Cosponsored by: NH, S)

Conveners: Bernard Mercier de Lépinay, Eric Calais, Paul Mann, Pilar Llanes Estrada
Wednesday, Dec 5 & Thursday, Dec 6

T11A: Before and after Subduction: Downgoing Plate to Inboard Strike-Slip Faulting (Cosponsored by: EP, G, GP, MR, S, DI, V)

Conveners: Sean Bemis, Linda Warren, Kenneth Ridgway
Monday, Dec 3

T13H: Before and After Subduction: Incoming Plate Structure, Outer-Rise Faulting, and the Subducted Plate (Cosponsored by: EP, G, GP, MR, S, DI, V)

Conveners: Robert Myhill, Erica Emry
Monday, Dec 3

T14A: Before and After Subduction: Interface Slip and Inboard Strike-Slip Faulting (Cosponsored by: EP, G, GP, MR, S, DI, V)

Conveners: Sean Bemis, Sarah Roeske, Jeff Benowitz
Monday, Dec 3

T11C, T13C: Cities on Subduction Thrusts (Video On-Demand) (Cosponsored by: NH, S)

Conveners: Martha Savage, Michael Bostock, Hiroshi Sato
Monday, Dec 3

T12C, T13F: How, When and Where Does Slip Occur in the Subduction Environment? (Video On-Demand) (Cosponsored by: G, MR, NH, S)

Conveners: Vala Hjorleifsdottir, Jascha Polet, Eric Kiser, Lee Liberty
Monday, Dec 3

T42C, T43E: Tectonic Mechanisms for Extension Along Convergent Margins (Cosponsored by: S, V)

Conveners: Paul Mann, Marco Giovanni Malusa', Suzanne Baldwin
Thursday, Dec 6

V21C, V31A: A Comprehensive Understanding of the Melting Processes at Subduction Zones (Video On-Demand) (Cosponsored by: MR, S, DI, T)

V42B, V53D: Physics and Chemistry of Deep Carbon: Cosponsored by MSA (Cosponsored by: MR, DI)

Conveners: Abby Kavner, Giulia Galli, Craig Manning
Thursday, Dec 6 & Friday, Dec 7

V43A, V51C, V52A: From Deep to Shallow: Elemental Cycling Through UHP Metamorphism and Serpentinization (Cosponsored by: MR, OS, S, DI, T)

Conveners: Alexander Zirakparvar, Ivan Savov, Yoshihide Ogasawara, Larissa Dobrzinetskaya, Ivan Savov, Dionysis Foustoukos
Thursday, Dec 6 & Friday, Dec 7

NH11C, NH14A: Geohazards and Disaster Risks in the North Pacific Region (Cosponsored by: G, S, T, V)

Conveners: Ali Ismail-Zadeh, John Eichelberger
Monday, Dec 3

OS41E, OS42A, OS43A: Fluid Flow and

Gas Hydrates in Continental Margins (Cosponsored by: H, NH, V)

Conveners: Christian Berndt, Sverre Planke
Thursday, Dec 6

OS21G, OS43C: Marine Geohazards (Cosponsored by: NH)

Conveners: Daniel Brothers, Jillian Maloney, Jason Chaytor, Uri Ten Brink
Tuesday, Dec 4 & Thursday, Dec 6

OS43D: On the Role of Gas or Hydrate Containing Sediments in Deformation and Slope Stability

Conveners: Nabil Sultan, Maarten Vanneste, Carl Forsberg, Jeffrey Priest
Thursday, Dec 6

Allied Sessions

T41E, T43A: Connections Between Long-Term and Short-Term Tectonics and Geodynamics (Cosponsored by: EP, G, NH, OS, S, DI, V)

Conveners: R Dietmar Müller, Mark Simons, Nicholas Rawlinson
Thursday, Dec 6

R/V Marcus Langseth Cruise to the Mariana Trench: February 2-29, 2012

Large Scale Active/Passive Source Seismic Experiment

John Lundquist (WHOI), Foreword by Doug Wiens (Washington University at St. Louis)

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

Foreword: How much water is transported deep into the Earth at subduction zones, locked away as hydrous minerals in the downgoing oceanic mantle? This question is vital for understanding the source of water erupted at island arc volcanoes as well as determining whether significant water is carried deeper to the transition zone.

A pair of cruises sailed in early 2012 near the Mariana trench to help provide answers to these questions. The project, under the direction of Doug Wiens (Washington University in Saint Louis) and Dan Lizarralde (Woods Hole Oceanographic Institution), involved deploying 85 ocean bottom seismographs (OBS) from the R/V Thompson and seismic refraction and reflection imaging work carried out using the R/V Langseth airgun array.

The active source results will constrain the seismic velocity, and thus the degree of serpentinization, of the uppermost mantle thought to be occurring at faults associated with the bending of the Pacific plate near the trench. 25 OBSs remain deployed and will provide constraints on the maximum depth of serpentinization and catalog microearthquake activity on the bending faults. These OBSs will be recovered by the R/V Oceanus in January, 2013.

Seven graduate students participated in the two cruises. What is it like to go to sea on a seismic cruise for the first time? John Lundquist's blog, from the Langseth cruise, provides some insight.

Life at Sea: 8,653 miles, 4 airports, 3 inflight meals, and 34 hours later, I'm standing in the Hagåtña, Guam Airport. In my post trans world flight delirium "What the hell have I gotten myself into this time?" pops into my mind. I collect myself and step outside into the

warm Pacific night air. A stark contrast from the arctic chill I left in Maine. I arrive at the hotel...sweet, sweet sleep. I wake up suddenly, unaware of where I am. A few hours of fitful rest hasn't revived my senses or my mind. I look out the window and see surf breaking and



Figure 1. The two ships used for the Mariana seismic experiment: (above) R/V Thomas G. Thompson, operated by the University of Washington; (below) R/V Marcus Langseth, operated by Columbia University.



the world starts to come back into focus. I'm John Lundquist....I know this.... my next thought.....go find someone in your group. I'm slightly anxious, as I'm about to rendezvous with a group of highly intellectual geophysicists, Ph.D. candidates, and graduate stu-



Figure 2. Protected Species Observers watching for marine wildlife

dents. Having studied geology in college I should have felt prepared to meet these great minds. I walk down stairs and arrive at the breakfast buffet. As I scan the restaurant area, my gaze immediately rests on “the science” party....not too hard to pick out of a crowd. Nathan Miller, one of the chief scientists, walks up to me, “you must be John.” Apparently I wasn’t too hard to spot either. Introductions were made and the trip was underway.

We all piled into the rented mini-van for the Naval Base, where the ship was docked. We boarded the ship, were assigned our rooms, and then set free. We headed out for a few libations and our last taste of land before the 9AM departure time. The next day, as the ship cast off its lines, we all walked out to the Observation Deck. Pulling out of the harbor was beautiful. Guam’s mountainous landscape is breathtaking from the water. As we reach the end of the channel and transition into the open ocean, I quickly realized the ship is not stationary. Five minutes later.... seasickness...this is going to be a long month.

I begin my first shift as a watchstander by making my way down to the lab. I had briefly seen this area earlier, my

first thought was “you could control the space shuttle from in here.” The lab is a complete floating technology hub, with about 40 computer monitors, countless processors, and Internet. From here everything science related is controlled and monitored. I was glad to finally get down there. As I sat down that first day, it was overwhelming to say the least. I had never been in a room with so many screens, let alone been put in charge of some of them. As a watchstander, we were basically assigned to monitor several scientific instruments. Every half hour, we entered data into a thirty-minute log. The function was to insure that all the instruments were still recording and running properly.

Day two, I walk down to my post in the lab only to find that nobody is there. Odd, I say to myself. I see on one of the remote cameras that everyone is outside working on the deck. I make my way aft and I’m instructed to put on a life jacket and “get to work.” The task at hand is to get the seismic streamer into the water. At this point, the streamer’s technicians, watchstanders, and ship’s crew were all working together. We were in charge of the streamer length number, the spacing of weights that

need to be on the streamer, the spacing of acoustics, and position of birds. On this cruise (MGL1204) the streamer length was 8000 m. Along with the OBSs (ocean bottom seismometers), the streamer was used to record data in the active source survey. Hydrophones were strategically placed along the entire streamer. Because of the precise spacing of all the elements of the streamer, and the long length, it took about 12 hours to put it all in the water. It was great to be able to work with the ship’s crew and aid in the technical aspect of the mission. As a watchstander, they pretty much let you participate as much as you want to. I was carrying birds, putting them on the streamer, coupling streamer lengths, and adding weights, all while the sun was rising. It was fun, and exciting to be part of such a technical aspect of the project. Once the streamer was fully out, the gunners began the process of putting out the guns. Once the guns were in place, they began firing and we started collecting our active source data. After each “shot” from the air guns, the acoustic echo from the ocean floor was picked up by the hydrophones on the streamer and the OBS’s on the ocean floor. The data was then used to create bathymetric profiles of the sea floor around the trench. Once the streamer and guns were in place, it was smooth sailing in terms of the instruments; the seas, on the other hand, were the contrary. The wind increased to 30 knots and the seas grew to 4-6 meters. Large seas, as you can imagine, change life aboard a ship. Everything is in constant motion. Sleeping was another story. Imagine sleeping in a moving bed...not conducive to quality rest. The way I solved that problem was by stuffing a bunch of blankets under one side of my mattress. This in effect created a v-notch that basically held me in one spot.

Life on a ship during a research mission is a lot of work. But nobody can work 24 hours a day. There was plenty to do

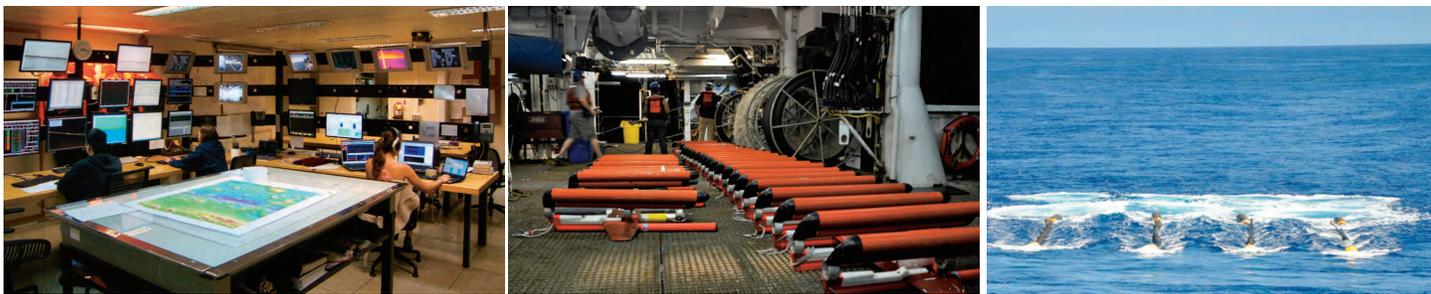


Figure 3 (left). The main lab. Figure 4 (middle). A line-up of buoys for the streamer. Watchstanders Matt Hughes and Martina Coccia assisting the ship's crew. Figure 5 (right). Guns discharging.

on the ship during down time. After a few days, everyone began to fall into their own routine. There was a full theater, complete with big screen TV, PlayStation 3, and a hard drive filled with movies and TV shows. This was a good place to go and unwind after a long shift, or if the boat was pitching too much to sleep. At any given time, there was bound to be someone there to share a laugh with.

For exercise, the ship had a nice gym. A month is a long time to go without working up a sweat, the gym was a good place to get the heart rate up. There was a treadmill, elliptical, erg, and bike. The gym was also home to some dumbbells and homemade equipment, rendered by the engineers and ship's crew over the years. A descent swell made working out quite interesting. With any pitch or roll of

the ship, you could be sent flying. After a couple minutes of practice, though, you could get the hang of it.

As for meals, the ship is equipped with a full galley and mess hall. Meals were served three times a day, but there was always food available. Dinnertime was especially good to relax and chat with other people on the ship. Sometimes, if it was nice, we would take our food up to the deck and eat outside under the Pacific sky. Sunset and sunrise were two of my favorite times on the ship. Its funny how on a ship, watching the sun go down or come up becomes another part of the routine. It was like a morning and afternoon break from the fast-paced research.

One of my favorite sky-watching spots was on the PSO bridge. Every seismic ship now has a crew of PSO's or Protected Species Observers. These peo-

ple spend their day watching the water. Their job is to make sure the seismic survey does not disturb or injure any marine life. They are on the lookout for whales, dolphins, seals, and other large marine mammals. If they see one too close to the ship, we stop firing the guns until the marine life has been deemed out of the danger zone.

In the end, I was happy to be part of such an interesting experiment. I arrived with no idea what to expect. By the end of the cruise, I was comfortable with technical equipment and data analysis in the lab. I got to meet several geophysicists and the whole ship's crew. If you have any interest in how active source reflection seismology is carried out, get on a research cruise. You will learn about geophysics as well as about yourself. Thanks to the R/V Marcus Langseth MGL 1204 crew!

MARGINS Bibliography

The MARGINS Office compiled a list of publications related to MARGINS science. Currently more than 250 MARGINS-funded publications are included, as well as over 200 related articles.

Visit <http://www.nsf-margins.org/bibliography>

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GeoPRISMS AGU Townhall Meeting and Student Forum

December 3, 2012, 6 - 9pm ; Metropolitan Ballroom III
Westin Market Street, San Francisco, CA (50 Third Street)
<http://www.geoprisms.org/agu-townhall.html>

Workshops of Interest

AGU Mini-Workshop: Marine Geophysics in the Cascadia Primary Site

December 2, 2012, 6pm – 9:30pm
Filmore ABC, Grand Hyatt San Francisco, CA (345 Stockton Street)
<http://www.geoprisms.org/agu-mini-workshops/cascadia-2012.html>

AGU Mini-Workshop: Early Career Investigators Networking Luncheon

December 4, 2012, 11:30 – 1:30pm
Bayview Room, Grand Hyatt San Francisco, CA (345 Stockton Street)
<http://www.geoprisms.org/agu-mini-workshops/eci-2012.html>

AGU Mini-Workshop: IODP opportunities in GeoPRISMS Subduction Studies

December 6, 2012, 6pm – 9:30pm
Filmore ABC, Grand Hyatt San Francisco, CA (345 Stockton Street)
<http://www.geoprisms.org/agu-mini-workshops/iodp-mini-workshop-2012.html>

GeoPRISMS Planning Workshop for the New Zealand Primary Site

April 15-17, 2013

Te Papa Museum, Wellington, New Zealand

Application Deadline: December 20, 2012

The workshop is intended to clarify the primary research objectives for the New Zealand primary site within the GeoPRISMS Subduction Cycles and Deformation (SCD) Initiative, and to develop an implementation plan to achieve these objectives.

For more information visit the meeting website:

<http://www.geoprisms.org/meetings/newzealand-apr2013.html>

Breaking News: The 5 September 2012 Costa Rica earthquake provides a unique research opportunity for MARGINS/GeoPRISMS.

Stay tuned for information on data access, conference sessions and research publications on the GeoPRISMS website soon: www.geoprisms.org/events.html