GeoPRISMS

Newsletter - Issue No. 39, Fall 2017

In this Issue

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

From the Chair

I'm pleased to welcome you to the Fall 2017 GeoPRISMS newsletter. As in the past, the Fall issue will continue to be electronic only, available in reader format or downloadable as a pdf file; the Spring edition will be both distributed in print and available online. In this issue, we are excited to feature science articles written by early career, student and postdoctoral researchers. These include a summary of recent results from the iMUSH (Imaging Magma Under mount St. Helens) experiment by Carl Ulberg and the iMUSH team; a Report from the Field on summer 2017 field work in the Alps as part of the ExTERRA E-FIRE project contributed by Besim Dragovic and Paul Starr; and profiles of GeoPRISMS postdoctoral fellows Tamara Jeppson (Texas A&M), Megan Newcombe (Lamont-Doherty Earth Observatory), and Shuoshuo Han (Univ. Texas). This issue also includes an update on the GeoPRISMS data portal, as well as announcements about upcoming opportunities, AGU sessions of interest, and recent GeoPRISMS-supported publications.

The GeoPRISMS Office has had a busy summer and fall, with efforts mainly focused on completing the final report from the Rifting Initiation & Evolution Initiative Theoretical and Experimental Institute (TEI) held early this year, planning for a suite of AGU events in a new venue and city, and on the very early stages of planning for a major thematic synthesis and integration TEI to be held in early 2019. I'd like to take this opportunity to thank the GeoPRISMS Steering and Oversight Committee (see p. 32 of this issue) for their contributions to important science, planning, and outreach activities, and our distinguished lecturers (Cindy Ebinger, Heather Savage, Esteban Gazel, and Brandon Schmandt), whose efforts continue to garner rave reviews from major universities, two and four-year colleges, and museums across the U.S. I'd also like to extend my thanks to the conveners of this year's AGU mini-workshops for their work in conceiving and organizing these important events for our community.

I'm especially excited that we are able to sponsor three mini-workshops on the Sunday preceding AGU this year, by extending our events to include an evening session. The workshops encompass a breadth of GeoPRISMS activities and resources, including a morning workshop focused on integration of existing studies at the ENAM primary site, highlighting emerging results, and discussion of outstanding questions; an afternoon workshop aimed at early career investigators (though all are welcome!) that will introduce GeoPRISMS data resources and mini-lessons with hands-on examples; and an evening session to summarize plans and communicate opportunities for participation in the Alaska Amphibious Community Seismic Experiment slated for 2018.

We will of course also be hosting our Town Hall & Community Forum at the Westin Canal Place on Monday evening. In addition to a short program highlighting recent and upcoming activities, the forum will offer an opportunity to connect with the GeoPRISMS community over food and refreshments - and to check out a wide range of exciting and ongoing student research. I hope to see you there!

Demian Saffer
Chair, GeoPRISMS Program

Cover Photograph:
Steve Hansen (left, UNM) and Wes Thelen (right, USGS-CVO) install Nodal seismometers in August 2017 in the crater of Mount St. Helens, WA, to follow up on new findings from the iMUSH deployments in 2014. Photo credit: Brandon Schmandt

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Message from NSF

As the end of October rolled around, NSF completed its move to Alexandria without any major interruptions to operations. While we are all getting used to our new building, surroundings and commute we are happy to receive visitors and panelists, but be forewarned that there are now additional security screening measures mandated by the federal government for entry into the building – so plan to add time to get through this screening on your visit.

In terms of the federal budget, just like the past few years, NSF is working under a Continuing Resolution that funds the government through December 8th with all the likelihood of extending beyond that. Again, like last year we expect that funding decisions on the 2017 GeoPRISMS round of proposals will be delayed until Congress passes a budget appropriation and funds are released to the agency.

Earlier this past summer, once the FY17 funds were released, NSF was able to finalize several proposal decisions from the 2016 GeoPRISMS panel that cover a wide range of focus areas from Eastern North America Margin to New Zealand to the East African Rift System and Alaska and the two themes on Rift Initiation and Evolution and Subduction Cycles and Deformation. To highlight two research efforts: there will be a lot of activity over the next few months on the New Zealand Hikurangi margin with 2 IODP drilling legs and both EAR-funded and OCE-funded research relevant to GeoPRISMS that is targeting this region along with a strong international component and local New Zealand researchers. By next summer, focus then shifts north to Alaska/Aleutians as the GeoPRISMS Alaska Amphibious Community Seismic Experiment (AACSE) gets underway in concert with the final phase of the EarthScope Transportable Array.

There will be a mini-workshop at this Fall's AGU meeting on the AACSE for those interested in finding out more information on this experiment. Similarly, at this year's AGU there will also be a townhall on the Subduction Zone Initiative (SZ4D), which is a follow-up to last year's successful Subduction Zone Observatory workshop in Boise, and where plans will be discussed to map a community path forward for research on this topic. The SZ4D report can be found on the *IRIS website*. In fact, several reports that may be of interest to this community have been (or will soon be) released, including the National Academies' *ERUPT report*, the *USGS Subduction Science Plan*, *Challenges & Opportunities for Research in Tectonics* and the *NASA Earth Science Decadal Survey* (still in review).

Lastly, as you may know, the current Division Directors of both Ocean and Earth Sciences at NSF are "IPA rotators," meaning the terms of Rick Murray (OCE) and Carol Frost (EAR) at NSF are limited to a maximum of four years. Their end dates are approaching, sometime in CY2018. It is now time for consideration of their successors, and so both of those positions are now being advertised. It's important for the success of each division, and for the support of the science community as a whole, that we have strong leadership. Please consider applying, or encourage colleagues in the community to apply. The positions are posted as either Permanent or IPA Rotator. Please visit the posts on USA Jobs for details about jobs in *OCE* and *EAR*, and for application instructions, and please feel free to distribute this information widely. The closing dates are all the same: January 29, 2018.

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

Funding Opportunities for GeoPRISMS-Related Proposals

Prediction of and Resilience against Extreme Events (PREEVENTS) | NSF 16-562

Submission Window: January 5, 2018 - January 4, 2019

https://www.nsf.gov/pubs/2016/nsf16562/nsf16562.htm

PREEVENTS is designed as a logical successor to Hazards SEES and is one element of the NSF-wide Risk and Resilience activity, which the overarching goal of improving predictability and risk assessment, and increasing resilience, in order to reduce the impact of extreme events on our life, society, and economy. PREEVENTS will provide an additional mechanism to support research and related activities that will improve our understanding of the fundamental processes underlying natural hazards and extreme events in the geosciences.

PREEVENTS is focused on natural hazards and extreme events, and not on technological or deliberately human-caused hazards. The PREEVENTS portfolio will include the potential for disciplinary and multidisciplinary research at all scales, particularly aimed at areas ripe for significant near- or medium-term advances.

PREEVENTS seeks projects that will (1) enhance understanding of the fundamental processes underlying natural hazards and extreme events on various spatial and temporal scales, as well as the variability inherent in such hazards and events, and (2) improve our capability to model and forecast such hazards and events. All projects requesting PREEVENTS support must be primarily focused on these two targets. In addition, PREEVENTS projects will improve our understanding of the effects of natural hazards and extreme events and will enable development, with support by other programs and organizations, of new tools to enhance societal preparedness and resilience against such impacts.

EarthScope | NSF 17-577

Submission Window: July 24, 2017 - February 12, 2018

https://www.nsf.gov/pubs/2017/nsf17577/nsf17577.htm

EarthScope is an Earth science program to explore the 4-dimensional structure of the North American continent. The EarthScope Program provides a framework for broad, integrated studies across the Earth sciences, including research on fault properties and the earthquake process, strain transfer, magmatic and hydrous fluids in the crust and mantle, plate boundary processes, large-scale continental deformation, continental structure and evolution, and composition and structure of the deep Earth. In addition, EarthScope offers a centralized forum for Earth science education at all levels and an excellent opportunity to develop cyberinfrastructure to integrate, distribute, and analyze diverse data sets.

Marine Geology and Geophysics (MG&G) | PD 17-1620

Full Proposal Accepted Anytime

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505468

The Marine Geology and Geophysics program supports research on all aspects of geology and geophysics of the ocean basins and margins, as well as the Great Lakes.

Geophysics (PH) | 17-554

Full Proposal Accepted Anytime

https://www.nsf.gov/pubs/2017/nsf17554/nsf17554.htm

The Geophysics Program supports basic research in the physics of the solid earth to explore its composition, structure, and processes from the Earth's surface to its' deepest interior.

Petrology and Geochemistry (CH) | 17-547

Full Proposal Accepted Anytime

https://www.nsf.gov/pubs/2017/nsf17547/nsf17547.htm

The Petrology and Geochemistry Program supports basic research on the formation of planet Earth, including its accretion, early differentiation, and subsequent petrologic and geochemical modification via igneous and metamorphic processes.

Distinguished Lectureship Program

2017 - 2018

An opportunity for US colleges, universities, museums, and other institutions to host lectures by outstanding scientists.

The distinguished speakers present technical and public lectures on subjects related to the two GeoPRISMS science initiatives:

Subduction **C**ycles and **D**eformation & **R**ift **I**nitiation and **E**volution

As usual, we received strong interest in the program, with applications from more than forty institutions.

Thank you for making this year's GeoPRISMS Distinguished Lectureship Program successful!

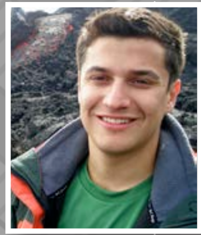
Visit the GeoPRISMS website to learn more about the speakers and their presentations

>>> GeoPRISMS is on YouTube! Subscribe and watch hours of lectures given by the GeoPRISMS distinguished speakers in the past years.

CYNTHIA EBINGER
Tulane University

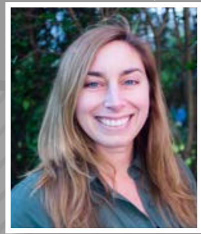
Florida International University
Marshall University
Weber State University
Michigan Tech University
New Mexico Tech

ESTEBAN GAZEL
Cornell University



NMNH, Smithsonian Institution
California State University East Bay
Hamilton College
California University of Pennsylvania
Miami University

HEATHER SAVAGE
LDEO, Columbia U



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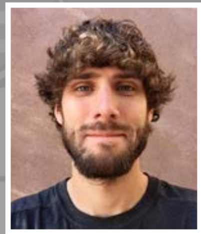
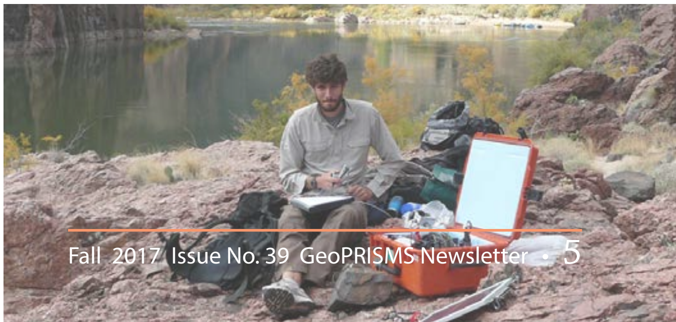
Bates College
Colby College
University of Alaska Fairbanks
Lafayette College

BRANDON SCHMANDT
University of New Mexico



Oregon State University
University of Oregon
University of Missouri
Stanford University
California State U Bakersfield

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



Imaging Magma Under Mount St. Helens with Geophysical and Petrologic Methods

*Carl W Ulberg[1] and the iMUSH Team**

[1]*University of Washington*

The imaging Magma Under Mount St. Helens (iMUSH) experiment aims to illuminate the magmatic system beneath Mount St. Helens (MSH) from the subducting Juan de Fuca Plate to the surface using multiple geophysical and petrologic techniques. Field work involved seventy broadband seismometers deployed from 2014 to 2016, 23 active shots set off in the summer of 2014 recorded at about 5000 sites with Texan instruments and 950 additional Nodal stations, 150 new magnetotelluric measurements, and new petrologic sampling and analysis (Fig. 1).

In June 2017, about twenty iMUSH scientists met at the USGS Cascades Volcano Observatory in Vancouver, WA, to discuss emerging iMUSH results and to integrate those results into a consistent model of the crust and upper mantle under Mount St. Helens. Some results have been published already and many more are on their way to publication.

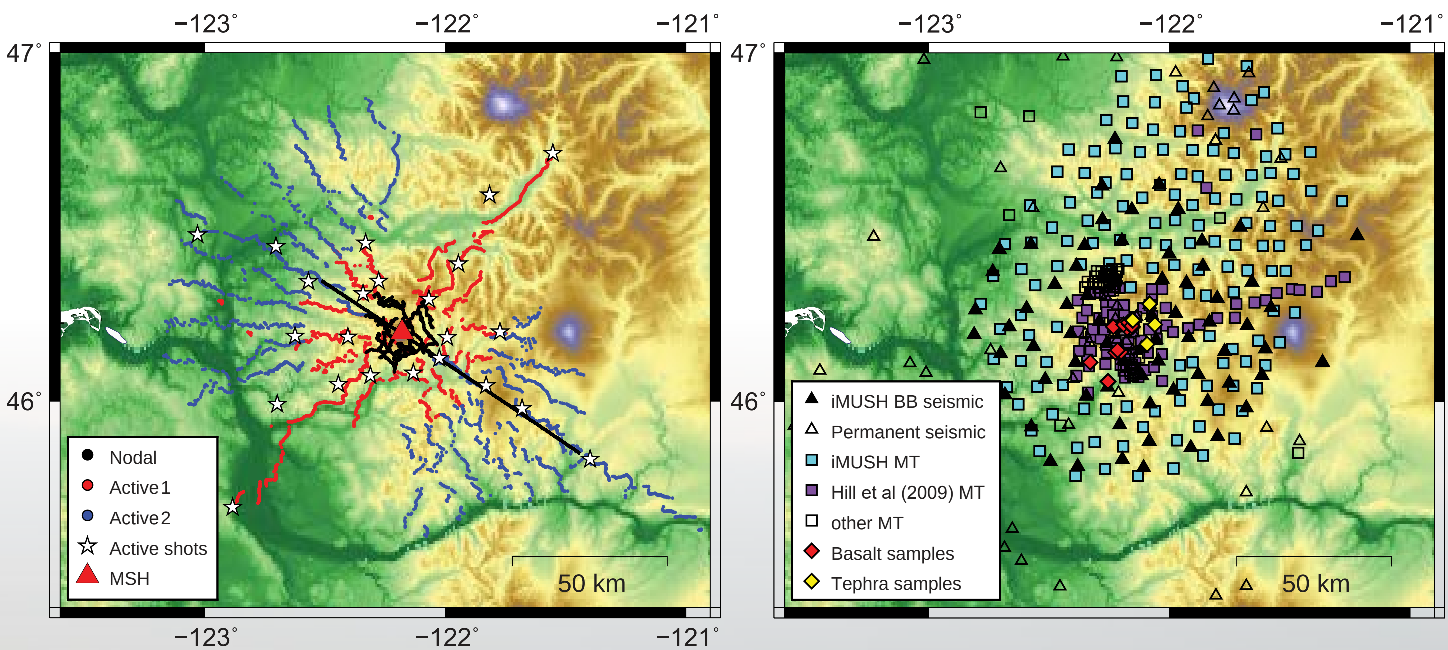


Figure 1. Left: Map of the active source deployment. In the summer of 2014, 23 shots were recorded by about 2500 Texan seismometers installed in two deployments, in addition to 950 Nodal seismometers. The black line shows the location of cross-sections in Figure 2. Right: Locations of permanent and temporary broadband seismometers used in the passive source experiment, magnetotelluric sites, and petrologic samples.

Photo Credit: Tim Clements

Passive seismic techniques include local earthquake tomography, ambient noise tomography, receiver function imaging, attenuation tomography, and SKS anisotropy. Using these techniques, we can image portions of the crust and mantle from the subducting slab to the surface, at varying degrees of resolution. Principal investigators for this portion of the experiment are Ken Creager, Geoff Abers, and Seth Moran, plus several students mentioned below.

Local earthquake tomography imaging is limited to the upper 20 km of the crust. Using more than 10000 first arrival picks for P- and S-waves from 400 local earthquakes, Carl Ulberg imaged surface-mapped features such as several high-velocity Miocene plutons, and the low-velocity Indian Heaven volcanic field and Chehalis sedimentary basin. Deeper features include the low-velocity Mount St. Helens seismic zone (SHZ), and low velocities at depths of 6-15 km below sea level beneath MSH, possibly related to a shallow magma storage region that has been identified previously with seismic studies and constrained by petrology (Fig. 3; Scandone and Malone, 1985; Lees and Crosson, 1989; Waite and Moran, 2009).

Ambient noise tomography involves cross-correlating the seismic noise between all of the station pairs in the array, and inverting the phase velocity maps to obtain a 3-D shear wave model of the crust and upper mantle. Using this technique, Kayla Crosbie found a general trend of high velocities in the lower crust to the west of MSH, and lower velocities to the east. This could be related to the presence of the accreted Siletz terrane (oceanic basalt from ~50Ma) to the west, and/or high temperatures and partial melt in the lower crust to the east (Fig. 2).

Receiver functions record the arrival of reflected and converted waves from teleseismic earthquakes. This technique is useful for locating interfaces with strong velocity discontinuities, since these reflect waves efficiently. Using this technique, Michael Mann imaged the subducting Juan de Fuca slab at a depth of ~70 km beneath MSH, and ~100 km beneath Mount Adams, almost 50 km to the east. Roque Soto used teleseismic attenuation tomography to model attenuation in the area around MSH.

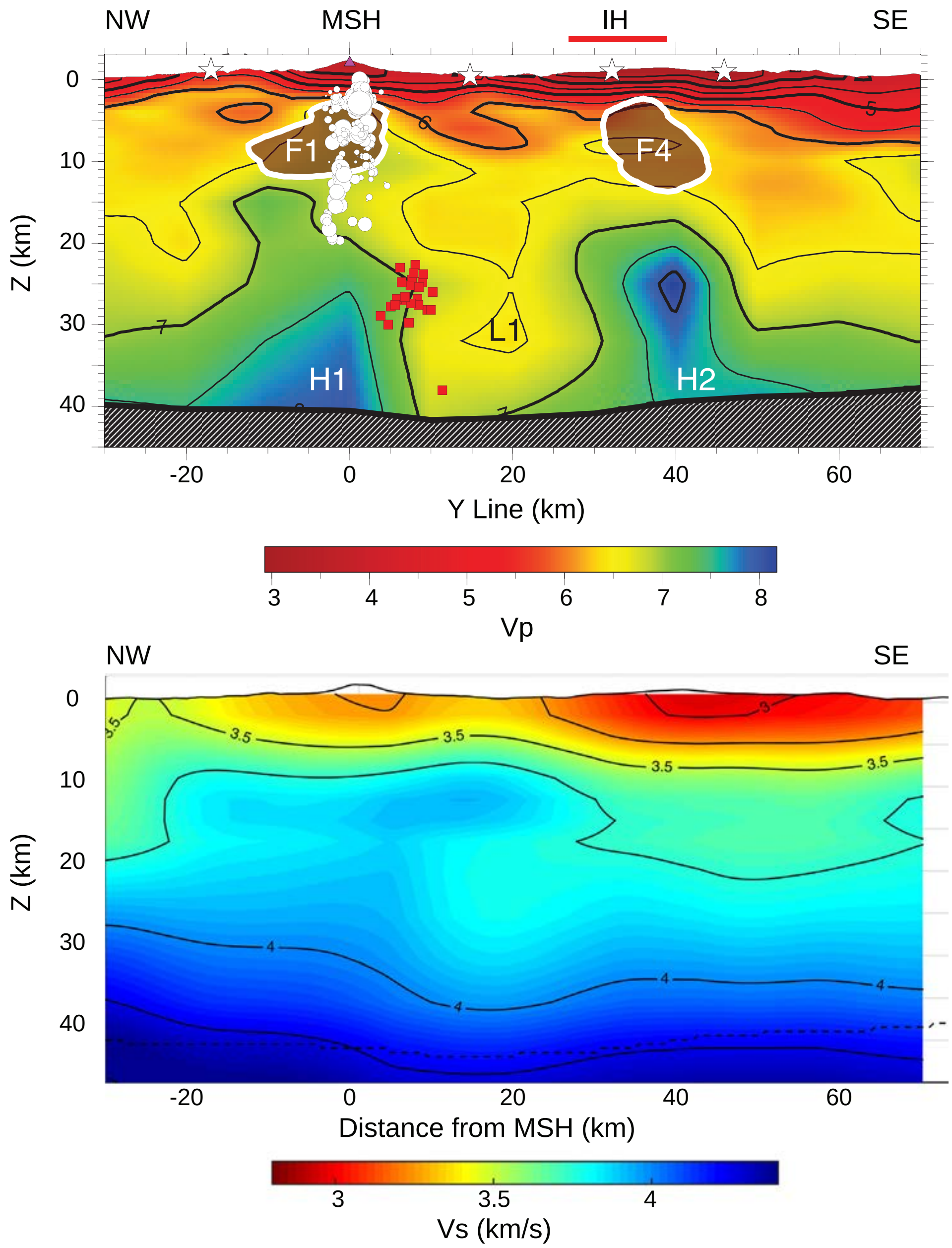


Figure 2. Top: NW-SE cross-section through MSH and the Indian Heaven volcanic field (IH) from Kiser et al (2016), showing high Vp (H1, H2), low Vp (L1) and high Vp/Vs anomalies (F1, F4). White dots are earthquakes during the first 24 h following the 18 May 1980 eruption, red squares are deep long-period event locations since 1980, white stars are active shot locations. Bottom: Cross-section along the same NW-SE line through the ambient noise tomography Vs model. High and low velocities in the lower crust are in similar locations as the active source model. The dotted line is the location of the Moho in the upper panel.

Abe Wallace and Erin Wirth used shear wave splitting of SKS phases to infer a fast direction of anisotropy aligned NE-SW, consistent with regional trends.

The active source experiment has yielded several results including 2-D Vp and Vs profiles through MSH down to the Moho, a map of the reflectivity of the Moho beneath MSH, and details of the locations and characteristics of seismic sources beneath MSH.

Using thousands of observations of the 23 active shots, Eric Kiser and Alan Levander obtained 2-D seismic velocity profiles through MSH (Kiser et al, 2016), and are working on a 3-D inversion of the same data.

The iMUSH Team

The iMUSH team includes Geoffrey A Abers[2], Olivier Bachmann[3], Paul Bedrosian[4], Dawnika L Blatter[4], Esteban Bowles-Martinez[5], Michael A Clynne[4], Kenneth C Creager[1], Kayla Crosbie[2], Roger P Denlinger[4], Margaret E Glasgow[6], Jiangang Han[1], Steven M Hansen[6], Graham J Hill[7], Eric Kiser[8], Alan Levander[9], Michael Mann[2], Xiaofeng Meng[1], Seth C Moran[4], Jared Peacock[4], Brandon Schmandt[6], Adam Schultz[5], Thomas W Sisson[4], Roque A Soto Castaneda[2], Weston A Thelen[4], John E Vidale[1], Maren Wanke[3]

[1]University of Washington, [2]Cornell University, [3]ETH-Zurich, [4]USGS, [5]Oregon State University, [6]University of New Mexico, [7]University of Canterbury, [8]University of Arizona, [9]Rice University

iMUSH is funded by NSF-GeoPRISMS, NSF-Earthscope with substantial in-kind support from the USGS.

Steve Hansen (left, UNM) and Wes Thelen (right, USGS-CVO) install Nodal seismometers in August 2017 in the crater of Mount St. Helens, WA, to follow up on new findings from the iMUSH deployments in 2014 with 3C constraints on source mechanisms and imaging of the volcanic edifice. Photo credit: Brandon Schmandt

The model includes a low-velocity zone in the lower crust 10-20 km SE of MSH, hypothesized to be a potential magma storage region as magma makes its way from the mantle to be erupted at MSH. This low-Vp zone corresponds spatially with the low-Vs zone imaged with ambient noise tomography (Fig. 2). High Vp/Vs regions in the upper crust beneath MSH and Indian Heaven could correspond to areas with partial melt, at active Holocene eruptive centers. The 3-D active source seismic imaging reveals similar features in the upper 15-20 km as imaged by the local earthquake tomography (plutons, sediments, etc.).

During the active source experiment, 950 Nodal stations were deployed for two weeks on and around the edifice of MSH. Steve Hansen and Brandon Schmandt stacked these data to reveal details of the reflectivity of the Moho, the boundary at the base of the continental crust (Hansen et al, 2016). They found large amplitude reflected waves to the east of MSH but little evidence for reflected waves to the west. This indicates that there is a stronger velocity contrast between the lower crust and upper mantle to the east of MSH than to the west. This could be related to the presence of a serpentinized mantle wedge, which would lower the velocity of the upper mantle. Due to its lower temperature, this probably also precludes the possibility of magma derived from the mantle wedge directly beneath MSH. Instead, it would have to come from somewhere to the east, an idea also supported by the active seismic and noise cross-correlation results.

Using the dense instrumentation on and around MSH, seismic sources can be better-characterized as well. Deep long-period earthquakes have been observed beneath MSH since sufficient instrumentation was installed around the time of the 1980 eruption. Using cross-correlation techniques, Jiangang Han determined that almost all of these events actually occurred in the same place, a location ~5-10 km SE of MSH at a depth of 22-30 km below sea level. Margaret Glasgow, Hansen, and Schmandt worked with the Nodal data to locate and characterize an order of magnitude more shallow events than were in the Pacific Northwest Seismic Network catalog. Xiaofeng Meng and John Vidale obtained a high-resolution set of seismic locations within 5-km depth of MSH with double-difference relocations using accurate 3-D velocity models.

The iMUSH magnetotelluric experiment, led by Adam Schultz (OSU) and Paul Bedrosian (USGS), collected data at 150 sites within the broad area encompassing Mounts St. Helens, Rainier, and Adams. These data were supplemented by a denser set of data collected ~10 years previously in the immediate area around MSH (Hill et al, 2009). A primary aim of the magnetotelluric study is to obtain a more detailed image of what has been termed the Southwest Washington Cascades Conductor (Stanley et al, 1987). Three-dimensional resistivity modeling by Jared Peacock, Esteban Bowles-Martinez, Bedrosian and Schultz imaged a ring of high conductivity extending NNW from MSH, east under the Cowlitz River, south along the western edge of the Cascades arc, and west beneath Indian Heaven.

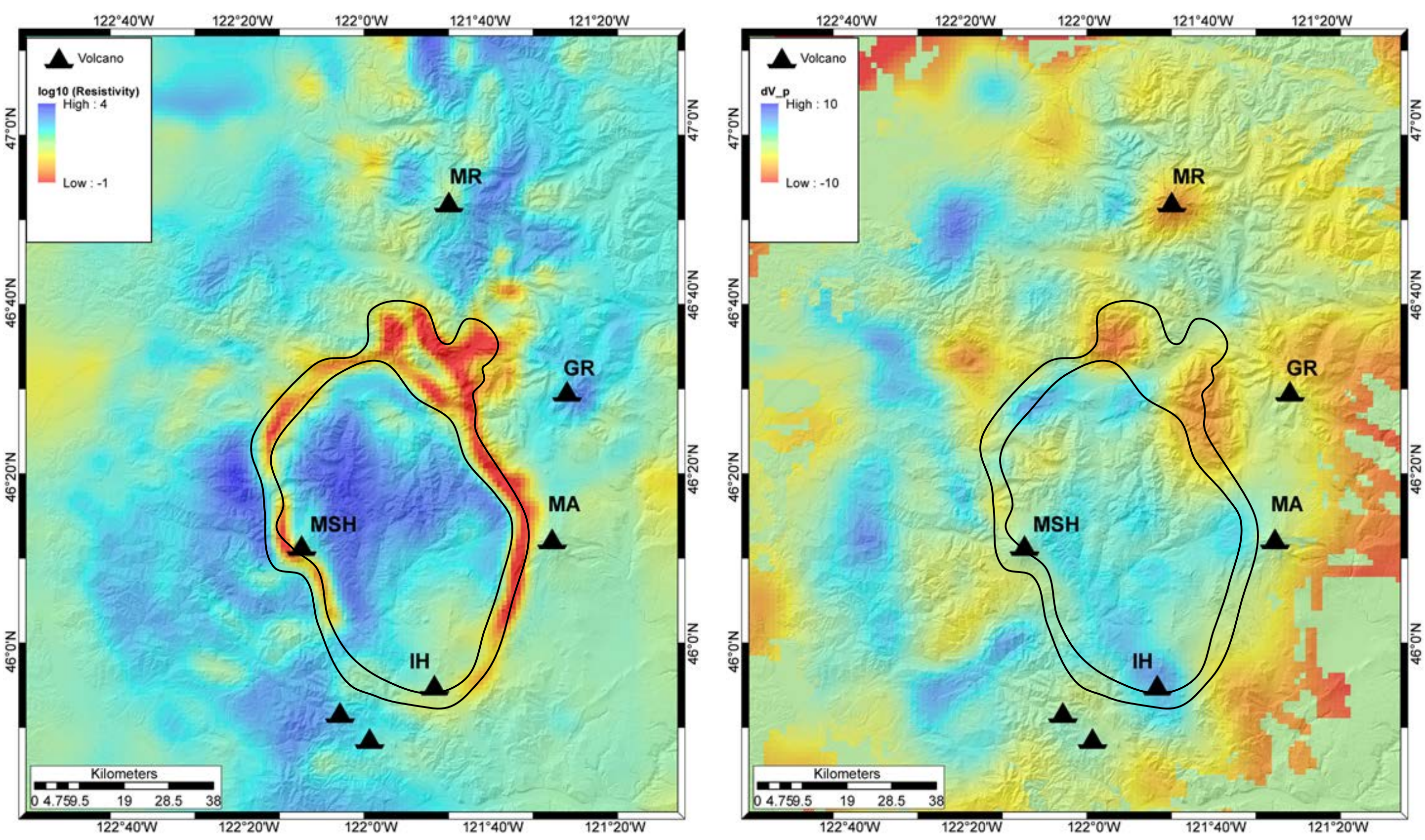


Figure 3. Left: Magnetotelluric model at 7km depth, showing details of high conductivities between MSH, Mount Rainier and Mount Adams (black outline). Scale is log10 (resistivity), so red areas are highly conductive. Triangles are volcanoes. Right: Local earthquake tomography Vp model at the same depth, showing percent variation from a 1-D average velocity model, masked for areas without raypaths. Several low-Vp anomalies coincide spatially with high conductivities in the MT model (black outline shows high conductivity).

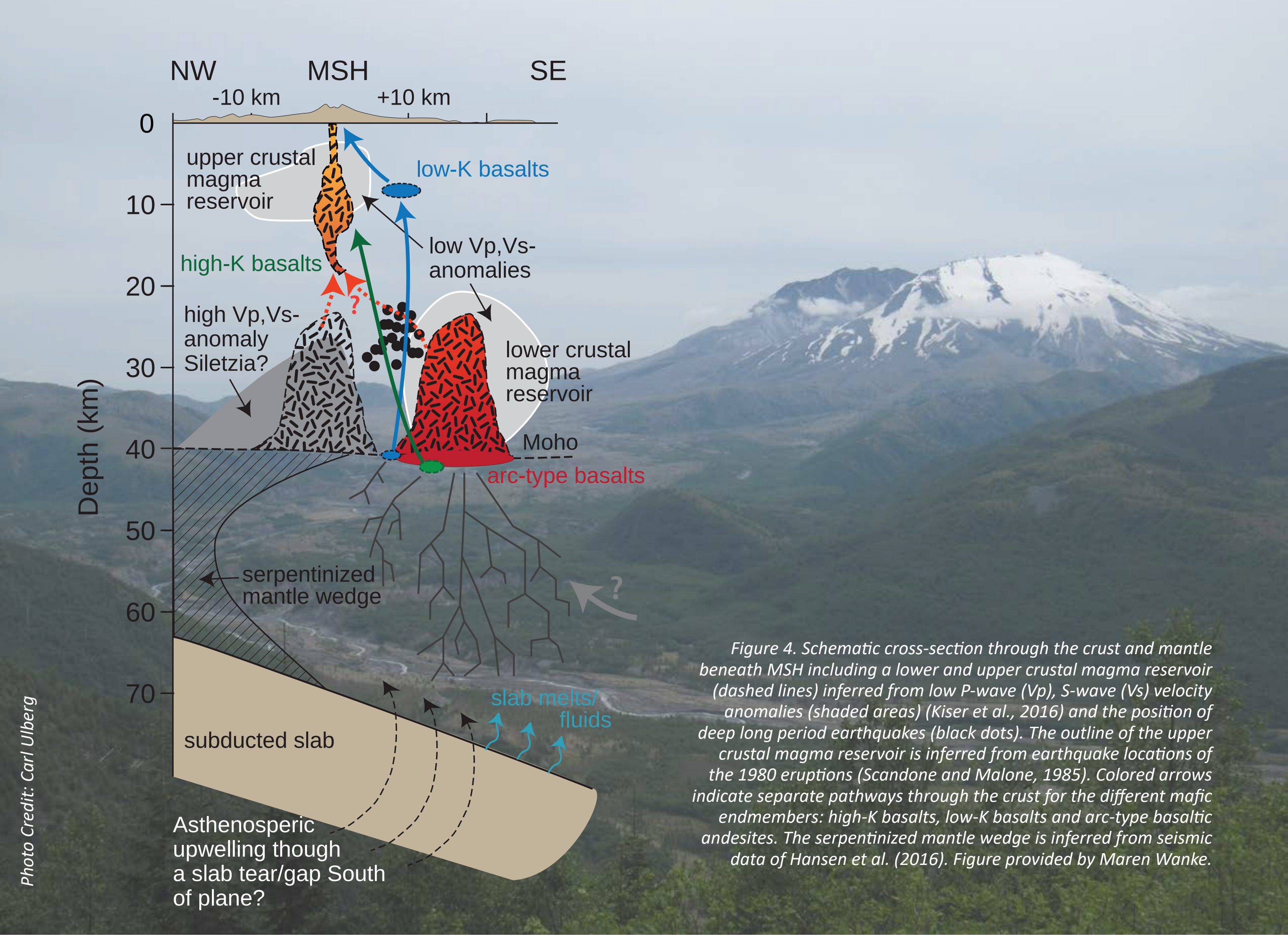


Figure 4. Schematic cross-section through the crust and mantle beneath MSH including a lower and upper crustal magma reservoir (dashed lines) inferred from low P-wave (Vp), S-wave (Vs) velocity anomalies (shaded areas) (Kiser et al., 2016) and the position of deep long period earthquakes (black dots). The outline of the upper crustal magma reservoir is inferred from earthquake locations of the 1980 eruptions (Scandone and Malone, 1985). Colored arrows indicate separate pathways through the crust for the different mafic endmembers: high-K basalts, low-K basalts and arc-type basaltic andesites. The serpentinized mantle wedge is inferred from seismic data of Hansen et al. (2016). Figure provided by Maren Wanke.

Much of the high conductivity overlaps with low velocities imaged by seismic tomography (Fig. 3). The origin of the high conductivity is somewhat enigmatic. One theory is that the high-conductivity reflects contact metamorphism of Eocene marine sediments along the margins of a large Miocene intrusion, emplaced in or near the suture zone between the Siletz terrane and the Mesozoic North American margin. That Mount St. Helens sits directly atop this conductive ring may shed light on both its unusual forearc location and predominantly dacitic composition. A more subtle conductor imaged within the lower-crust may be related to a small degree of partial melt which may in turn source surface volcanism.

Petrologic studies conducted on rocks collected near MSH have revealed several new insights into the magmatic system. Three mafic endmembers are encountered at MSH: high-K basalts (Type 1), low-K basalts (Type 2), and arc-type basaltic andesites (Type 3). The distinct geochemical characteristics of each mafic type require variable contributions of flux and decompression melts, involving different sources in the mantle, possibly including asthenospheric upwelling through a slab tear or gap beneath northern Oregon (Obrebski et al, 2010). The preservation of their mantle signatures requires separate ascent pathways through the crust (likely along re-activated fractures) for distinct batches of basalt aside from the main plumbing system. Further, petrographic observations made by Maren Wanke, Olivier Bachmann, and Michael Clynne indicate frequent mixing of some basalt types with the silicic upper part of the system, producing magmatic cycles of basalt entraining a dacitic magma reservoir, mixing, fractionating and erupting the diverse magmas of the Castle Creek period (~1900-1700 years B.P.). However, dacites are the most abundant rock type at MSH and the eruption of basalt remains a rarity. Hydrous arc-type basaltic andesite (Type 3), presumably the most abundant type of mafic magma produced in the mantle, is likely feeding the main magmatic plumbing system to form dacites in a lower crustal mush zone, which is possibly being imaged by the active source, ambient noise, and magnetotelluric studies.

Two voluminous dacitic tephra units from MSH over the last 4 ka were also sampled and studied using near-liquidus, fO_2-buffered inverse experiments over a range of pressures, temperatures and H_2O concentrations (Blatter et al, 2017).

The results of these experiments indicate that the dacite liquid is generated at deep crustal pressures (700-900 MPa, ~20-35 km) and moderate temperatures (925°C), with high H_2O concentrations (6-7 wt%) and high fO_2 (~NNO+1.3). Mass balance calculations using the mineral and liquid compositions from the experiments indicate that crystallization of an H_2O-rich basaltic andesite (similar to Type 3), or re-melting a vapor-charged hornblende gabbro can generate large quantities (~35 wt%) of hydrous dacite, implying that regular recharge of the system by H_2O-rich basalts, basaltic andesites, or vapor is necessary for the persistent production of dacitic melt consistent with the eruptive history of MSH.

Several features are consistently observed in geophysical surveys and match inferences from petrological clues (Fig. 4). Local and active source tomography, place an anomalous region in the upper crust at depths of 5-15 km below sea level beneath MSH. The likely explanation for this is an upper crustal storage region for evolved magma, some of which will likely erupt at MSH in the future. In the lower crust, ambient noise tomography and reflected waves from active source tomography point towards a low-velocity region to the east or SE of MSH, which could be related to lower crustal magma storage. Magnetotelluric results are also consistent with a small degree of lower-crustal partial melt, although the spatial extent of such melt is not in complete accordance with that inferred from seismic tomography. Since MSH is located anomalously trenchward for a Cascades volcano, with a slab depth of ~70 km directly beneath MSH, an offset magma pathway is possible. Deep long-period earthquakes may indicate the presence of magmatic fluid along this pathway. Low velocities and high conductivity are observed along the SHZ, which could be related to higher temperatures and fractured rock, fluids, and/or the presence of metasedimentary rocks within the Eocene Siletz suture zone. Upper crustal features are also consistent across local, active source, and ambient noise tomography, giving us a better idea of the upper crustal structure of the region, including multiple Miocene-aged plutons and sedimentary basins. ■

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Recent GeoPRISMS Publications

Below are compiled GeoPRISMS-funded studies that have been recently published. If you would like your publication to be included in the list, please send your reference to the GeoPRISMS Office at info@geoprisms.org

Nature Geoscience, in press (2017), doi: 10.1038/s41561-017-0007-2

Links between sediment consolidation and Cascadia megathrust slip behavior

S.Han, N.L.Bangs, S.M.Carbotte, D.M.Saffer, J.C.Gibson

Journal of Volcanology and Geothermal Research, in press (2017), doi.org/10.1016/j.jvolgeores.2017.09.001

Geochemical constraints on volatile sources and subsurface conditions at Mount Martin, Mount Mageik, and Trident Volcanoes, Katmai Volcanic Cluster, Alaska

T.Lopez, F.Tassi, A.Aiuppa, B.Galle, A.L.Rizzo, J.Fiebig, F.Capecchiacci, G.Giudice, S.Caliro, G.Tamburello

Lithos 286–287, 264-301 (2017), doi.org/10.1016/j.lithos.2017.05.014

The Cenozoic magmatism of East-Africa: Part I — Flood basalts and pulsed magmatism

T.Rooney

Nature Geoscience 10, 765–770 (2017), doi:10.1038/ngeo3021

Large-scale dynamic triggering of shallow slow slip enhanced by overlying sedimentary wedge

L.Wallace, Y.Kaneko, S.Hreinsdóttir, I.Hamling, Z.Peng, N.Bartlow, E.D'Anastasio, B.Fry

Journal of Volcanology and Geothermal Research 337, 98–110 (2017), doi.org/10.1016/j.jvolgeores.2017.03.001

Magmatic degassing, lava dome extrusion, and explosions from Mount Cleveland volcano, Alaska, 2011–2015: Insight into the continuous nature of volcanic activity over multi-year timescales

C.Werner, C.Kern, D.Coppola, J.J. Lyons, P.J.Kelly, K.L.Wallace, D.J. Schneider, R.L.Wessels

Nature Geoscience 10, 609–613 (2017), doi:10.1038/ngeo2990

Tsunamigenic structures in a creeping section of the Alaska subduction zone

A.Bécel, D.J.Shillington, M.Delescluse, M.R.Nedimović, G.A.Abers, D.M.Saffer, S.C.Webb, K.M.Keranen, P-H. Roche, J.Li, H.Kuehn

Earth and Planetary Science Letters 475, 169-180 (2017), doi.org/10.1016/j.epsl.2017.07.007

Sr and O isotopes in western Aleutian seafloor lavas: Implications for the source of fluids and trace element character of arc volcanic rocks

G.M.Yogodzinski, P.B.Kelemen, K.Hoernle, S.T.Brown, I.Bindeman, J.D.Vervoort, K.W.W.Sims, M.Portnyagin, R.Werner

Nature Geoscience 10, 333–337 (2017), doi:10.1038/ngeo2922

The cold and relatively dry nature of mantle forearcs in subduction zones

G.A.Abers, P.E.van Keken, B.R.Hacker

Journal of Petrology 57 (10), 1865–1886 (2016), doi.org/10.1093/petrology/egw058

An assessment of clinopyroxene as a recorder of magmatic water and magma ascent rate

A.S.Lloyd, E.Ferriss, P.Ruprecht, E.H.Hauri, B.R.Jicha, T.Plank

Geochimica et Cosmochimica Acta 181, 217–237 (2016), doi.org/10.1016/j.gca.2016.03.010

Tracking along-arc sediment inputs to the Aleutian arc using thallium isotopes

S.G.Nielsen, G.Yogodzinski, J.Prytulak, T.Plank, S.M.Kay, R.W.Kay, J.Blusztajn, J.D. Owens, M.Auro, T.Kading

Nature Communications 7, Article number: 13242 (2016), doi:10.1038/ncomms13242

Seismic evidence for a cold serpentinized mantle wedge beneath Mount St Helens

S.M.Hansen, B.Schmandt, A.Levander, E.Kiser, J.E.Vidale, G.A.Abers, K.C.Creager

Geochemistry, Geophysics, Geosystems 17 (2), 616-624 (2016), doi/10.1002/2015GC006171

A MATLAB toolbox and Excel workbook for calculating the densities, seismic wave speeds, and major element composition of minerals and rocks at pressure and temperature

G.A.Abers, B.R.Hacker

GeoPRISMS AGU Townhall & Community Forum

Monday December 11 at 6:00pm
Westin Canal Place
100 Rue Iberville, New Orleans - Riverbend Terrace

The event is open to all with interests in the GeoPRISMS Program and GeoPRISMS (or MARGINS) research. Come hear updates about the GeoPRISMS Program, the latest GeoPRISMS research projects & study areas, and ongoing GeoPRISMS research from student presenters.

- A short formal session (starting at 6:30PM) will include a welcome and opening remarks from the GeoPRISMS Chair Demian Saffer and updates from NSF Program Director Jenn Wade.
- Luc Lavier (UTIG) will provide a summary of the Theoretical and Experimental Institute for the Rift Initiation and Evolution Initiative that was held in February 2017.
- Aubreya Adams (Colgate University) and Emily Roland (University of Washington) will present the Amphibious Array Community Seismic Experiment (AACSE) Project and Mini-Workshop held the Sunday before AGU.
- Colton Lynner (University of Arizona) will provide a summary of the ENAM science advances Mini-Workshop held the Sunday before AGU.
- Andrew Goodwillie (LDEO, Columbia University) will provide a summary of the GeoPRISMS data resources, mini-lessons, and effective broader impacts Mini-Worshop held the Sunday before AGU.
- Terry Plank (LDEO, Columbia University) will provide a status report and update of the SZ4D initiative.

Students, welcome!

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.

Stay informed, get involved

There will be ample time to mingle and refreshments will be available. Among those present will be Demian Saffer (GeoPRISMS Chair), members of the GeoPRISMS Steering and Oversight Committee, GeoPRISMS Distinguished Lecturers and Program Director for GeoPRISMS from the National Science Foundation.

We hope to see you there!

Questions should be directed to the GeoPRISMS Office:
info@geoprisms.org
More information can be found at:
http://geoprisms.org/meetings/agu-townhall-and-student-forum/

ExTerra Field Institute and Research Endeavor: Western Alps, Summer 2017

Besim Dragovic (Boise State University)
Paul G. Starr (Boston College)

Subduction zone field geologists are a proud bunch. In 2011, the name ExTerra (**Ex**humed **Terra**nes) was coined to describe those in the GeoPRISMS community who investigate rocks exhumed from fossil subduction zones, rocks whose evolution illuminates processes otherwise hidden beneath the surface of active subduction systems (kudos to Sarah Penniston-Dorland and Maureen Feineman for the name "ExTerra").

Traditional field studies have often been conducted by individuals or only small groups of researchers. One fundamental aspect of this project, termed the ExTerra Field Institute and Research Endeavour (or E-FIRE for short) was to conduct collaborative fieldwork to collect materials held communally, foster broad interactions through workshops, and incorporate student exchanges among research laboratories. The E-FIRE group consisted of researchers (including seven PhD students and three postdocs) from nine U.S.-based universities and research institutions, each with different analytical expertise in metamorphic petrology and geochemistry (e.g. stable isotopes, geochronology, thermodynamic modeling).

In addition, ExTerra partnered with a sister European organization, the ZIP project (**Z**ooming **I**n between **P**lates). The ZIP project, coordinated by Philippe Agard, consists of researchers from twelve universities across Europe with support from a number of different industry partners. The project has been running since 2013, with many of the twelve PhD students being in the final stage of their projects when we arrived in the field this summer.

The overall big picture of this project was to trace the cycle of rocks and fluids through the subduction process. For this, we proposed to go to the Earth's premier example of a fossil subduction zone – the Western Alps, Europe in the summer of 2017.

Monviso
Photo credit: Paul G. Starr

Dent Blanche
Photo credit: Paul G. Starr

Planning and logistics

Weekly Google Hangouts offered the early stage researchers an opportunity to discuss papers on Western Alps geology and conduct webinars on analytical techniques, modeling, and field observation. In addition, an important component of the E-FIRE initiative was to have open, collaborative documentation and data sharing, with the end goal of opening the complete sample and data collection to any future researchers interested in subduction zone research. Hangout sessions before fieldwork included discussion with Frank Spear about the use of MetPetDB (a global database of various metamorphic petrology data) and with members of SESAR (System for Earth System Registration) about utilizing International Geo Sample Numbers (IGSNs – unique numbers and barcodes given to each sample).

One of the first major steps in the E-FIRE project was the first joint E-FIRE-ZIP workshop/retreat held in the Marin Headlands, close to San Francisco, in December 2016. This was the first time many of us had met in person. It provided a great opportunity for everyone to get to know each other. We also got to see some of our first subduction zone rocks together during a mini fieldtrip to nearby outcrops of eclogites and blueschists of the Franciscan Complex. It was also exciting to have such a large group of young researchers, from across North America and Europe!

Much of the credit for the fieldwork planning and organization must go to the E-FIRE PI triumvirate of Matt Kohn, Maureen Feineman, and Sarah Penniston-Dorland, as well as our main European collaborators Philippe Agard, Marco Scambelluri, Othmar Müntener, Samuel Angiboust, and their students.

E-FIRE Group Fieldwork overview – 7/26/17 – 8/6/17

This would turn out to be a different field experience for many of us. At any one time, there were 25-30 of us in the group, including our European collaborators. For a majority of the time, we stayed in Italian hostels and rifugios with beautiful mountain vistas (I know what you're thinking…rough stuff). Thankfully, it just so happens that many of the world's premier metamorphic rocks are associated with many of the Alp's premier mountains: the Matterhorn, the Dent Blanche, and Monviso. Lunchtime in the field would often consist of grab bags of breads, cheeses, and cured meats from the local market (don't worry, we ate some fruits and vegetables).

After a few close scares with delayed flights, everyone arrived safely in time for our first group E-FIRE dinner in Geneva. The next morning, we headed off for our first day in the field, consisting of an introduction to Alpine geology with rapid-fire stops along the way driving from Geneva to the Aosta Valley in Italy. This part of the trip was led by Alpine geology maestro, Philippe Agard, who demonstrated an incredible ability to explain complex Alpine features whilst hand-drawing cross-sections in front of some fantastic Alpine vistas.

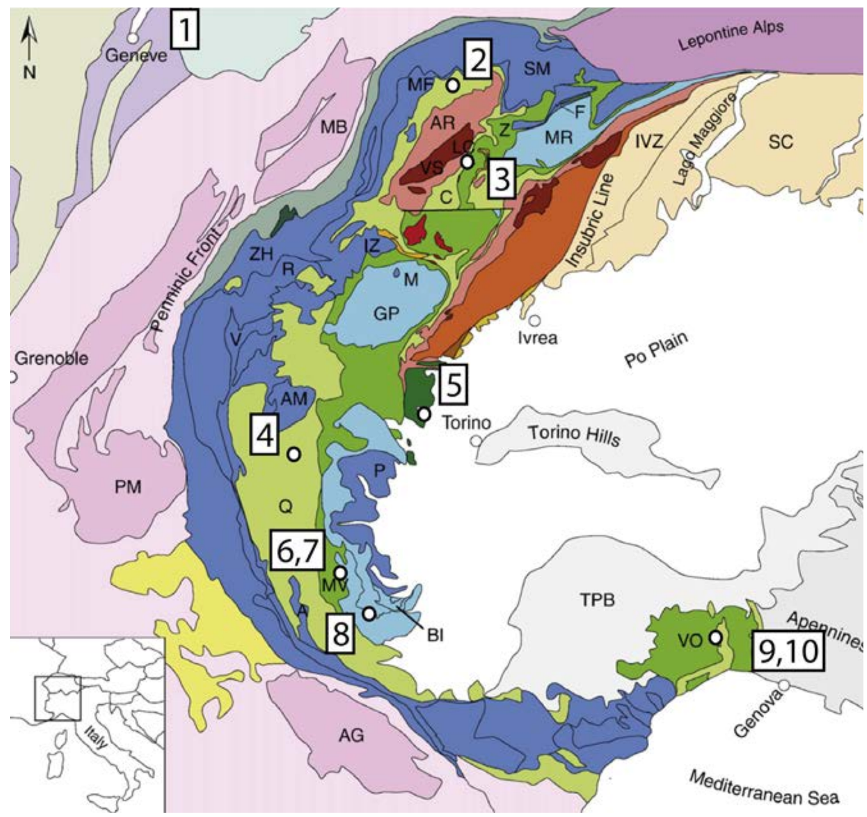
No trip to the Alps would be complete without a hard slog up some steep mountainous terrain and our second day in the field delivered just that! Having hiked up some 1200 m of relief (most of us still suffering from jetlag), we were rewarded with spectacular views and some equally exciting geology in the Dent Blanche area. This area is interpreted to be a well-exposed example of an ancient subduction interface, where continental material of the colliding overlying plate is juxtaposed against the lower plate of European affinity. Recent work by some of our European collaborators, led by Samuel Angiboust, has suggested that this could be one of the best natural analogues for a subduction zone interface near the base of the upper plate crust.

Dent Blanche. Photo credit: Paul G. Starr

E-FIRE logo
Credit: Will Hoover

Philippe Agard laying out Alpine geology
Photo credit: Besim Dragovic

Samuel Angiboust in Dent Blanche
Photo credit: Matthew Kohn



Metamorphic map of Western Alps with stop locations from our 10-day group fieldwork overview. (1) Drive from Geneva with Pre-Alps overview, (2) Dent Blanche, (3) Lago Di Cignana, (4) Schistes Lustres, (5) Lanzo Massif, (6, 7) Monviso Ophiolite, (8) Relaxation day, (9, 10) Voltri Massif. Map modified after Beltrando et al. (2010).

Field participants in Monviso. Photo credit: Besim Dragovic

Monviso Photo credit: Besim Dragovic

Our third day started with an immaculate view of Monte Cervino (or it's more well-known German name, Matterhorn). A beautiful mountain-side trail took us up to Lago Di Cignana, an artificial lake located in Valtournenche, in the Aosta Valley. This site is most well known as an ultra-high pressure (UHP) locality, consisting of various coesite (high-pressure polymorph of quartz)-bearing eclogites and schists. Recent work has found evidence for micro-diamonds within fluid inclusions in garnet, suggesting that these rocks were buried to depths greater tha 100 km and potentially provide a unique record of processes occurring deep within the subduction zone.

The next day consisted of a transect across the Schistes Lustres – one of the most complete sections across a fossil accretionary wedge complex consisting of blueschist and eclogite facies metasediments. The fieldwork was punctuated by brief outbursts of some stormy Alpine weather (thankfully one of the only rainy days in the whole trip!).

Day 5 featured a trip to the Lanzo Massif and a shift in focus from the processes operating during Alpine orogenesis to those occurring on the seafloor, prior to subduction. In contrast to many of the Alpine ophiolites seen on this fieldtrip, the Lanzo Massif has largely escaped metamorphic overprinting. Our leader for this day, Othmar Muntener, showed us well-preserved examples of seafloor serpentinisation and discussed the evidence for Lanzo, and some other Alpine ophiolites, belonging to an ultra-slow spreading ridge system. Of particular interest to the group was discussion of evidence for subducted sub-continental lithospheric mantle that would have been exhumed to the seafloor along large-scale detachment faults as part of a slow-spreading ridge system.

For many of us, one of the highlights on the trip was the Monviso area, in the Italian Alps. The two-day trip featured a tour around one of the best exposed fragments of subducted oceanic material, interpreted as a coherent slice of the oceanic crust/mantle interface. Whilst the hiking around the area featured some fantastic vistas of Monviso and the adjacent peaks, it was perhaps equally memorable for the dense clouds that would appear out of nowhere and reduce the visibility to just a few meters. Perhaps unsurprisingly, given a group of thirty geologists easily distracted by the rocks, we managed to lose some of the group in the fog! After about a thirty-minute search, and a lot of shouting and whistling, the lost E-FIRE folks were located – already on their way to the Rifugio for an early happy hour.

After the Monviso trip, we took a field break to decompress and to discuss the nascent project ideas the students and postdocs were thinking about in the context of the sites we had visited. It was exciting to hear students bouncing ideas off each other and contemplating how each of their individual projects goals will tie into each other's. We smell collaboration (and field boots)!

Top: Monviso. Photo credit: Kirkland Broadwell.
Bottom: Paul Starr (left) and Besim Dragovic (right).
Photo credit: Sarah Penniston-Dorland

After a well-needed day of rest and relaxation, we drove east to the Ligurian Alps, with the port city of Genoa as our base of operations over the next three days. Here, we drove north, as the serpentinite guru, Marco Scambelluri, led us into the Voltri Massif. In this portion of the Western Alps, it is suggested that convergence between Europe and Apulia occurred at an ocean-ocean plate interface (as opposed to northwest at Monviso, which is suggested to be ocean-continent). We got to contemplate whether changes in plate dynamics here would have resulted in differing metamorphic conditions and preservation of buried lithologies. Our first day was an introduction to the regional geology, and a quick introduction to fieldwork closer to the Mediterranean, with temperatures at times in excess of 100˚F. Much of the terrane is heavily vegetated, so the best field exposures were in riverbeds, like those of the Gorzente River, in the Erro Tobio Unit. The Erro Tobio Unit consists of variably serpentinized ultramafic rocks, with the most striking feature in these rocks being coalescing veins of metamorphic olivine resulting from dehydration during subduction.

The next day, Marco led us to several roadside locations in the Beguia Unit of the Voltri Massif, a region of large (tens to hundreds of meters) lenses of metamorphosed gabbro in a matrix of serpentinite. It has been hypothesized that these lenses may represent a tectonic mélange or simply an extension of what we all observed earlier in the trip. The temperature that day did not let up, and hammering dense Fe-Ti meta-gabbros did not provide a break either (pun intended), but we collected some spectacular samples and witnessed Marco's expert wielding of a sledge hammer. At the end of days like this, a cool refreshment is always welcome, as well as a nice stroll along the rocky coast of Genoa.

Small Group Fieldwork | 8/8/17 – 8/28/17

Groups of researchers went back to Monviso to collect more stunning examples of slab/mantle fluid-rock interaction, to Dent Blanche for finer-scale sampling of the subduction interface, and out by ferry to explore an extension of the high-pressure Western Alpine rock in Corsica. The authors, with a group of others, went back to the Voltri Massif for more sampling of meta-gabbros and serpentinites, but also to the Apennines, where relics of unsubducted gabbro and serpentinite are preserved. There, we experienced two firsts: tripe (with mixed responses!), and having the carabinieri (the Italian military police) called on us for hammering rocks. This time with smaller groups going back to some of the same locations we visited earlier in the trip, the focus was on more detailed sampling for individual project goals, and expanded discussion of field observations and any tectonic interpretations.

After several days in smaller teams, the E-FIRE group was re-assembled back in Geneva, Switzerland for one more day, and what could possibly beat the adventures we experienced in the field? Why, it's sample packing! In a parking lot at the Université de Lausanne, we showed each other some of the rocks we collected for our projects, and in some cases, samples we set out to collect for each other's projects. Samples were packed onto a pallet and wrapped like no rocks had ever been wrapped before. That night, we had one final group dinner in Geneva before we all split up again, where many were back out into field and others were off to the Goldschmidt conference in Paris.

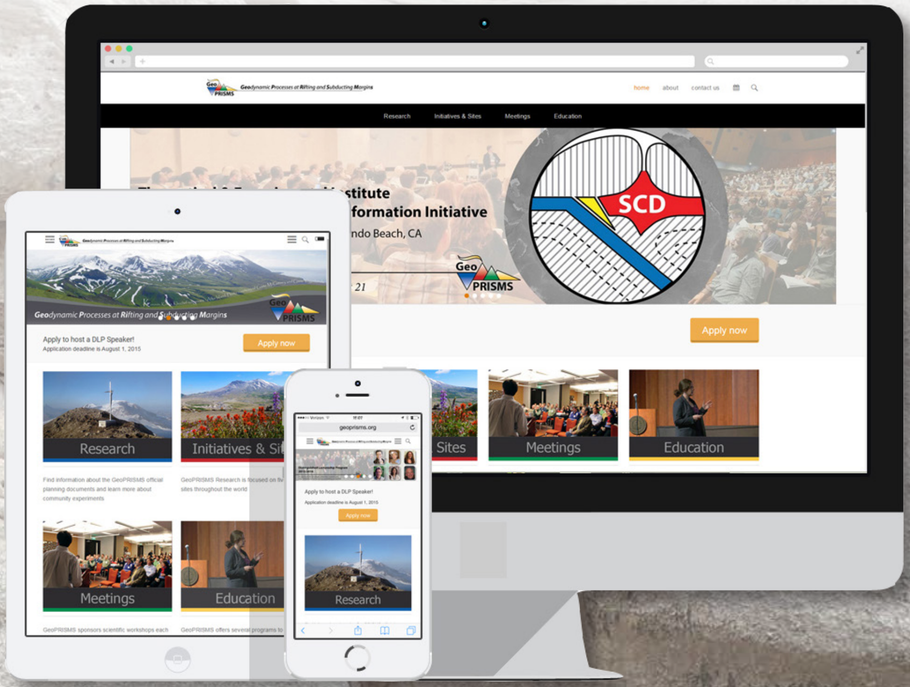
All told, roughly 700 kg of rock was collected by the E-FIRE group during the field excursion, and shipped to Penn State University where the samples will be held in a sample repository. This is of course until we crush, pick at, dissolve, and shoot lasers at them. In all seriousness, it is safe to state that the 2017 ExTerra Field Institute and Research Endeavour was the experience of a lifetime, especially for the early stage researchers; a unique opportunity to interact and initiate collaborations with each other and our new European colleagues, observe and contemplate subduction zone processes in a classic field location, and travel through one of the most beautiful terranes on Earth.

Acknowledgments

We are grateful to Philippe Agard, Marco Scambelluri, Othmar Müntener, and Samuel Angiboust (along with other European students, postdocs, and research scientists) for their guidance in field logistics and immense knowledge of Western Alps geology. We would like to thank the principal investigators Matt Kohn, Sarah Penniston-Dorland, and Maureen Feineman for the leadership and organizational skills necessary for such a large field-based research endeavor. We finally thank W.O. Bargone for field assistance. This field institute was supported by NSF EAR-1545903 and readers like you. ■

Group photo in Monviso.
Photo credit: Sarah Penniston-Dorland

Visit the GeoPRISMS website for more information about science planning, meeting outcomes, job opportunities, and funding



www.geoprisms.org

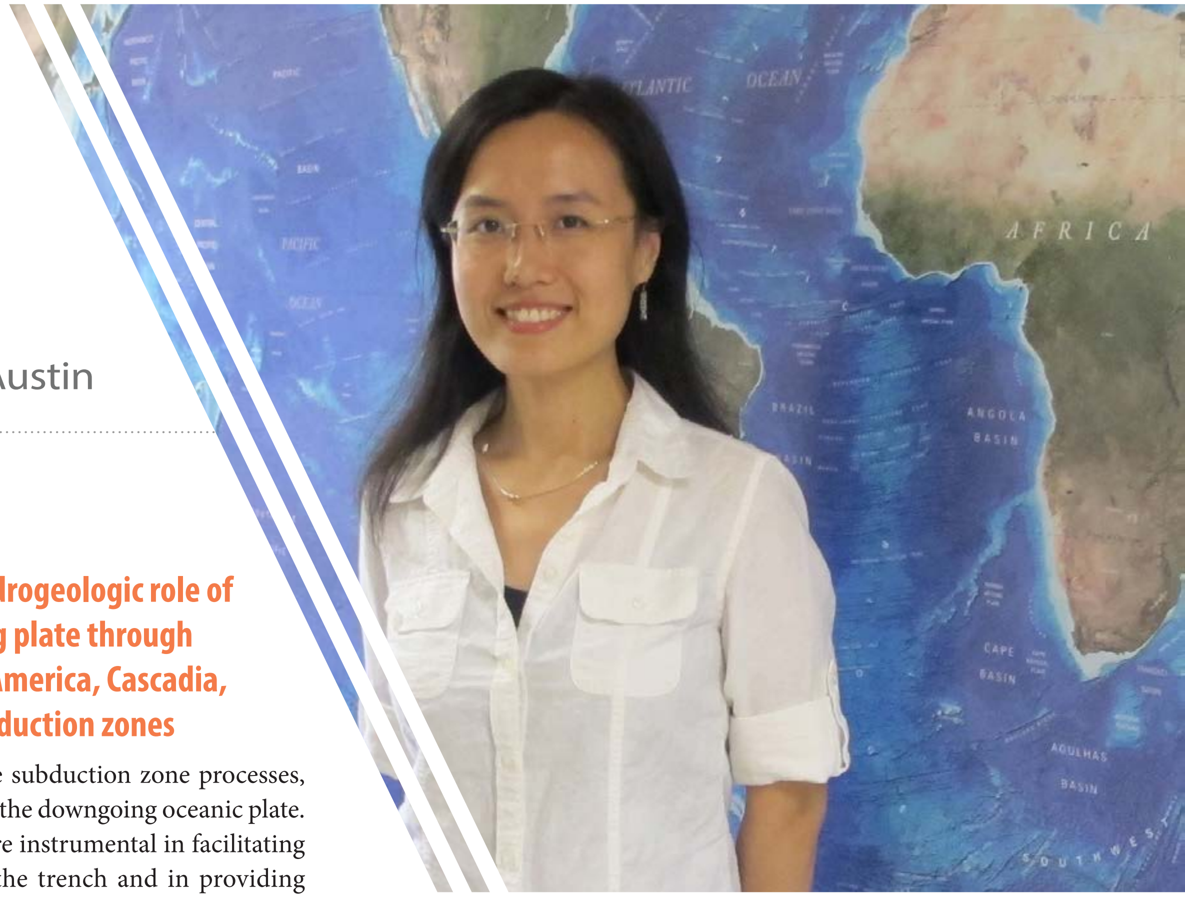
Tamara Jeppson

Texas A&M University

Experimental investigations on the deformation behavior of sediment in the shallow region of the Nankai, Sumatra, and Aleutian subduction zones

In general, the seismogenic zone is characterized by unstable slip while aseismic zones are characterized by stable slip. In the last decades, however, the discovered new modes of slip and observations of shallow coseismic slip to the trench have blurred the distinction between seismic and aseismic and suggest subduction zones are more complex than this simple model. Because the deformation behaviors of sediments have a strong influence on fault stability, magnitude of co-seismic slip, and a spectrum of slip behaviors in the shallow regions of subduction zones, characterizing and quantifying the full range of visco-elasto-plastic deformation behaviors of subduction zone sediments is essential to understand earthquake and fault mechanics in this environment.

I obtained my Bachelor of Science degrees in geology and physics from Utah State University. There I worked with Dr. James Evans on constraining the relationship between deformation and alteration observed in fault rocks and borehole geophysical measurements using data from the San Andreas Fault Observatory at Depth. I also worked with Dr. Anthony Lowry to determine if slow slip events occurred on the Wasatch Fault. As a result of these projects I became interested in understanding variations in the physical properties of fault zone rocks and their role in different fault slip behaviors. I continued to pursue this interest while working on my Master's and Doctoral degrees with Dr. Harold Tobin at the University of Wisconsin – Madison. There my research focused on characterizing the seismic velocity structure of plate boundary faults at multiple scales. My work on drill core samples from the Japan Trench frontal prism lead to a collaboration with Dr. Eric Dunham's group at Stanford University and early results from that collaboration suggest that the presence of a compliant accretionary prism can lead to a significant increase in shallow coseismic slip and seafloor displacement. The results of my graduate research illustrated a need to better characterize the physical properties and deformation behaviors of the sediments that are present within the shallow region of subduction zones. Now at Texas A&M I am working with Dr. Hiroko Kitajima to define elastic, plastic and viscous deformation behaviors of shallow subduction zone materials by performing high-pressure and high-temperature consolidation and creep experiments on samples of incoming sediment obtained during ocean drilling projects at the Nankai, Aleutian, and Sumatra subduction zones. This work will address fundamental questions about and advance knowledge of strain accumulation, fault coupling, and slip behaviors in shallow subduction zones by providing new insights on sediment deformation at in-situ conditions over time and the mechanisms of earthquakes and co-seismic slip that occur in the shallow portion of plate boundary faults.



Shuoshuo Han

University of Texas at Austin

Investigation of the hydrogeologic role of faults in the downgoing plate through comparison of Central America, Cascadia, Nankai, and Alaska subduction zones

Fluid plays a key role in the subduction zone processes, and most of the fluid is from the downgoing oceanic plate. Faults in the oceanic plate are instrumental in facilitating deep plate hydration near the trench and in providing pathways for fluid migration during subduction. However, the internal structure and hydraulic conductivity of these faults and their variation over time and space have not been examined and quantified.

At Lamont-Doherty Earth Observatory, Columbia University, working with Suzanne Carbotte, I started my PhD research at the fast spreading mid-ocean ridge East Pacific Rise. Using 3D multi-channel seismic reflection data, I imaged a group of melt lenses beneath the ridge flanks and assessed the contribution of off-axis magmatism to crustal accretion. From this project, I became familiar with the structure and formation process of the oceanic crust. Then I participated in the Juan de Fuca Ridge-to-Trench project, during which I imaged the detailed structure of the Juan de Fuca plate from its formation at the Juan de Fuca ridge to prior to subduction at the Cascadia subduction zone. In particular, I characterized the faulting deformation in this young oceanic plate and found deep-cutting faults formed offshore Oregon in response to subduction bending, but are absent offshore Washington. This more extensive bend-faulting deformation offshore Oregon correlates with the higher degree of plate hydration determined from coincident seismic refraction data, and has important implications for seismicity at the Cascadia subduction zone. Through this project, I got interested in understanding how fluid is transported into the deeper part of the oceanic plate through faults, and this motivated my GeoPRISMS postdoc study.

Now at the Institute for Geophysics at the University of Texas at Austin, I am working with Nathan Bangs to investigate the hydrogeological role of faults in the downgoing oceanic plate. The reflections from the fault planes in the oceanic crust and uppermost mantle, although only observed in a few locations so far, provide windows for us to probe the internal structure of these faults. Through waveform modeling and inversion of the fault plane reflections, I constrain the impedance, and from these I estimate the porosity and water content within the fault zones. I also use depth imaging to characterize the distribution and larger-scale geometry of these faults. By comparing downgoing plates of different subduction zones, I hope to understand the dependence of fault structure on parameters such as plate age, bending curvature, and fault offset, and explore the limit of plate hydration through these faults. In addition, using accurate seismic velocity determined from depth imaging, I examine the consolidation state of sediments above the oceanic plate, another major fluid source, so that I can have a fuller view of the fluid input into subduction zones.

Megan Newcombe
Columbia University

Magma ascent and eruption in the Aleutian arc

The links between precursory signals of volcanic eruptions (as inferred from seismic and geodetic data) and eruptive style are poorly understood. Factors that are thought to play a role in controlling the vigor of a volcanic eruption include the volatile content of the magma, the depth of vapor-melt segregation, the ascent and mass transfer rate of the magma in the volcanic conduit, and the thermal history of the magma. These parameters are difficult to measure directly; however, they can be inferred a posteriori from analyses of erupted materials, and this is the main goal of my GeoPRISMS postdoctoral project at the Lamont-Doherty Earth Observatory.

My interest in basaltic volcanism began during my undergraduate degree at the University of Cambridge, during which I had the opportunity to sample pillow-rim glasses in central Iceland. I analyzed olivine-hosted melt inclusions from the Icelandic glasses and I studied the extent to which their compositions could be influenced by post-entrapment diffusion. I then moved to Caltech for my PhD, where I transitioned to the study of basaltic volcanism on the Moon. I conducted experiments to determine the solubility and diffusivity of water in lunar basalt. Also during my PhD, I characterized chemical zonation in olivine-hosted melt inclusions and I developed a technique that uses this zonation to constrain the syneruptive thermal histories of the inclusions. One aspect of my GeoPRISMS postdoctoral work is the application of this method to explosive basaltic eruptions to determine whether their magmas increase or decrease in temperature during ascent through the conduit.

Over the course of my GeoPRISMS postdoctoral fellowship, I have measured gradients of water and other chemical species in erupted crystals and glasses from Aleutian arc volcanoes. These chemical gradients are signatures of magma ascent, degassing, and cooling. I am developing techniques for interpreting such chemical gradients that can be used to provide constraints on the ascent rates and thermal histories of magmas in the minutes to hours prior to their eruption. The ultimate goal of this approach is to provide a physical framework in which to place real-time volcano monitoring data.

GeoPRISMS Postdoctoral Fellowship

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

Apply to Sail with the Alaska Amphibious Community Seismic Experiment!




Deployment of the Alaska Amphibious Community Seismic Experiment (AACSE) kicks-off in May 2018. This major shoreline-crossing community experiment focuses on the subduction zone offshore the Alaska Peninsula, which has been the site of North America's largest recorded earthquakes as well as major volcanic hazards.

Beginning in May 2018, 75 broadband ocean bottom seismometers (OBS) and 30 land stations will be deployed for the 15-month experiment. The array covers a broad area that spans the incoming plate, the megathrust and volcanic arc to the distal backarc, with a dense trench-normal transect in the Kodiak region.

Apply to Sail

Graduate students and scientists at all career stages are invited to sail with two OBS deployment legs of the AACSE during the late spring and early summer of 2018. The project will collect OBS data from offshore part of southern Alaska. Both legs of the deployment expedition will be aboard the Global-Class R/V Sikuliaq. The PI team anticipates that berths for 5 to 7 additional students or scientists will be available on each leg. Travel costs to Seward, AK will be paid for Apply to Sail participants, but no stipend is included.

Cruise Dates

Leg 1: May 9 - May 29, 2018 (*arrive three days before departure*)
Leg 2: July 11 - July 25, 2018 (*arrive two days before departure*)

Students and scientists with a strong interest in learning field techniques and contributing to this community experiment are encouraged to seek additional information and apply for a position at:

http://geoprisms.org/research/community-projects/alaska/aacse-apply-sail/

Questions should be directed to the GeoPRISMS Office:
info@geoprisms.org
More information at:
http://geoprisms.org/research/community-projects/alaska/

Status Report on the GeoPRISMS Data Portal: November, 2017

Andrew Goodwillie and the IEDA Database Team

Lamont-Doherty Earth Observatory, Columbia University

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

East African Rift System

A new aeromagnetic total *magnetic intensity* grid for eastern Botswana was made available for download by Estella Atekwana, Folarin Kolawole, Tiyapo Ngwisanyi, and Elisha Shemang. The data set was used in their study of lithospheric initial rifting processes and is also accessible through GeoMapApp.

Aleutian Arc

As part of an integrated geochemical-geophysical study of the Aleutian arc Unimak-Cleveland corridor, headed by Diana Roman, Erik Hauri and Terry Plank, Cindy Werner's helicopter-derived analytical chemistry data for *volcanic trace gas emissions* at Mount Cleveland volcano is now available. Analyzed with a Multi-GAS system, the concentrations of CO_2, SO_2 and H_2S are described in Werner et al., 2017 and can be explored in GeoMapApp.

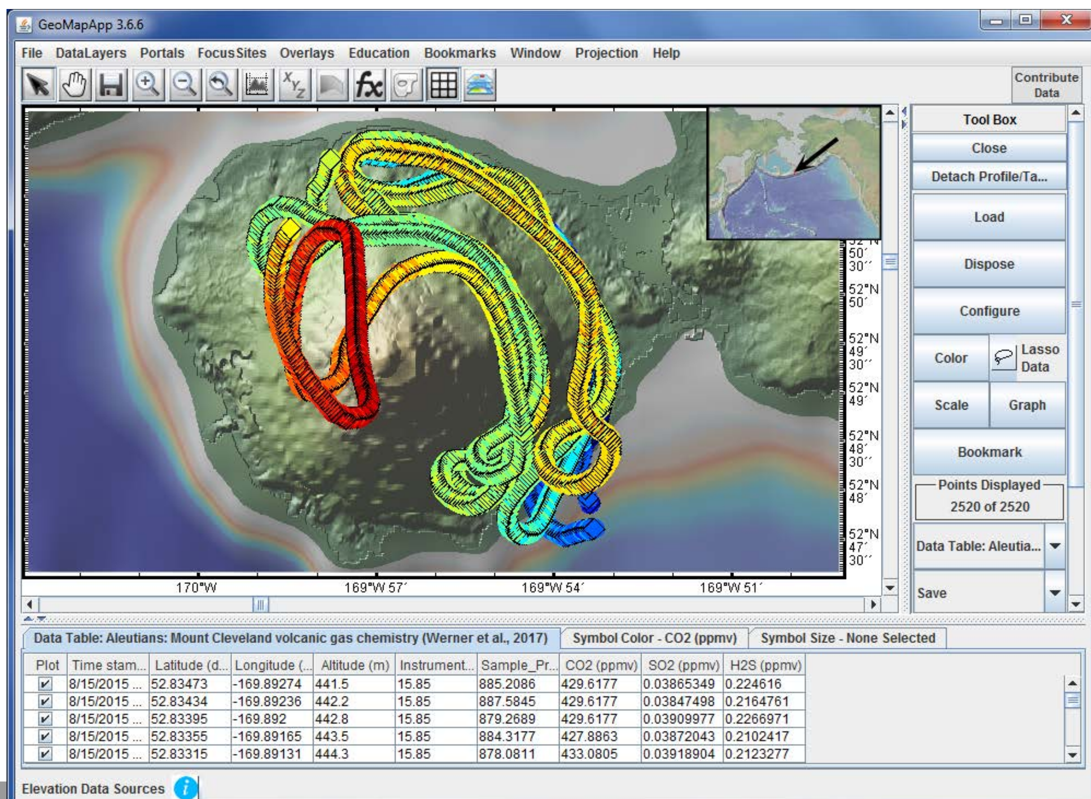


Figure 1. Werner et al. CO_2 trace gas concentration at Mount Cleveland volcano from a survey in August 2015. The data set is available in GeoMapApp under both the Geochemistry and Focus Sites menus. In this image the symbols indicate the helicopter flight path and have been coloured blue (low CO_2 concentration) to red (high).The background map is the Global Multi-Resolution Topography (GMRT) synthesis which incorporates the USGS NED land topography data for the Aleutian arc.

The GeoPRISMS Data Portal team is here to serve the community

Please contact us at info@marine-geo.org

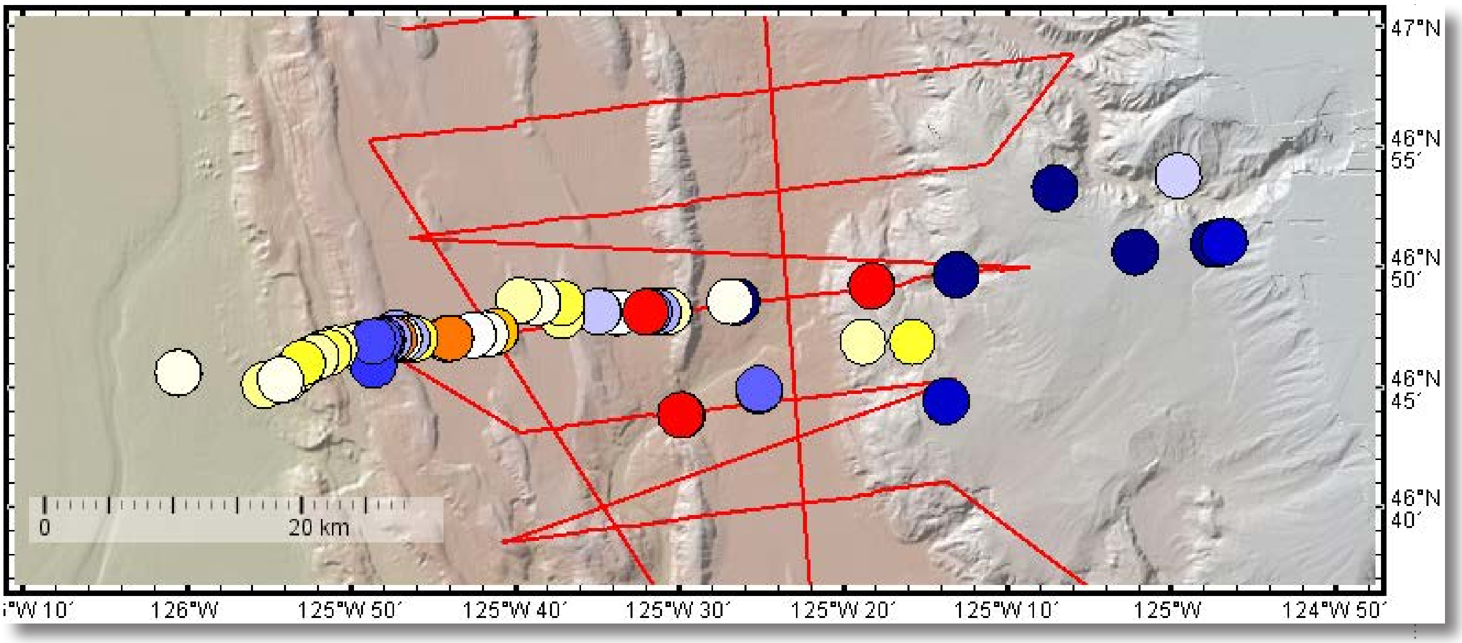


Figure 2. Shown as circles, Alvin probe seafloor heat flow data across part of the Cascadia margin is coloured according to heat flow value, from blue (low) through white, to red (high). The red track shows the location of BSR-derived heat flow values from MGL1212 multi-channel seismic profiles. The Global Multi-Resolution Topography (GMRT) synthesis forms the background bathymetry map. Image made with GeoMapApp. The data sets are accessible through the GeoMapApp menus.

Cascadia

Subduction zone *heat flow* data sets from H. Paul Johnson, Evan Solomon, Robert Harris and Marie Salmi were contributed for surface heat flow measurements collected during an R/V Atlantis cruise in 2013. These include heat flow data acquired with a multi-core logger as well as with thermal blankets and an Alvin heat flow probe that were deployed using the Jason II remotely-operated vehicle. The investigators also contributed the Salmi et al. 2017 heat flow data derived from Bottom-Simulating Reflectors (BSR) that were imaged using active-source multi-channel seismic data from the 2012 Cascadia Open Access Seismic Transects (COAST) survey. The BSR-related fieldwork was conducted along the southern Cascadia margin on R/V Langseth expedition MGL1212.

GeoPRISMS Data Portal Tools and Other Relevant IEDA Resources

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

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

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

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

GeoPRISMS Sessions of Interest at the 2017 AGU Fall Meeting

December 11-15, 2017 AGU Fall Meeting, New Orleans

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 to the GeoPRISMS Community. Please refer to the AGU meeting program to confirm date and time of sessions (*https://agu.confex.com/agu/fm17/meetingapp.cgi/Home/0*)

New Orleans Ernest N. Morial Convention Center

TECTONOPHYSICS

T11A. T14A. Eastern North American Margin: Multidisciplinary studies

Monday 8:00-12:20 (Poster Hall D-F)
Monday 16:00-18:00 (215-216)

Conveners: Xiaotao Yang (U of Massachusetts Amherst), Cong Li (U of Massachusetts Amherst), Michael L Williams (U of Massachusetts Amherst), Vadim L Levin (Rutgers U)

—

T11E. T12B. T23F. Subduction dynamics across the scales

Monday 08:00- 10:00 (211-213)
Monday 10:20-12:20 (211-213)
Monday 13:40-18:00 (Poster Hall D-F)

Conveners: Gabriele Morra (U of Louisiana at Lafayette), Emma Hill (Earth Observatory of Singapore), Thorsten W Becker (U of Texas at Austin), Ylona van Dinther (ETH Swiss Federal Institute of Technology Zurich)

—

T13F. T14B. T23A. Exploring the characteristics and dynamics of oceanic plates entering subduction zones

Monday 13:40-15:40 (211-213)
Monday 16:00-18:00 (211-213)
Tuesday 13:40-18:00 (Poster Hall D-F)

Conveners: Shuichi Kodaira (JAMSTEC) Douglas Wiens (Washington U in St Louis), Asuka Yamaguchi (U of Tokyo), John Naliboff (U of California Davis)

—

T21E. T22E. T23I. T31D. Subduction Top to Bottom 2, with a Caribbean flavor

Tuesday 8:00-10:00 (211-213)
Tuesday 10:20-12:20 (211-213)
Tuesday 13:40-15:40 (211-213)
Wednesday 8:00-12:20 (Poster Hall D-F)

Conveners: Gray E Bebout (Lehigh U), David W Scholl (USGS Geological Survey), Robert J Stern (Univ Texas Dallas), Philippe Agard (U Pierre and Marie Curie Paris VI)

—

T22B. T23B. Integrated view of the Gulf of California and adjacent western Mexico and U.S.A. plate boundary: Tectonics, geophysics, structure, volcanology, petrology, stratigraphy and sedimentology, paleontology, geomorphology, geochronology, ore deposits and hydrothermal vents, and marine geology

Tuesday 10:20-12:20 (208-209)
Tuesday 13:40-18:00 (Poster Hall D-F)

Conveners: Cathy Busby (U of California Davis), Raquel Negrete-Aranda (Centro de Investigación Científica y de Educación Superior de Ensenada), Joann M Stock (California Institute of Technology), Paul J Umhoefer (Northern Arizona University)

—

T22C. T23E. Role of preexisting structures on plate deformation in continental rifting and subduction zones

Tuesday 10:20-12:20 (206-207)
Tuesday 13:40-18:00 (Poster Hall D-F)

Conveners: Daniel A Laó-Dávila (Oklahoma State University), Estella A Atekwana (Oklahoma State University), Mohamed G Abdelsalam (Oklahoma State University)

—

T33B. T33F. Fluid migration through subduction zones: observations and the consequences on geodynamic processes and natural hazards

Wednesday 13:40-18:00 (Poster Hall D-F)
Wednesday 13:40-15:40 (211-213)

Conveners: Stephen Paul Hicks (U of Southampton), Lidong Bie (U of Liverpool), Andreas Rietbrock (U of Liverpool)

—

T41E. T51B. Breaking up is never easy: Why do some rifts fail and others succeed?

Thursday 8:00-10:00 (215-216)
Friday 8:00-12:20 (Poster Hall D-F)

Conveners: Zach Eilon (U of California Santa Barbara), Natalie J Accardo (Columbia U), James Muirhead (Syracuse U), D. Sarah Stamps (Virginia Polytechnic Institute and State University)

—

T42C. T43F. T51E. New insights on the Cascadia Subduction Zone from offshore and amphibious studies

Thursday 10:20-12:20 (210)
Thursday 13:40-15:40 (210)
Friday 8:00-12:20 (Poster Hall D-F)

Conveners: Helen A Janiszewski (Columbia U), William Bythewood Hawley (U of California Berkeley), Kerry Key (Institute of Geophysics and Planetary Physics La Jolla), Matthew James Cook (U of California, San Diego)

—

T44C. T51G. Transform plate boundaries: Mechanics and hazards

Thursday 16:00-18:00 (210)
Friday 8:00-12:20 (Poster Hall D-F)

Conveners: Maureen A L Walton (USGS Pacific Coastal and Marine Science Center Santa Cruz), Uri S Ten Brink (USGS Coastal and Marine Science Center Woods Hole), Nathaniel C Miller (USGS Coastal and Marine Science Center Woods Hole), Daniel S Brothers (USGS Pacific Coastal and Marine Science Center Santa Cruz)

T43D. T44A. T51C. T51D. T53B. T54B. Continental rifts and passive margins: Geology, geophysics, geodynamics

Thursday 13:40-15:40 (211-213)
Thursday 16:00-18:00 (211-213)
Friday 8:00-12:20 (Poster Hall D-F)
Friday 13:40-15:40 (211-213)
Friday 16:00-18:00 (211-213)

Conveners: Sascha Brune (Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences), W Roger Buck (Columbia U), Patricia Persaud (Louisiana State U), Gianreto Manatschal (U of Strasbourg)

SEISMOLOGY

S11D. S13A. Advances in full waveform modeling, inversion, and imaging

Monday 8:00-10:00 (222)
Monday 13:40-18:00 (Poster Hall D-F)

Conveners: Xueyang Bao (U of Rhode Island), Yang Shen (U of Rhode Island), Nian Wang (U of Rhode Island), Dmitry Borisov, (Princeton U)

—

S33C. S41E. S42A. Seismically surveying North America: synthesis and emerging ideas as USArray spans Alaska and the CCArray initiative builds momentum

Wednesday 13:40-18:00 (Poster Hall D-F)
Thursday 8:00-10:00 (220-221)
Thursday 10:20-12:20 (220-221)

Conveners: Brandon Schmandt (U of New Mexico), Scott Burdick (Wayne State U), Pascal Audet (U of Ottawa), Emily Hopper (Lamont -Doherty Earth Observatory)

STUDY OF THE EARTH'S DEEP INTERIOR

DI11A. DI13B. DI14A. Deep mantle dynamics and its surface expressions

Monday 8:00-12:20 (Poster Hall D-F)
Monday 13:40-15:40 (203-205)
Monday 16:00-18:00 (203-205)

Conveners: Mingming Li (Arizona State U, U of Colorado at Boulder), Lorenzo Colli (Ludwig Maximilians University of Munich), Keely Anne O'Farrell (U College London), Melanie Gerault (U Claude Bernard Lyon 1)

EARTH AND PLANETARY SURFACE PROCESSES

EP32A. EP33A. Reconstructing landscape dynamics and environmental signals from stratigraphy and relict landscapes

Wednesday 10:20-12:20 (352)
Wednesday 13:40-18:00 (Poster Hall D-F)

Conveners: Vamsi Ganti (Imperial College London), Kyle M Straub (Tulane University of Louisiana), Elizabeth A Hajek (Pennsylvania State U), Zoltan Sylvester (U of Texas at Austin)

OCEAN SCIENCES

OS53A. OS54A. Geological, oceanographic, and biological processes of the Western Pacific convergent margins and trenches

Friday 13:40-18:00 (Poster Hall D-F)
Friday 16:00-18:00 (278-279)

Conveners: Jian Lin (WHOI), Robert J Stern (U Texas Dallas), Yasuhiko Ohara (Hydrographic and Oceanographic Department of Japan), Chuanlun Zhang (Southern U of Science & Technology)

GeoPRISMS Data Portal

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

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

GeoPRISMS references database of relevant publications is now available:

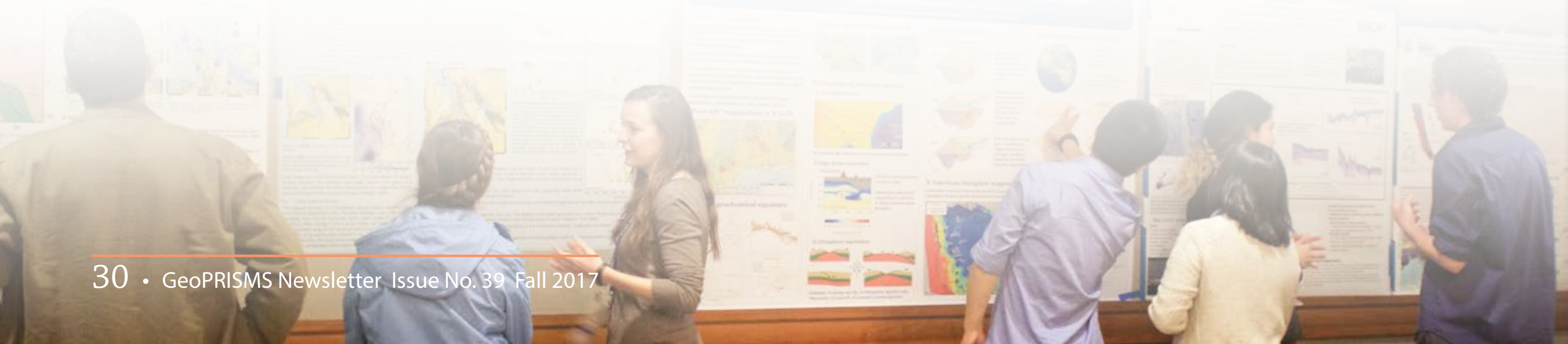
http://www.marine-geo.org/portals/geoprisms/references.php

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

GeoPRISMS Prize for Outstanding AGU Student Poster and Oral Presentations

The GeoPRISMS Program is offering two $500 prizes for Outstanding Student Presentations on GeoPRISMS- or MARGINS-related science at the AGU Fall Meeting in San Francisco, December 11-15, 2017.

The two prizes, one each for a poster and an oral presentation, will be awarded to highlight the important role of student research in accomplishing MARGINS- and GeoPRISMS-related science goals, and to encourage cross-disciplinary input.



GeoPRISMS Mini-Workshops at the AGU Fall Meeting 2017

Westin Canal Place, 100 Rue Iberville, New Orleans
Crescent Ballroom - 11th Floor

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

Sunday December 10, 2017 • 8 – 1pm

ENAM science advances: Progress and outlook

Conveners: Colton Lynner[1], Zach Eilon[2]

[1]University of Arizona, [2]UC Santa Barbara

This mini-workshop will focus on new results from investigations of the ENAM at a variety of scales, with a focus on research highlights and outstanding research questions that demand integration of multiple perspectives. Early-career (grad student & post-doc) contributions will be prioritized and there will be ample time to discuss a forward-looking approach to this community endeavour.

Speakers: Lara Wagner, Benjamin Murphy, Anne Bécel, Roger Buck

Sunday December 10, 2017 • 1:30 – 5pm

Early-career scientists/Faculty: Introduction to GeoPRISMS/MARGINS data resources, mini-lessons, and effective broader impacts

Conveners: Juli Morgan[1], Andrew Goodwillie[2]

[1]Rice University, [2]LDEO, Columbia University

Early-career scientists often seek help in generating ideas for successful broader impacts for proposals, in finding reliable sources of material for their class exercises, and in finding effective data tools relevant for their research and teaching. Hands-on demonstrations of useful data resources from the IEDA, IRIS, and UNAVCO data facilities will be tied to science through examples chosen from the MARGINS mini-lesson collection. Ideas for broader impacts will be discussed with an emphasis on compelling ways to broaden one's reach. Participants will also have time to explore their own questions and ideas for data-rich teaching opportunities, and gain experience with the data tools.

Speakers: Juli Morgan, Bob Stern, Eliza Richardson, Jeff Marshall, Jeff Ryan, Andrew Goodwillie, John Taber, Shelley Olds

Sunday December 10, 2017 • 5:30 – 9pm

Amphibious community experiments in Alaska and related opportunities

Conveners: Lindsay Worthington[1], Spahr Webb[2], Susan Schwartz[3], Emily Roland[4], Aubreya Adams[5], Geoff Abers[6]

[1]University of New Mexico, [2]LDEO, Columbia University, [3]UC Santa Cruz, [4]University of Washington, [5]Colgate University, [6]Cornell University

GeoPRISMS and EarthScope have chosen the Alaska-Aleutian subduction system as a focus of their science plans, emphasizing infrastructure such as the Transportable Array. In 2018 the Alaska Amphibious Seismic Community Experiment (AACSE) will be deployed across the Alaskan subduction interface and Aleutian arc, in the Alaska Peninsula region; This mini-workshop will communicate regional science goals and logistical plans for AACSE and a number of other concurrent projects in the region, with the aim of developing synergies and fostering further planning among the broader community. It will highlight opportunities for participation through the apply-to-sail and other educational programs, and opportunities for a regionally targeted, multi-disciplinary set of studies that would take advantage of AACSE and other infrastructure.

Speakers: Aubreya Adams, Geoff Abers, Emily Roland, John Paskievech, Shanshan Li

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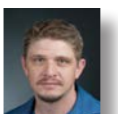

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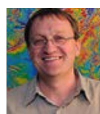

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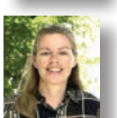

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The GeoPRISMS Office is hosted by the Pennsylvania State University in State College, PA. Demian Saffer (Chair, middle), Anaïs Férot (Science Coordinator, left), and Jo Ann Lehtihet (Admin Coordinator, right) in front of the Department of Geosciences in November 2016.

Meet the GeoPRISMS Staff

GeoPRISMS Chair

Demian is a Professor at The Pennsylvania State University, whose research focuses on the role of fluids in geologic processes, including the interaction between pore fluid pressure, rock and sediment deformation, fault zone processes, and regional transport of heat and solutes. He has worked extensively on fault zone drilling projects, including the San Andreas Fault Observatory at Depth (SAFOD) and Alpine Fault Deep Fault Drilling Projects, and has been heavily involved in Scientific Ocean Drilling Projects at the Costa Rican, Nankai, and Hikurangi subduction zones. Demian was the recipient of the 2005 GSA Donath medal, and the 2009 Alexander von Humboldt Foundation Friedrich Wilhelm Bessel Research Award. He has served on a number of advisory panels, including the IODP New Science Plan writing committee, the MARGINS successor program steering committee, the MARGINS steering committee, and the IODP science evaluation panel.

GeoPRISMS Science Coordinator

Anaïs was part of the GeoPRISMS Offices based at Rice University and the University of Michigan, and continues as the GeoPRISMS Science Coordinator for the Office hosted by Penn State, working from University of Oregon in Eugene. Anaïs assists the Chair of the Program, facilitates the communication with the science community, plans and organizes workshops. She maintains and develops the GeoPRISMS website and produces the newsletter. She manages the Education & Outreach activities, in particular the Distinguished Lectureship Program, and oversees GeoPRISMS social media engagement. Anaïs holds a PhD in Experimental Petrology from Université Blaise Pascal, France. She aimed at constraining the combined effects of pressure, temperature, and composition on water solubility in olivine and pyroxene under upper mantle conditions.

GeoPRISMS Administrator

Jo Ann supports the Chair and Science Coordinator in logistics planning, implementation and on-site support. She holds a BA in International Affairs from the George Washington University and has held private sector management positions in international student programs and the IC chip card industry. Prior to joining the Penn State Geosciences Department, she served as a public relations manager in the cable industry.

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US and international participants at the GeoPRISMS Theoretical and Experimental Institute for the RIE Initiative, held in Albuquerque, NM, in February 2017.