

NUHOU KANAKA PUKA

GG tackles Kilauea's uncertain future

Department of
GEOLOGY & GEOPHYSICS
University of Hawai'i,
Mānoa
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This issue is published in an electronic only format. The forests will benefit from this action.

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Nuhou Kanaka Puka

Nuhou Kanaka Puka ("Alumni News" in Hawaiian) is published by the Department of Geology and Geophysics of the School of Ocean and Earth Science and Technology (SOEST) for its alumni and friends.

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Figure 1. Streams of 'a'ā lava flowing across pali to coastal plain at Kalapana, July 8, 2016. Photograph, Hawaiian Volcano Observatory, USGS.

Geology and Geophysics is participating in a \$2.9 M, 6-university collaboration with the Volcano Hazards Program of the U.S. Geological Survey, studying volcanic crises at Kīlauea and Long Valley (California). The core of the study is to improve human relationships with 'restless', potentially dangerous, active volcanoes in the United States.

The study includes seven institutions: U.S. Geological Survey, University of Hawaii at Manoa, UC Berkeley, University of Washington, and Duke, and Marquette universities, led by University at Buffalo. It will link closely to agencies with formal responsibility for hazard science and assessment in Hawaii, via multiple interactions with state and county emergency management, and the National Disaster Preparedness Training Center.

Volcanic eruptions in this country are infrequent but long-lasting and high consequence events with multiple hazards (Figure 2). Amongst large geological hazards, they are almost unique in being preceded by weeks or months of clear precursors which offer the potential for successful early interventions. However eruptions are beset at all stages by high levels of uncertainty - aleatoric, epistemological, and ontological. Precursors, if interpreted accurately, can lead to successful intervention and hazard adjustments, but the uncertainties can turn events into crises and sometimes disasters. We are tackling the sources of uncertainty by focusing on two exceptionally long-lived crises in the USA.

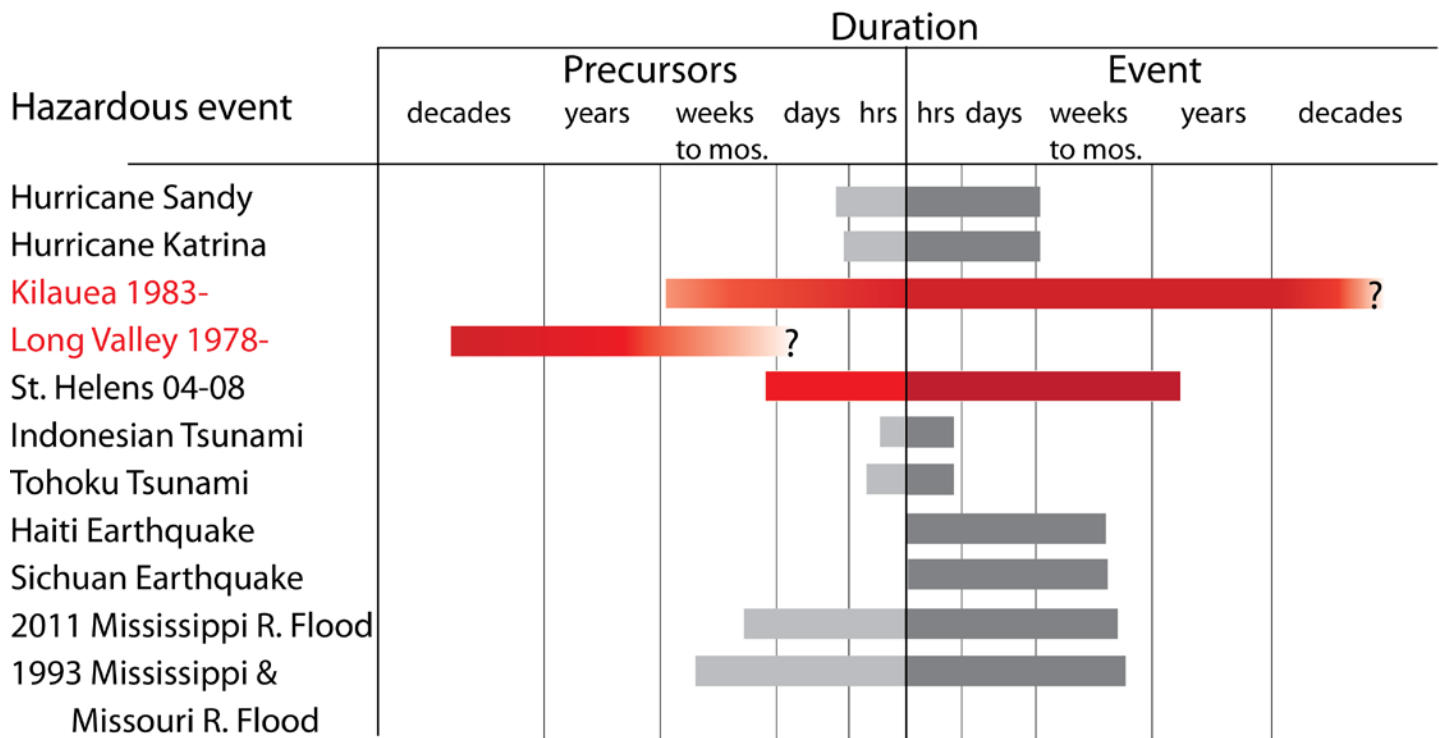


Figure 2. Contrasting durations of precursor phenomena unrest and events for (i) several recent large hazard events and (ii) three recent volcanic crises in the USA (red bars). The long period of unrest at volcanoes promotes awareness in neighboring communities but may also lead to complacency and reluctance to take mitigation action. The extended duration of eruptions causes chronic fatigue and funding issues for responding agencies.

Long Valley caldera (LVC), California formed 760 ka by a “super-eruption”. Eruptions over the past 100 ka have been localized along the Mono-Inyo Craters volcanic chain. The most recent period of unrest at LVC is commonly dated to the 4 October 1978 M 5.8 Wheeler Crest earthquake (Hill, 2006). Despite the lack of eruption, diffuse volcanic CO₂ emissions have claimed four lives since 1998, all related to asphyxiation. Long Valley also provides the only US example of an official notice of potential volcanic eruption that had serious economic impact, yet no eruption has occurred to date. In 1982 the notice resulted in a collapse of the economy of Mammoth Lakes, a ski-resort town within the caldera with ca. 5000 year-round residents at the time (c. 40,000 residents in peak skiing season). The long period of unrest that may or may not result in future eruption has thus already resulted in fatalities, environmental degradation and strain on local economies. This part of the study is coordinated by scientists at the University at Buffalo and the California Volcano Observatory (CalVO).

The current Kilauea eruption has continued for an almost unprecedented duration since 1983. The last precedent for this rare, prolonged event is the `Aila`au eruption, which lasted for approximately 60 years until 1470 AD, and was

followed immediately by collapse of the modern caldera (Swanson et al., 2012). The 1983-eruption has taken a complex form in which activity has switched between numerous vents and destroyed 212 homes and 14 kilometers of highway. Eruptions have extended from the summit for 30 km along the East Rift Zone. High emissions of sulfur dioxide and other gases have taken a prolonged toll on residents and crops, leading to a state of agricultural emergency in 2009. Perversely the activity has also created a surge in tourism linked to the eruptions. The Kilauea project is led by UH-Manoa and has four parts incorporating geoscience, behavioral sciences and Bayesian statistics.

Part 1: Lava behavior at Kilauea: The new flow east of Pu`u `O`o, that formed on May 24, 2016 (Figure 3) provides an unprecedented opportunity to study the complex behavior of pahoehoe flows with newly developed technologies in order to improve both monitoring tools and our general understanding of lava flow dynamics. In comparison to the June 27 lava flow of 2014-2015, this flow will give much greater understanding of why the pahoehoe behaves the way it does. Newly started, frequent mapping with thermal and visible-light cameras will allow us to address what drives the patterns of how

new lava is 'partitioned' across the growing flow between advancing the flow front, 'breaking-out' at the margins of the flows, and accumulating in the body of the flow by 'inflation'. The new flow to-date has retained a relatively simple geometry, but is ideal for this detailed state-of-

the-art investigation as it is traveling over variable slopes and known topography. Further, it is not affected by vegetation or ground cracks (vegetation and ground cracks greatly complicated the study of the June 27th flow).



Figure 3. A 'skylight' reveals a cross section through the tube of the eastern 2016 (61g) lava flow on June 23, 2016. RV Fisher Fellow **Sebastien Biasse** and HVO scientist (and UH alumnus) **Matt Patrick** for scale. Photograph. U.S.G.S.

Part 2: Magma ascent, storage and eruption:

The 1983-present eruption of Kīlauea has taken a complex form in which activity has switched between numerous vents, accompanied by significant variation in magma flux rates. Understanding these seemingly random changes is a complex scientific challenge, and also a major impediment to forecasting volcanic activity over even short time periods. Key unknowns include rates of magma supply, storage, and eruption, the volatile concentration of the magma, the volume of magma stored in Kīlauea's shallow magma plumbing system, and the mechanisms and rates at which these properties of the volcanic system may change with time.

A simple model of magma supply, storage, eruption, and degassing has been developed by USGS's Kyle Anderson and has proven useful for constraining magma supply rate (MSR) and the volatile content of Kīlauea primary magma during 2001-2006 (Figure 4). MSR and volatile content both play a fundamental role in governing eruptive behavior, so these constraints are critical in evaluating volcanic hazard. However, the current model is only applicable to steady-state volcanic activity prior to the 2008 onset of Kīlauea's summit eruption. A more sophisticated model (or models) of Kīlauea is being developed that will incorporate the contribution of extensive outgassing from the Halema'uma'u vent, transient processes, and other more complex behavior.

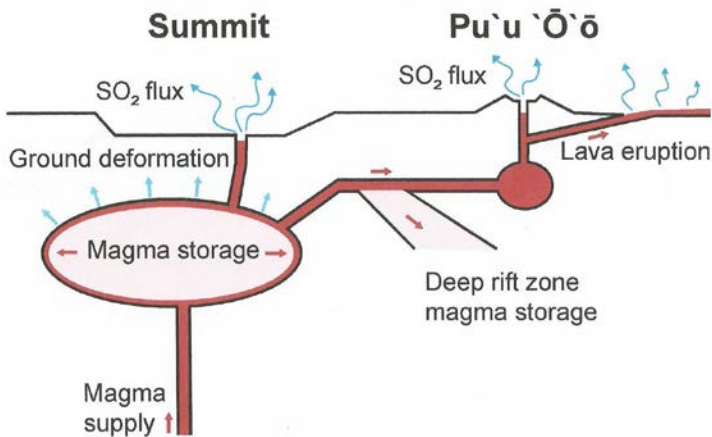


Figure 4. Schematic cross-section drawn through Kīlauea along the line of the East Rift Zone to show geometry of the conceptual model after Anderson and Poland (2016).

Task 3: Human influences in the volcanic crisis – Here **Chris Gregg** and **Mike Lindell** (1) assess the mental models used by individuals and key decision makers during crises, (2) conduct experiments to track patterns of dynamic

decision making in volcano emergencies, and (3) assess household preparedness at Kīlauea. Topic (1) addresses how limited knowledge about the most effective ways to communicate scientific uncertainty through verbal, numeric, and graphic methods impedes risk communication and identifies the misconceptions that contribute to inefficient organizational communication of risk information. In (2), *DynaSearch*, a computer process tracing program for dynamic decisions, will track how different individuals react differently and heed the same information about volcanic activity.

Task 4: Integration through statistical modeling – The disparate data sets from tasks 1, 2, and 3 will be drawn together via hierarchical Bayesian statistical models. As models become more complex, computation time increases, and because Bayesian statistical analyses may require millions of model solutions, problems may quickly become impracticable. Emulators make such problems tractable with a greatly reduced number of model solutions by using statistical methods to predict model outputs – and uncertainties – at other values. In general, emulators are broadly useful because of their capability to synthesize evidence from a whole suite of physical, statistical, and behavioral models in order to predict features of interest; these extend well outside of the subsurface realm to include the probability of a successful evacuation, or human or financial losses. In this way, we will simulate the entire sequence of the volcanic crisis.

A key ingredient of this project is recruitment of graduate students and young researchers into interdisciplinary research to train the next generation of volcanologists and hazard researchers in the United States. These individuals, known as R.V. Fisher Research Fellows, are splitting their time between a home university and either HVO or CalVO. The first UH fellows are postdoctoral fellow **Sebastien Biasse**, from Universite de Geneve, and PhD student **Nick Turner**.

Further Reading

Anderson, K.R. and Poland, M.P. 2016. Bayesian estimation of magma supply, storage, and eruption rates using a multiphysical volcano model: Kīlauea volcano, 2000–2012. *Earth and Planetary Science Letters*, 447: 161–171.

Bruce Houghton

Message from the Department Chair



Greetings all. I probably don't need to remind you that we live in interesting times. The impacts of human activities are showing up increasingly in water, soil, climate, and sea-level, political discourse is eroding public confidence in science, there is ever less public funding for public higher education, and technological advances are vastly enhancing the pursuit of science and democratization of its results. Geology has been an important discipline for centuries, unraveling the mysteries of Earth history and the resources found in the rock record, but now as it encompasses the broader fields of Geoscience, Earth Science, and Environmental Sciences, it takes center stage as the science that is also most relevant for understanding the role of human societies in shaping and being shaped by the natural world.

It is from this exciting and yet challenging context that I write about the past and upcoming academic years in the UHM department of Geology and Geophysics. Student numbers are up across the board in all of our programs and class evaluations demonstrate a high level of regard and appreciation for the work of our faculty in the classroom. Student achievement continues to be strong. With major renovations to our Geology BA degree now in place, we spent the last year thinking about the BS degree, exploring ways to modernize, expand, and adapt it to best meet the needs of our students and evolving workplace demands. We are looking into forming new partnerships and better exploiting current ones within SOEST and the UH system overall, to provide seamless pathway for students to join our undergraduate programs from both high school and the UH community college system. We are also working to put in

place better student recruitment and retention efforts to allow our undergraduate program to grow and to ensure the best student success that we can. Meanwhile, the GG MS and PhD programs are growing quickly, with a large group of incoming student this year (15!) and the MGeo program is maturing as it enters its third year with a couple of new students. Paul Wessel spearheaded a faculty effort to propose an NSF-REU (research experience for undergraduates) program this past year, which was successfully funded and will welcome its first class in summer 2017.

We also had a bumper crop of successful promotion and/or tenure applications last year (4!), with all of the applicants successfully passing this milestone. Join me in congratulating Associate Professors Bridget Smith-Konter and Jasper Konter, Professor Janet Becker, and Specialist Eric Hellebrand on their accomplishments and promotions. We also welcomed a new Department Administrator for GT this past year, Lily Shao, who is quickly becoming indispensably expert at all sorts of activities.

GG has long been a vibrant and productive place for education and research. We are also looking for new ways to fund our research and graduate students as diminished access to federal funding for science, particularly in the Earth Sciences, continues. As we approach the instructional and research challenges, we are striving to work more collaboratively and in new areas of research and instruction to hopefully emerge from the decade much stronger than we entered it.

We are very grateful to our friends and alumni for your continued financial support. Your gifts to our general and field trip funds have made a very real difference for our students and our program (for instance funding new projectors, computers, and the lion's share of our field trips). If you have not already done so, please consider a (tax deductible) contribution to one of the Department's funds (see the last page of this Newsletter for a copy of the form or click the "donate" button on the GG home page). Every bit you contribute directly helps our students. Thank you!

Please visit the GG website at www.soest.hawaii.edu/GG/ regularly for updates, job opportunities, special announcements, course listings, curricular plans for the next 5 years, information about our degree programs and profiles of GG members.

Finally, I would like to welcome our new and returning undergraduate and graduate students, and wish them all success in the coming years.

Ken Rubin, Chair

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Message from the UH Foundation

To the Geology & Geophysics 'Ohana,

It is with joy and appreciation that I come to the end of my first year of fundraising for the School of Ocean and Earth Science and Technology. The research SOEST is doing is world-changing and the education it provides is world-class, so it is no surprise that SOEST is ranked in the top 20 geosciences schools worldwide. What a pleasure to build support for such an outstanding institution.

It has been a particular pleasure of mine to get to know the Department of Geology & Geophysics. I have seen amazing generosity from G&G alumni, as well as from non-alumni who are excited about the work G&G is doing. They have many good reasons to be excited, as G&G has some of the most exciting and progressive degree and research programs at UH.

I thank all of you who have donated to and supported G&G over the years, both from within and outside of the department, including Janet Haggerty, Mike Jackson, Stephen Leslie, Ralph Moberly and Pat Chun-Moberly, and Mark and Jo

Ann Schindler. I also want to take this opportunity to mention that a few years ago three G&G faculty members gave up a full month of salary to help the department over a budget shortfall. It is a pleasure to fundraise for a school where the quality of the education and research is matched only by the generosity of the same faculty and staff doing the work.

Finally, I want to extend my warmest aloha to you all, and an invitation to reach out to me at any time. I would love to meet you to see the ways G&G is making its mark on the world through your efforts and your lives. And as always, I invite you to support the department so it can continue its work of educating and training the coming generations of earth, environmental, and planetary scientists: <https://giving.uhfoundation.org/funds/12077204>.

Mahalo nui loa for your support!

Jana M. Light (for the UH Foundation)

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Degrees, Awards & Honors

Undergraduates

Lindsey Howard	BS Summer 2015
Eva Kakone	BS Summer 2015
Tanis Leonhardi	BS Summer 2015
Jeffrey Murl	BS Summer 2015
Zachary Olds	BS Summer 2015
Brian James	BS Fall 2015
Travis Takashima	BS Fall 2015
Jean Pierre Bourquin	BA Spring 2016
Lhiberty Pagaduan	BA Spring 2016
Celeste "Kanani" Pali	BA Spring 2016
Christopher Burman	BS Spring 2016
Wendy Cockshell	BS Spring 2016
Ryan Hendrix	BS Spring 2016
Logan Magad-Weiss	BS Spring 2016
Trista Mckenzie	BS Spring 2016
Warren Mckenzie	BS Spring 2016
Bryant Quinonez Servin	BS Spring 2016
Diamond Tachera	BS Spring 2016

Masters of Science

James Bishop – Thesis: *Effect of Land Use and Groundwater Flow Path on Submarine Groundwater Discharge Nutrient Flux.* (Advisor: C. Glenn, Summer 2015).

Katie Taladay – Thesis: *A 3-Dimensional Analysis and Assessment of the Natural Gas Hydrate System in the Kumano Forearc Basin, offshore Japan, from NanTroSEIZE Drilling and 3D Seismic Data.* (Advisor: G. Moore, Summer 2015).

Christopher Shuler – Thesis: *Source Partitioning of Anthropogenic Groundwater Nitrogen in a Mixed-use Landscape, Tutuila, American Samoa.* (Advisor: A. El-Kadi, Spring 2016).

Laura Corley – *Lunar Olivine Exposures: Origins and Mechanisms of Transport.* (Advisor: J. Gillis-Davis, Spring 2016).

Shellie Habel – *Modeling Sea Level Rise Induced Groundwater Inundation in Waikiki, Kakaako and Moililil, Oahu.* (Advisor: C. Fletcher, Spring 2016).

MGeo- Masters in Geoscience

David Waller - Advisor: G. Apuzen-Ito, Fall 2015.

Jeffrey Murl - Advisor: A. El-Kadi, Spring 2016.

Doctor of Philosophy

Christine Jilly – *Timescales and Conditions for the Aqueous Alteration of Chondrites.* (Advisor: G. Huss Summer 2015).

Myriam Telus – *Developing the ^{60}Fe - ^{60}Ni System for Early Solar System Chronology.* (Advisor: G. Huss Summer 2015).

Tim Orr – *Studies of Recent Eruptive Phenomena at Kilauea Volcano.* (Advisor: B. Houghton, Fall 2015).

Brian Boston – *Plate to Backstop: A Geophysical Investigation of Two Japanese Subduction Zones, from the Outer Rise to the Forearc Slope.* (Advisor: G. Moore, Fall 2015).

Maria Janebo – *Historical Explosive Eruptions of Hekla and Askja Volcanoes, Iceland: Eruption Dynamics and Source Parameters.* (Advisor: B. Houghton, Spring 2016).

Jonathan Weiss – *The Bolivian Sub Andes and Beyond: Linking Wedge Deformation Processes Across Multiple Timescales.* (Advisor: J. Foster, Spring 2016).

Student Awards



Agatin Abbott Memorial Award

Presented to the outstanding senior, annually, in memory of department faculty Agatin Abbott.

Wendy Cockshell

Fred M. Bullard Fellowship

Endowed by Thais Freda Bullard in memory of her father, Fred M. Bullard, a pioneer in the studies of Volcanology and general Geology & Geophysics. **Xiaojing Lai** and **Kendra Lynn**

J. Watumull Scholarship

Awarded annually to the department's outstanding graduate student from an endowment from the Watumull Foundation.
Xiaojing Lai

ARCS Award

Awarded by the Achievement Rewards for College Scientist Foundation. **Emily First**

Other Fellowship, Scholarships & Awards

2016 UH Graduate Student Organization Awards: Estelle Bonny, Haunani Kane, Brett Walker, and Samantha Weaver.

Faculty – Promotions, Awards & Honors

Janet Becker - 2016 Professor, Promotion

Eric Hellebrand - 2016 Specialist, Promotion & Tenure

Bridget Konter - 2016 Associate Professor, Promotion & Tenure

Jasper Konter - 2016 Associate Professor, Promotion & Tenure

Michael Garcia - 2016 Fellow Mineralogical Society of America.

1st Place in the American Geophysical Union Virtual Poster Showcase



Trista McKenzie, a senior geology student from University of Hawai'i at Manoa, won first place at the 2016 spring Virtual Poster Showcase (VPS). Trista won for her project, "Quantifying Atmospheric Fallout of Fukushima-derived Radioactive Isotopes in the Hawaiian Islands."

Virtual Poster Showcase is a multi-society showcase sponsored by the American Geophysical Union, Geological Society of America, American Geosciences Institute, the American Meteorological Society, and the Council on Undergraduate Research. VPS is the resulting effort of AGU, with help from its partners, to reduce the funding and travel barriers that limit traditional research presentation opportunities for Earth and space science students. Students participating in VPS undergo a preliminary review by other student participants, and the top ranked submissions in each division are evaluated by a panel of experts.

"Promising Earth and space students represent the next generation in leading-edge scientific research and discovery. VPS gives these students the opportunity to share their research and make connections with peers around the world and experienced scientists in their discipline without being cost prohibitive," said Christine McEntee, AGU's Executive Director and CEO. "Congratulations to [Trista] and this year's VPS winners on their recognition."

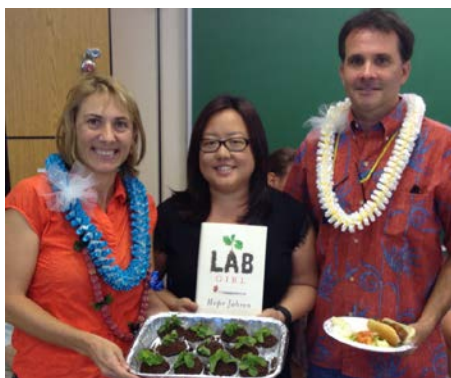
1st Place in Best Student Poster Competition at the Geological Society of America Annual Meeting



Congratulations to GG graduate student **Shellie Habel**, who won first place in the best student poster competition at the Geological Society of America 2015 annual meeting, for her study on beach replenishment, "Monitoring the 2012 Waikiki beach nourishment project, Oahu, Hawaii."

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Congratulations **Hope Jahren** for your publication of a National Best Seller, *Lab Girl*.

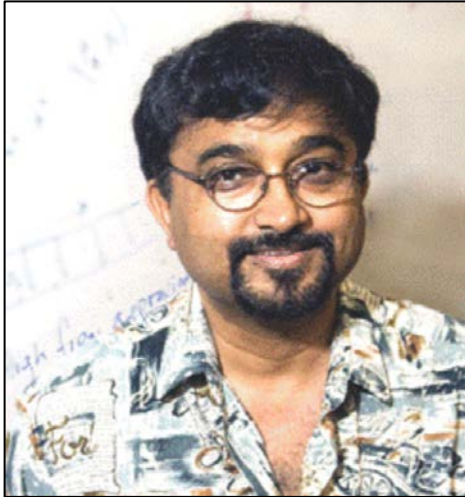


Hope Jahren, Audrey Kakehi and Bill Hagopian.



Robyn Honnaka, Kim Okazaki, Hope Jahren and Audrey Kakehi.

Distinguished Graduate Alumnus



An occasional feature of this newsletter is the Distinguished Graduate Alumnus Award, which honors a grad whose subsequent career has inspired us with its productivity in research or education, or both. **Mrinal K. Sen**, our DGA this year, sets a very high bar in this regard, both nationally and internationally.

Mrinal graduated from the Indian School of Mines with the B.Sc (1977), and M.Sc. (1979). After working in the petroleum exploration industry for several years, he entered our PhD program, finishing in 1987. Following two more years in industry, this time in California, Mrinal joined the Institute for Geophysics in the University of Texas at Austin. His current UT position is a split appointment with the Institute for Geophysics and the Department of Geological Sciences in the Jackson school of Geosciences, where he is the John and Katherine G. Jackson Endowed Chair in Applied Seismology.

In his twenty-five years (so far) at UT, Mrinal has supervised over fifty doctoral and post-doctoral students, created five courses in geophysics, authored a textbook that was

nominated for an award, co-authored another widely used textbook that is now in its second edition at Cambridge University Press, taught twenty-seven industry short courses, and authored or co-authored sixteen book chapters and over two hundred journal articles.

As you might expect, Mrinal has received many awards: the Jackson School of Geosciences Joseph C. Walter award for research excellence (2007); the School's Distinguished Educator Award (2015); the Decentennial Gold Medal of the Indian Geophysical Union (2012), the Hari Narayan Award of the Geological Society of India (2013), and Honorary membership in the Society of Exploration Geophysicists (2015) "for extraordinary contributions as a geophysicist, educator and author."

Several pages would be needed to list Mrinal's contributions in the category of professional service, so I'll mention only one: For a two-year period beginning in 2012, he served as Director of the National Geophysical Research Institute of India, an institution with a staff of 550 including 150 research scientists; i.e., it is roughly the size of all the research institutes in SOEST combined.

Along the way, Mrinal and his wife Alo, now a senior systems analyst for the State of Texas, somehow found time to raise two accomplished children, Amrita and Ayon. In 2016 Amrita completed her PhD at Stanford in (surprise) geophysics, and in 2012 Ayon graduated from Caltech in (surprise again) applied and computational Math.

Mahalo nui loa, Mrinal and Alo, for your inspiring contributions: to science, to education, to industry, to your native land, and to the next generation of scientists in America.

* * *

2015-2016 GG Research and Teaching Highlights

Garrett Apuzen-Ito taught GG312 this past fall. You may have known the course as "Geomathematics" (remember Cramer's Rule? and I hope you've recently had the opportunity to solve a non-linear ODE) but it is now entitled "Advanced Mathematics for Scientists and Engineers". Garrett continues to work on geothermal energy prospecting in Hawaii with **Nicole Lautze** (PI to the DOE grant and GG alumnus) and **Neil Frazer**. **David Waller** analyzed well-water chemical indicators of geothermal alteration for this project and for his MGeo work project (MGeo is the new Masters in Geoscience for Professionals degree: see http://www.soest.hawaii.edu/GG/academics/g_g_mgeo.html). Congratulations David for being the first graduate of the MGeo degree program! Garrett also advised **Jonathan Weiss** for the third chapter of his dissertation. Jonathan used numerical models to simulate thrust faulting and the growth of mountain belts. This work nicely complimented his other two chapters which emphasized seismology and GPS studies of the Andes with Ben Brooks (now at USGS Menlo Park) and **James Foster** (HIGP research and GG alumnus). Congratulations to Jonathan for a wonderfully successful defense. Jonathan is moving on to a post-doc position at Leeds University. We will miss him! Finally congratulations to **Sam Howell** for publishing his first two Ph.D. chapters: one is a novel use of GPS data to determine the pattern of uplift

associated with earthquakes in southern California (with **Bridget-Smith Konter** and **Neil Frazer**), and the other is a study of multibeam bathymetry to quantify the amount of magmatic versus tectonic extension on the Chile Ridge (with myself, **Fernando Martinez** and others).

During the 2015-2016 academic year, **Janet Becker** advised **Ksenia Trifonova** for her professional Masters of Geoscience (MGeo) degree. For her internship, Ksenia worked with Dr. Severine Busquet of HNEI assessing the effects of environmental conditions on the electric performance of two types of photovoltaic modules from data collected through the Holmes Hall Green Initiative. Janet published her observational and theoretical study of infragravity waves generated by breakpoint forcing on steep reefs in JGR, and began examining the climatological effects on extreme shoreline water levels at Ipan, Guam from a ten-year time series of wave and water level observations collected through the PILOT project. On a personal note, Janet's oldest daughter received her PhD in physical oceanography from the MIT/WHOI joint program.

Clint Conrad and his research group have had an active year developing a number of different research topics that relate to planetary convection, seafloor processes, and sea level change.

Visiting graduate student **Emeline Veit** joined the research group for the summer of 2015, and developed a project studying the impact of recent groundwater depletion on spatial patterns of sea level rise. This work suggests that rates of sea level rise should be slower near areas with intense groundwater depletion, such as California and India. Indeed, tide gauges in both California and India exhibited rates of sea level rise during the past century that were slower than the global average. This work should be important for helping coastal communities evaluate their exposure to future sea level change.

Graduate student **Harrison Togia** defended his Master's thesis on the evolution of Hawaiian swell topography in the spring of 2015. In this thesis, Harrison placed new constraints on the time history of Hawaiian Plume buoyancy flux that are useful for understanding the history and dynamics of the Hawaiian Plume. Harrison is



Garrett Apuzen-Ito was invited to attend a series of workshops on "Magma in the Mantle" at the Isaac Newton Institute of Mathematics, University of Cambridge UK. With his family, Kahlil, Sekai and Nia at Stonehenge.

currently teaching at the University of Hawaii West Oahu, and is preparing his master's thesis for publication.

Graduate student **C. Evan Watkins** defended his Master's thesis in the summer of 2016. For his research, Evan examined asymmetries in the bathymetric expression of mid-ocean ridges, and found that they can be explained by dynamic topography, which is the topographic deflection of Earth's surface across thousands of kilometers by convection in the Earth's mantle. In particular, Evan found that both the Mid-Atlantic Ridge and the East Pacific Rise are tilting slightly toward South America, which is consistent with mantle flow models that predict subsidence above mantle downwelling associated with subduction of the Nazca plate. Evan was also able to show that long-wavelength dynamic topography deflects the surface by only about ~500 m, approximately half of what numerical models predict. This suggests that mantle flow might be less vigorous than previously thought.

Finally, Clint will be bringing Aloha to Norway in the coming years, after he relocates to University of Oslo during the summer of 2016. Although he is looking forward to a new adventure, Clint will greatly miss Hawaii and so many wonderful colleagues here in G&G! Mahalo to the G&G Ohana for eight memorable, productive, and thoroughly enjoyable years!

Henrietta Dulai has been working with graduate students **Christina Richardson**, who studies the effects of submarine groundwater

discharge on coastal carbon chemistry, and visiting student **Camille Vautier**, who studies tidal flushing of sandy beach berms as a source of nutrients. Both students will graduate with an MS degree in the summer of 2016. Undergraduates **Hannah Azouz** and **Trista McKenzie** worked on their senior theses on Fukushima-derived radionuclides in fish and soil in the Hawaiian Islands. The group also continued their collaboration with **Aly El-Kadi** and **Craig Glenn** on water resources in Tutuila, American Samoa spearheaded by students **Chris Shuler** and undergraduate **Eric Welch**.

For **Robert Dunn**, last year saw the culmination of several research projects, resulting in the publication of 3 sole-author and 5 co-authored papers, including one in the journal Nature. He has been working on a variety of topics that span the tectonic and magmatic evolution of mid-ocean ridges, arc-backarc systems, and hotspots; he also developed a method for imaging the ocean's internal structure using reverberated acoustic waves. He and former student **Dana Brodie** published a paper on baleen whale calls recorded on ocean-bottom seismometers. This year Robert is looking to new directions, and is pursuing ideas for new oceanographic cruises/studies in the Havre-Kermadec subduction system with **Deborah Eason**, **Fernando Martinez**, and a group from USC and New Zealand. Meanwhile he is working on developing methods for seismic imaging of anisotropic earth structure in 3-D, and finishing

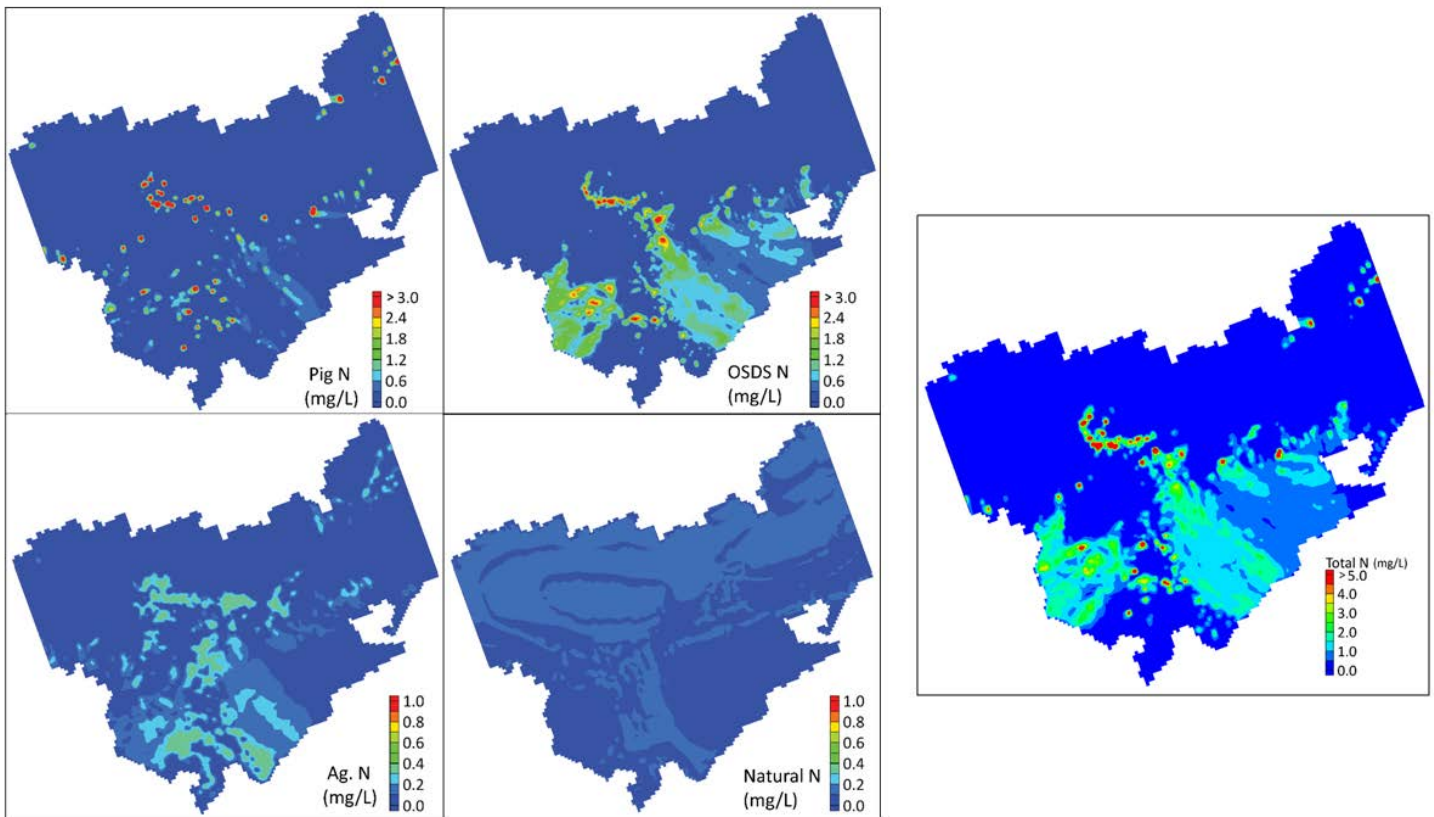


GG455 field trip to Halawa Shaft.

work on his MARINER geophysical experiment (Mid-Atlantic Ridge) with former postdoc **Ryuta Arai** and colleagues at WHOI. Ph.D. student **Silke Ballmer** is finishing her work on seismic imaging of Hawaii Island structure. Robert has presented his work in recent seminars around the world, with talks in Paris, Montpellier, Yokohama, and Scotland.

The Hydrology Group, namely, **Dr. Aly El-Kadi**, **Olkeba Tolessa Leta** (postdoctoral fellow), and **Christopher Shuler** (graduate research assistant) has been assessing the sustainability of water resources on Oahu, Hawaii, and Tutuila, American Samoa. Water resources in tropical volcanic islands are under stress due to many factors, including limited useable water amid competing demands. The sustainability of these resources is often challenged by issues such as drought, salt-water intrusion, and anthropogenic contamination. Our research is progressing on Oahu and Tutuila at a number of sites on each. The criteria for each study are aligned with the nature of the problems at hand and the issues related to management of water resources. Sites on Oahu include the Heeia Watershed where

land-use changes towards cultural restoration are the motivation for the study. On the other hand, surface water harvesting in the Nuuanu area watersheds necessitates a study to assess the visibility of the project, the amounts captured and a strategy for operations. In such an endeavor, surface water captured in a reservoir is injected into the subsurface as a means for water conservation. Suitability issues on a third site on Tutuila are mainly related to water quality, mostly due to impacts of agricultural chemicals and waste storage facilities. Identifying the relative contributions of various sources to groundwater contamination is the main objective for planning a best management strategy to improve on water quality. The figure below shows that On Site Disposal Systems (OSDS) contribute significantly more total nitrogen (TN) to the aquifer than other sources, and thus should be prioritized in future water quality management efforts. Finally, the water budget of the Fagaalu Watershed on Tutuila is examined for use in assessing potential ocean contamination by terrestrial sources. Climate change and variability are integral parts of these studies.



Nitrogen Concentrations due to various sources (4 left-side plots) and the total from all sources (right-side plot). (Provisional results).

During 2015-16, **Neil Frazer** had the pleasure of working with terrific colleagues and students in a variety of fields, including coastal processes, geothermal exploration, tsunami prediction, mesophotic coral occurrence, and epidemiology.

Eric Gaidos is continuing his research on planets around other stars (exoplanets), motivated by what can be learned about the formation of rocky planets like the Earth and the potential for habitable planets and life elsewhere. His team launched the Zodiacal Exoplanets in Time (ZEIT) project, which is discovering and characterizing planets around stars that are much younger or older than the Sun, allowing the evolution of planets to be studied. The team uses data from the NASA Kepler space telescope, as well as several of the telescopes on Mauna Kea. Eric is spending the summer in Bern, Switzerland as a guest professor at the Center for Space & Habitability at the University of Bern and the International Space Studies Institute. He was awarded a Fulbright Fellowship for the fall semester at the University of Vienna.

Michael Garcia's research group focuses on Hawaiian volcanoes. **Jonathan Tree** is finishing up a study of lavas from the leeward Hawaiian Islands (from the bend in the Hawaiian-Emperor Chain to Middlebank). His research shows that the dramatic variation in size of these volcanoes is related to their mantle melting temperatures. **Kendra Lynn** is studying olivine, the most common mineral in Hawaiian lavas. She is examining chemical zoning as a tool to understand magmatic processes including the timescales of crustal storage, especially for the explosive deposits from Kilauea. She has made 3 trips to Singapore to obtain laser ablation ICPMS data for trace elements to complement her UHM electron microprobe results. She will be going to Japan in June to present her results to the Goldschmidt Congress. **Brett Walker** (first year MS) has just completed field work on the east rift zone of Kilauea, around Napau Crater, collecting lavas to assess why so many eruptions have occurred in this area and to evaluate the petrology of the 2011 eruption. She was assisted by Kendra, Mike and **Tim Orr** (MS 2015 - HVO). We were extremely lucky to fly out to the field site just a few hours after the start of two new fissure eruptions on the Pu'u 'Ō'ō cone.

Mike is currently working on a paper to address the controversy about the age of Kilauea. His new high precision age data for rocks from the 1.6 km deep drill hole on Kilauea's east

rift zone show that Kilauea is much older (at least 150,000 years) than previously thought. He is continuing research on the two, ongoing, longer-term Kilauea eruptions (Pu'u 'Ō'ō since 1983, summit since 2008) using petrology and geochemistry to evaluate crustal and mantle processes. NSF just released a video of his work on Kilauea

https://www.nsf.gov/news/special_reports/science_nation/hawaiiivolcanoes.jsp Mike just published a paper on Kaula, the forgotten main Hawaiian Island volcano that is a US military bombing target. This paper is part of a special issue of a geochemistry journal that he edited in honor of retired MIT professor Fred Frey.



Photo of sideways basalt columns, taken at Puy de Sancy, near Le Mont-Dore, France.

Julia Hammer spent part of her sabbatical year as visiting professor at the Université Blaise Pascal, in Clermont-Ferrand, France. She caught up with GG and HIGP folks **Lucia Gurioli** and **Andrew Harris**, and participated in field trips to the 3.0 - 0.2 million year old volcanic terrain of France's Massif Central, and to several volcanoes of Italy, including Vesuvius, Campi Flegrei, Stromboli, and Vulcano. A highlight of the trip to Europe was participation in a summer school on magmatic processes at Santorini, Greece. A second major activity of the sabbatical was an international workshop and associated field excursion in the Chilean Andes in February, 2016, in which 18 U.S. and Chilean scientists and students, including GG graduate student, **Emily First**, collected dacite lava samples, drone imagery, and mafic scoria. The sample materials will sustain laboratory experiments and collaborative research into an enigmatic pair of 20th century eruptions from Volcán Quizapu, one



Emily First and collaborator, Philipp Ruprecht at Volcan Quizapu, Chile.

highly explosive and one benignly effusive, which occurred just 85 years apart and each produced 5 cubic kilometers of magma.

Jasper Konter's research this year has focused on applying non-traditional stable isotope measurements of iron to igneous rocks. With graduate student **Valerie Finlayson**, he worked on new technique development for improved measurement precision needed to identify the small signals in igneous systems (Finlayson et al., 2015; and ongoing work), while a collaboration with multiple other research groups resulted in the discovery of unusual iron isotope compositions in Samoan lavas (Konter et al., 2016). These data appear to indicate that the mantle source rocks in Samoa contain an unusual amount of pyroxenite. There is an on-going debate in the community regarding the presence and quantity of this type of rock in mantle sources, as they affect melting temperatures, melt generation, and magma composition. We have also been active in radiogenic isotope studies of the Tuvalu Islands and submarine volcanism in the Lau Basin. The work in the Tuvalu Islands measured for the first time the

volatile element make-up of mantle materials thought to have been generated from subduction, and work in the lab on the Tuvalu Islands is being finalized as part of Valerie's PhD work to trace the Rurutu hotspot back into the Western Pacific (with implications for plate motion). Samples from the Lau Basin, from the same cruise that visited Tuvalu, contain a complex history of the interaction of the northern end of the Tonga Trench and the nearby hotspot sources (Price et al., 2016). This summer Jasper was asked to serve as a lecturer in the national CIDER (Cooperative Institute for Dynamic Earth Research) summer workshop, and he will be participating as geologist on NOAA's Okeanos Explorer in an exploration mission around Wake Island.

Steve Martel is focusing his research efforts on the effects of topography on stresses in the Earth, which are proving to be remarkable. For example, a variety of observations and measurements indicate that topography can substantially affect the permeability in the subsurface. Steve is working with **Garrett Apuzen-Ito** and **Neil Frazer** in GG, and **Nicole**

Lautze in HIGP, to explore this effect and its implications for geothermal resources. Steve is also working to finish a pair of structural geology books with Dave Pollard. This fall he will lead a field trip to Kilauea for a national meeting of the Association of Engineering Geologists. The trip will be based on his regular GG303 field trip to the Big Island.

Greg Moore's group continued with studies of convergent margins in Japan and Myanmar. Graduate student **Katie Taladay** finished her MS thesis in the summer and submitted a paper on Gas Hydrates in the Nankai Trough to Earth and Planetary Science Letters. **Brian Boston** (PhD 2015) finished his Ph.D. in the Fall; one paper on the deep structure of the Nankai forearc was published in G-cubed and his second paper on the Japan forearc was submitted to EPSL. He began a post-doc at JAMSTEC in Yokohama, Japan on July 1st.

Greg spent much of the year away from Hawaii while on sabbatical. In the Fall, he was a Visiting Professor at the Earth Observatory of Singapore. He visited the Geological Survey of Indonesia, joined some field work on the Sagaing Fault in Myanmar, visited former Ph.D. student **Toshi Ike** in Ho Chi Minh City, Vietnam and presented talks at EOS, Chiang Mai University (Thailand), Dagon University (Myanmar) and at an industry meeting in Yangon, Myanmar. In the Spring, he was a Visiting Professor at GEOMAR, the German oceanographic institution in Kiel, Germany. In addition to working on a proposal and presenting talks and a short course at GEOMAR, he also spent time in northern Italy with Italian colleagues and visited Innsbruck University, Austria.

Brian Popp continues his isotope biogeochemical research focusing on nitrogen cycling in marine environments, marine food web studies and the marine mercury cycle. **Joy "Leilei" Shih** (Oceanography Ph.D. Student) is examining the importance of ammonia oxidation and denitrification associated with sponges on the nitrogen budget of reefs in Kaneohe Bay, Oahu. Joint with **Jeffrey Drazen** (UH Oceanography), **Cecelia Hannides** (G&G Assistant Researcher), **Kanesa Duncan Seraphin** (UH Sea Grant Center for Marine Science Education) and **Hilary Close** (UCSC/USGS) he is using amino acid compound specific nitrogen isotope analyses to study the trophic ecology of meso- and bathy-pelagic

organisms in the ocean north of Oahu. This group is also using trophic positions derived from isotopic analyses of amino acids to examine methylmercury bioaccumulation in pelagic fishes and zooplankton and, in combination with isotopic analysis of mercury (with Joel Blum, University of Michigan), he hopes to better constrain mercury cycling in the ocean. Check your local television schedule for the upcoming Voice of the Sea documentaries on these two projects. The first of his group's three TV episodes focused on mercury research in the food web recently won a Bronze Telly Award for Educational Television Programming!

For reasons unknown, **Scott Rowland's** contribution to last year's newsletter ended up on the cutting room floor and he would like to make sure that the G&G alumni who came to talk to our undergrads last year are recognized for taking time out of their busy schedules to give the undergraduates a sense of what to expect out in the so-called real world. Mahalo to **Lerma Gamiao** (BS 2013), a GIS technician for the US Army Corps of Engineering, **Pete LaPlaca** (BS 2004), a geologist at AECOM, and **Kingtak Wong** (BS 2013), a software engineer at Pono Health. Scott would also like you to know that G&G now offers a BA in Earth Science Education. If you know anyone who would like to be that great, nerdy, knows-a-lot-of-cool-stuff-and-goes-on-lots-of-fun-fieldtrips middle school or high school science teacher, this is the degree for them. We hope that once there are sufficient high-quality Earth Science teachers in local schools, their students will be inspired to become G&G majors.

Scott continues to work on Mars with Curiosity and in June was fortunate to go to Paris(!) for a rover-team meeting. While in France he visited briefly with ex-G&G-rs **Andy Harris** and **Lucia Gurioli**, both of whom are thriving in Clermont-Ferrand. In the Fall, he taught GG104 and GG461, and in the Spring, taught GG305 and GG460 (with Rob Wright). Photos from field trips with these classes can be found elsewhere in this newsletter. This year GG305 had 18 students in it, the largest class in recent memory. After the Mojave mapping was pau, we went to Zion instead of Death Valley. If you haven't been to Zion, you should go – it is an amazing place.



Jerma Gamiao, Pete LaPlaca and Kingtak Wong.

This year's trip received considerable support from two sources. First, grant money from Barbara Bruno (CMORE) fully supported two students, as well as the cost of the rental vans. Second, **Amy Kitchener** and **J.P. Bourquin** (BA 2016) obtained almost \$6000(!) from the Student Activities & Programs Fee Board, and it was added to the Geology Club support for travel. I would like to thank the GG101L TAs for their hard work the past three semesters: **Val Finlayson** (F15), **Shellie Habel** (S15), **Samantha Jacob** (S15), **Xiaojing Lai** (F15, S16), **Sam Mitchell** (S16), **Nicole Robinson** (S16), **Hannah Shelton** (S15), and **Jonathan Tree** (F15).

in the Department. Mahalo you three, for coming back to help.

Ken Rubin is managing to find some time for research in between his department chair duties. He and various UH and outside colleagues are working on active submarine volcanism, including the 2015 eruption of Axial Volcano in the NE Pacific Ocean (where this blurb is being written), deglacial sea level research in Hawaii, geochemistry of fossil animal teeth in China for paleoclimatological and anthropologic research, Geochronology of subaerial volcanism (such as recent unexpected activity at Tatun volcano in Taiwan), and a U-Th Geochronology Cyber-Infrastructure project. Last summer Ken spearheaded two successful Schmidt Ocean Institute proposals for seagoing research in Hawaii, the Line Islands and Tonga, and will spend most of Fall 2017 at sea in those locales. His first year as GG department chair has kept him busy.



Samantha Isgett, Alex Krause and Zac Olds.

This year the G&G graduates who returned to talk to current undergraduates about life after G&G were **Alex Krause** (BS 2015) and **Zac Olds** (BS 2015) of Enviro Services, and **Samantha Isgett** (BS 2010), who is pursuing her PhD here

Bridget Smith-Konter and her crustal deformation research group had an exciting and productive year. Bridget, along with Ph.D. student **Sam Howell** (first author) and **Neil Frazer** recently published (in Nature Geoscience) results from study that investigated anomalous vertical rates of ground motion in southern California associated with earthquake cycle loading. This study received quite a bit of media attention, including over 60,000 public views of the UH News webpage that hosted the press release for this published study. **Sam Howell**



Mānoa Elementary students interacting with the NSF- and UH-sponsored Active Earth kiosk, which hosts a collection of customized, interactive web pages with plate tectonics, earthquake, volcano, and tsunami educational content. The Active Earth kiosk is a great learning tool for children of all ages, emphasizing Earth Science educational content with a fun technology interface.

provided several radio and television interviews as well – way to go Sam! Bridget also worked with postdoctoral scientist **Arjun Aryal** on improving computational crustal deformation codes to better study faulting mechanics of recent earthquakes on the Big Island. Along with Ph.D. student **Marissa Cameron**, G&G major **Liliane Burkhard**, and JPL colleagues, Bridget's icy satellites research group embarked upon an exciting NASA-supported project to map strike-slip morphological features on the surface of Jupiter's largest moon, Ganymede, using high-resolution Galileo spacecraft imagery. The group has now completed the mapping of hundreds of fascinating fault structures and is preparing a manuscript for publication. We have also begun integrating these mapped structures into a global tidal stress model to investigate global mechanisms for the evolution of strike-slip faulting on Ganymede. In collaboration with other research colleagues at UTEP and Lowell Observatory, Bridget published two other papers: one on geoscience education and one on Halley's Comet. (A long, long time ago, Bridget participated in astronomical research!) On the educational front, Bridget focused most of her time teaching UH undergraduates, offering introductory courses GG105 (*Voyage through the Solar System*) and GG101 (*Dynamic Earth*). Also this year, Bridget and undergraduate **Liliane Burkhard** collaborated with teachers and

students at Manoa and Wai'ālae elementary schools to install an interactive *Active Earth* kiosk in each school's library. These IRIS-developed educational kiosks (FIGURE) were supported by an NSF-Career grant to help broaden public awareness and appreciation of the Earth sciences.



Paul Wessel spent much of last year writing proposals (well, it felt that way) but it has paid off and the coming year will be a busy one. Later this summer, the GMT (Generic Mapping Tools) team will have a Developer Summit at the Scripps Institution of Oceanography and among other tasks will add a postdoctoral candidate to the team, with the goal of developing a GMT/Python module during the coming year. The GMT/Python module will complement the GMT/MATLAB Toolbox to be released this year. Later in the fall we head to sea: With new student **Elizabeth Benyshek**, co-PI Anthony Koppers (OSU) and (if diplomacy can work its magic) former PhD student and present KIOST (S. Korea) post-doc **Mike Chandler** (MS 2006, PhD 2011) we will sail the R/V Kilo Moana across the Pacific to the Ellice Basin, a poorly mapped basin formed by seafloor spreading during the Cretaceous, and in the process splitting up the large Ontong Java Nui Plateau into three: the Ontong Java, Manihiki, and Hikurangi plateaus. We will map the central portion of the basin in an effort to identify the extinct spreading center and to obtain seafloor basalt samples for dating, as the entire basin was produced during the Cretaceous Quiet Zone (i.e., there will be no magnetic isochrons to guide us). Hoping to return by Christmas, it is then on to preparing for the new GG/SOEST Research Experience for Undergraduates (REU) program for the next summer when we will host 10 undergraduates for 9 weeks. Designated an NSF REU Site, we initially have funding for three years.

* * *

Alumni News

Arjun Aryal [PhD 2013] Arjun was born only a few miles away from the epicenter of the Gorkha earthquake in Nepal. In his district alone, more than 100 children lost their parents due to the earthquake. Arjun initiated a program to support these children to continue their education, and over 100 of them are now receiving financial support from the program, which will continue until they graduate from high school. Arjun is also leading a project to help rebuild earthquake-damaged schools in Nepal. For more information, email him at aryala@gmail.com.



Arjun Aryal with children orphaned by the 2015 Gorkha earthquake in Nepal.

John Bailey [MS 2001, PhD 2005] After moving to Alaska post-PhD, John spent most of the next decade as a postdoc and then faculty at the University of Alaska Fairbanks. In Fall 2013, he decided it was time for a career change, so he quit. Whilst teaching the remainder of the semester, John was recruited by Google to become program manager for their global Geo Education efforts to shape the role that Google Earth, Maps and Street View can play in the classroom. In February 2014, he moved to California and now works out of the mothership as part of the Google Earth Outreach team. His role has taken him to every continent, providing opportunities to maintain Alaskan and Hawaiian connections, the former by collecting Street View trekker footage as part of the Iditarod Sled Dog race and the latter by working with Polynesian Voyaging Society Education efforts supporting Hōkūle'a's Worldwide Voyage.



John Bailey as part of the Google Earth Outreach team, "Street View trekking." The world stops for a turtle selfie.

Jess Barnes [MS 2013] I'm doing some consulting work right now for smaller oil and gas companies in Houston. I'm getting ready to move to Perth in a couple months!

Jenn Beyer [BS 2012] I just started a PhD program at the University of Massachusetts, Amherst this past fall where my research is focused on the San Andreas fault system in southern California. I'm using numerical modeling and focal mechanism data from the earthquake catalog to gain more insight into the stresses on the faults, which in turn tells us more about earthquake potential. By determining which faults are active and which faults are most likely to rupture during the next large earthquake, we can better inform and prepare the community. When my head is not in a computer, I'm exploring New England with my furry partner in crime, Kelsie.



Jenn Beyer with Kelsie.



James Bishop and Natalie married in Santa Cruz.

James Marshall Bishop [MS 2015] Things have been going well, lots of changes for me. I moved to Santa Cruz, CA in August 2015 and have been working for the USGS. Initially I was working as a contract geologist at the USGS Santa Cruz working on coastal change to east coast barrier islands resulting from Hurricane Sandy.



James Bishop on a research cruise through San Francisco Bay.

Recently I converted to a federal employee and now work as a hydrologist at USGS Menlo Park studying contaminants in San Francisco Bay and the Sacramento Delta, primarily mercury and selenium.

Also, I married Natalie in April 2016!

Michael Chandler [PhD 2001] I moved to South Korea back in February for a postdoc job at KIOST (the Korea Institute of Ocean Science and Technology). The cost of living here is a lot lower than Honolulu's, mass transit is great, and taxes are really low, so I'm getting by quite easily here. In my free time I'm learning golfing, Korean language, and yoga, but I hope to find some water sports to involve myself in soon. I also continue to work on UH projects with **Paul Wessel** and **Brian Taylor**, and hope to join this Fall's Ellice Basin mapping expedition.

Sirit Coeppicus [MS 1999] People may wonder... what has been and is going on in Europe, in Germany with respect to refugees. If you want a quick insight, read on.

I started volunteering in August 2015 when the first groups of exhausted refugees arrived in my German hometown. A camp of 60 mattresses was quickly installed in the gymnasium of the school right next to my apartment. Those dark haired people, who arrived from different countries, were tired and not really "there" yet. After days of travel with small kids or elderly family members they were surprised and thankful for every single hug, every hesitant smile they received.

Those people had seen the worst and had now arrived in a country they did not know anything about. Germany donated clothes and toys and basics such as towels, soap and linen. After the first wave of hundreds of people, thousands followed in the next weeks and months. Organizational chaos hit the country. It was (and still is) too few translators, too much bureaucracy, too many diverse people undergoing registration,

first medical survey and treatment. Germany pays for housing, for transportation, for medical treatment, and for bursting kindergartens and schools. In a few weeks it learned how to support kids who had never seen a school, people who had never eaten what we eat and people whose beliefs are diverse and not necessarily similar to ours. I am still here helping but I don't call them refugees anymore. I call them my friends and family. And it is not me who invented that expression for them. It is they, thanking me from the bottom of their hearts for not judging them. They would have loved to stay in their home countries, but they did not have a choice.

One of my unforgettable rewards has been the gesture of two hands describing a heart in the air then pointing to their hearts and mine. Another: two weeks ago my seven-year old son and I were driving home from one of the camps: "Mom, that is so cool! We now got Syrian and Afghan friends. It is like having a large family". I had to pull the car over.

Ashton Flinders [MS 2009] I graduated, finally, with my PhD from University of Rhode Island. Just moved to Menlo Park to start a Mendenhall fellowship at USGS with CalVO, working on full waveform tomography of Mammoth Mountain and Long Valley.

Andy Goodliffe [PhD 1998] and **Denise Hills**. Denise has been at the Geological Survey of Alabama for 10 years now, and Director of Energy Investigations since November 2012. She has been busy publishing this year, too, including an article in AGU's Eos in December 2015, "The Importance of Data Set Provenance for Science". Another piece, "Oil sands in Alabama, USA: A fresh look at an emerging potential resource" will be out in the June issue of the Bulletin of Canadian Petroleum Geology; it examines how oil sands resources in Alabama compare to those in Alberta, Canada. Her research continues to focus on energy-related topics, with a focus on geologic carbon sequestration. Her group is just starting a project looking at sequestration potential in offshore reservoirs, which promises to be exciting. Denise also continues to promote data rescue and preservation efforts, both at the survey and beyond. Her contributions to these efforts have been recognized by listing as an EarthCube Distinguished Lecturer (more information on that program here: <http://earthcube.org/info/get-involved/earthcube-distinguished-lecturer-program>).

In January, Denise received the President's

Award from the Federation of Earth Science Information Partners (ESIP). This award recognizes a participant who has made significant contributions to ESIP during the previous year. ESIP is a non-profit, volunteer, and community-driven organization that has the goal to "Make Data Matter." More information about ESIP can be found at <http://esipfed.org>

Andy continues to divide his time between teaching and research in the Department of Geological Sciences and as Assistant Dean of the Graduate School at The University of Alabama. This past year he traveled extensively, including a trip to Thailand. His research continues to focus on applying geophysical techniques to tectonic problems, as well as science outreach and education. Andy again organized UA's Three Minute Thesis (3MT) competition, now in its 3rd year. He also organized the University's "Last Lecture" program. He will be teaching at the Cutting Edge workshop again this summer.

The kids are doing great. Kieran (born shortly before we left Hawai'i) just turned 13 and is entering his last year of middle school. Genevieve (who goes by Ginny, just like Ginny Weasley in Harry Potter) will be 10 soon. Both kids are enjoying school (especially science) and are growing up way too fast.

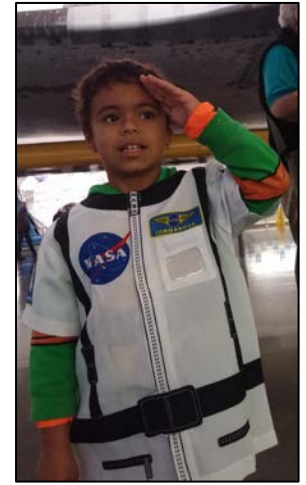


Ginny, Andy Goodliffe and Kieran.

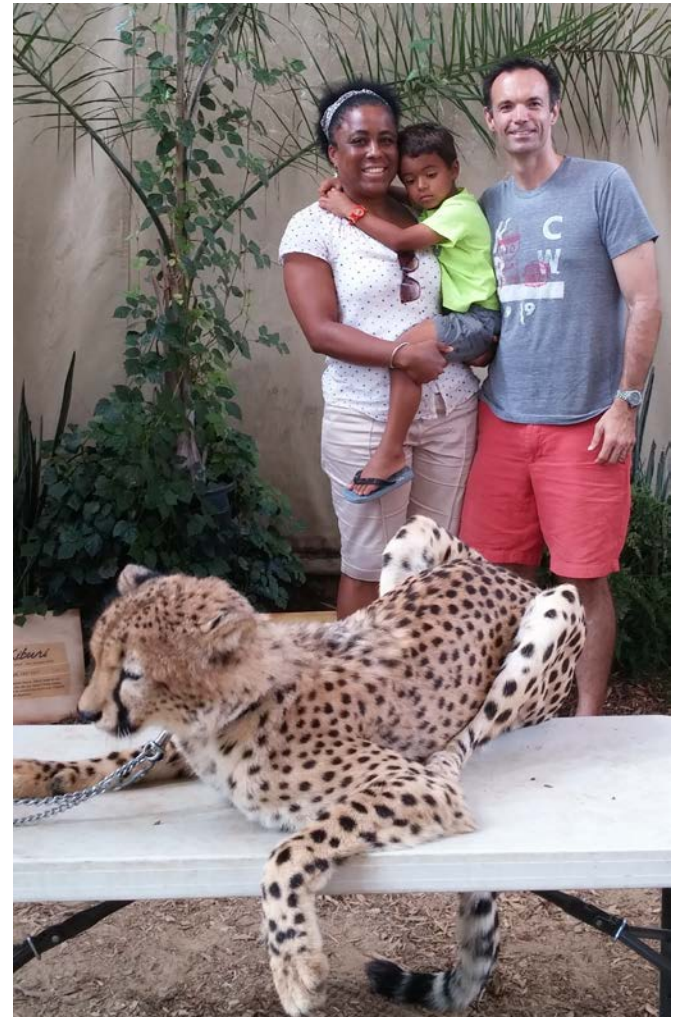
Emilie Grau [BS 2010] I've been working as a NOAA Pacific Island Regional Office fisheries observer since 2014. My days (& nights) at work involve recording catch and incidental protected species interaction data while aboard longline fishing vessels in order to promote the sustainability of our fisheries. Even though my career is centered around marine biology, I use

skills I learned from my UH geology classes (especially field techniques) every day, and am thankful to have been part of such a great college community.

The picture is of me about to release a Black-Footed Albatross after it had become accidentally hooked in the beak while attempting to eat a baited fishing hook behind the boat.



Ebitari Isoun-Larson and son Briggs.



Ebitari, Matthew and Briggs up close and personal with a cheetah!

Ebitari Isoun-Larsen [MS 2001] Still living in Long Beach, CA, Ebitari likes to visit the California Science Center with her son, Briggs, to see the Space Shuttle Endeavor. Briggs, who is 5, graduated from Preschool this year and will attend Kindergarten in the fall.

Ebitari continues to run her small business named Delta Data Services. She partners with, Zoho Corporation (named for its suite of online office products), emphasizing their Customer Relationship Management (CRM), Books, Sites and Campaign applications.

Ebitari took a short vacation with her family to the Safari Park in San Diego last year. Ebitari and Matthew are celebrating their 10-year wedding anniversary this year.

Alyson Joos [BS 2009] After receiving my MSc in Environmental Geology and Geohazards at the Univ. of Oslo, Norway, I joined DKSH Inc. North America (a multi-national distributor of raw materials). I am about to begin my third year as the Western Regional Sales Manager. I reside in

Moorpark, CA where my boyfriend, John, and I take part in many outdoor activities on weekends. In July, my family and I will travel to the border of England and Scotland to hike the 135km Hadrian's Wall Path.



John and Alyson visiting Lyme, England near his hometown of Lyminster in April 2016.

Tanis Leonhardi [BS 2015] I spent the first year of my PhD studies at UC Berkeley splitting time between experiments at the Advanced Light Source at Lawrence Berkeley National Lab and research on campus. I am currently using a combination of geophysics, condensed matter physics, and astrophysics to study volcanic stresses and the chemical and physical behavior of carbon under the extreme temperatures and pressures relevant to planetary interiors. My proposed research on volcanic stresses received an Honorable Mention for the 2016 National Science Foundation GRFP.

Floyd W. McCoy [BS 1962; MS 1965]

Another sabbatical leave is underway for this member of the department's first graduating class in geology. The respite from teaching at Windward CC - and from transferring students into G&G - is happening in Athens, Greece. Here I am focusing on the merger of the geosciences and archaeological sciences – geoarchaeology – as well as on publishing papers that have remained unfinished thanks to the teaching load at the CC's and to the magnificent bureaucracy of this university (try being department head or faculty senate chair sometime...). My work is at the imposing new facilities of the Wiener Laboratory for the Archaeological Sciences of the American School of Classical Studies at Athens [www.ascsa.edu.gr]. Daily life is a wonderfully stimulating blend of Mediterranean antiquity

(history, classics, language, philology, and more) with every aspect of science and engineering.

Tina (Mahina) Mueller [BA 2000] Worked with HMRG 1989-1999, then CMORE from 2009-2010. After spending the better part of 20 years in science, I left SOEST in 2010 to care for my mom, who has Alzheimer's. In this new season of my life I started my own two-part company Tina Mahina Media LLC, providing social media development for Hawaii's small businesses as well as Luxury family & couples portrait and event photography. I have been blessed to be a part some incredible Hawaii events: Hawaii Five-0 Red Carpet, Merrie Monarch Festival, Made In Hawaii Festival, and the Ukulele Festival to name a few. My favorite activity is creating custom artwork that becomes heirlooms of the families and couples I photograph. Visit me at MahinaStudios.com to see more of my work. Soon I will be heading back to Hawaii Island to capture Kilauea's new ocean entry. My love for lava will never die! There is life after Geology! My work has been featured locally, nationally, and internationally.



Tina Mueller.

If you are in the Washington, DC, area please stop by the Smithsonian's National Museum of the American Indian to see my image of the 'Iolani Palace Throne Room. The photo is part of their exhibit called E Mau Ke Ea: The Sovereign Hawaiian Nation, which opened on January 2016 and runs through January of 2017.



Everything with aloha... Tina Mahina. Photographer, Mahina Media.

Margaret Milman-Barris [MS 2002] A few years ago I traded the freeways of Los Angeles for the rural lanes of upstate NY and settled into a job with the environmental consulting firm FPM Remediations. I serve as site manager and senior geologist at impacted groundwater sites at federal facilities in Kentucky, Tennessee, and South Carolina. I just completed an effectiveness evaluation of past remedial activities at a karst groundwater site impacted by historical jet fuel releases, during which I got to get my data-managing, R-scripting hands nice and dirty. Brian and I have 3 daughters now, who are thankfully well and make us proud.

Kolja Rotzoll [PhD 2007] Not much has changed. I am still a post-doc at WRRC, working on grants from the USGS Pacific Islands Water Science Center, currently combining Python scripting with numerical groundwater modeling. If I count the total time working with the USGS, I come to my 10-year anniversary this summer!



Kolja Rotzoll, exploring hidden routes on the North Shore of Oahu.

Lindsey Spencer [BA 2012] Earlier this year, I received the prestigious title of "Mom." My boyfriend and I welcomed our first child, Sebastian "Bash" Kiyabu on March 29, 2016.



Proud parents of Sebastian, fondly known as "Bash".

Christine Waters [MS 2015] One month after grad school, I began working as a geologist for Amec Foster Wheeler, Environment and Infrastructure. Our company has offices around the globe and conducts activities on in a variety of geo-friendly arenas: oil and gas, environmental management, archeology, and mining. I am currently living and working on Kwajalein Island, in the Republic of the Marshall Islands, as the Diesel Contamination Specialist during construction of the U.S. Air Force "**Space Fence.**" The entire island is very small (only twice the size of the Ala Wai) and there are no personal vehicles, cell phones, or television channels outside the Armed Forces Network (AFN). It's a bit like being in the middle of nowhere. My job is diverse and 90% of my 60-hour weeks are spent in the field managing hazardous waste, coordinating waste characterization and transport, and mitigating preexisting groundwater and soil contamination at our sites. I also work hand-in-hand with an archeologist to manage, document, and curate historical artifacts during excavation activities on the island. Of the skills that I learned at college, I've found that mapping (soil stratigraphy and locating artifacts, contamination, and utilities) and sample collection and data management have been the most useful in my current job.

I must have fallen asleep during the Geology 101 lecture about bombs. I wish I hadn't! As the geologist, I am (along with the excavators) the first line of defense when we find unexploded ordinance (UXO) – and we find a lot! It has been my job to identify UXO, clear the work area, and

notify the island's explosive ordinance disposal team (EOD). I've found everything from 50-caliber bullets to 5-inch rounds to phosphorus grenades, artillery shells, and fuses. No one ever told me that a geologist could someday be a junior EOD!



Munitions.



Intact brass.

* * *



Aloha to **Clint Conrad**, **Hope Jahren** and **Bill Hagopian**. Both Hope and Clint are going to the University of Oslo, Norway, specifically the Center for Earth Evolution and Dynamics (CEED). Hope will be the J. Tuzo Wilson Professor at CEED and Clint will be Professor and Team Leader of the Earth Modeling Research Team, and Bill will be joining them in Oslo later this year.



Clint Conrad, Hope Jahren, Dave Karl, Henrietta Dulai and Janet Becker.

* * *

Field Trips



Looking for those perfect stones at Keawa'ula.



Learning about the importance of water from Eric Enos.



Many hours of pounding later ...



Wet group photo at Kalalau lookout, Kaua`i.



A windy rainy attempt to explain the geology of Kaua`i at Waimea canyon. Photo by Rajeev Nair.



Preparing for some wet service learning, Waipao.



Learning about traditional pa`akai (salt) cultivation, Hanapēpē.



This post-mapping jump photo was taken in the mapping area itself.



Mapping the twisted carbonates.



First day at Hanauma Bay, with kayak race offshore.



Big smiles after a day of Mojave mapping.



Whew! Made it down the steep part of the Angels' Landing trail in Zion National Park.



2016 GG460 students (+ Rob Wright) proudly showing off their final-project maps.



Nā wahine o GG460, out in the Ka`ū desert sands.



Many beverages were bet on whether the surface on either side of this sand-filled fissure is `a`ā, pāhoehoe with splatter, transitional lava, or what.



Nā kāne o GG460, ready to start the day.



Casey, Lhiberty, Shyun and Ryan sharing a laugh, (likely at their instructor's expense), on the 2014 Pāhoa lava flow.

* * *

Come Back to Hawai'i and G&G in May!

113TH ANNUAL GSA CORDILLERAN SECTION MEETING 23-25 MAY 2017, HAWAI'I CONVENTION CENTER

Meeting overview

The venue is the beautiful Hawai'i Convention Center in Honolulu, with guest rooms held at the nearby Ala Moana Hotel. Hotel rates are \$165-\$185 single or double. Come early and stay late, the meeting is the week before Memorial Day.

Program highlights include:

- 34 Topical Sessions, ranging from archaeological geology to volcanology
- 13 Pre- and Post-meeting Field Trips on the Big Island, Maui, O'ahu, and Kaua'i
- 6 Pre- and Post-meeting Scientific and Educational Short Courses and Workshops
- Special events, including the Schlemmer and Mann Student Mentoring Programs and three Geoscience Career Workshops, offer numerous opportunities for students and networking.
GG Alumni Mentors and Guest Speakers Are Needed!
- Icebreaker Blast in the Convention Center Rooftop Gardens, Monday May 22.

Meeting Website

<http://www.geosociety.org/Sections/cord/2017mtg/>

2017 GSA MEETING CHAIRS	
Chair:	Craig Glenn, glenn@soest.hawaii.edu
Co-Chairs:	Stephen Martel, smartel@hawaii.edu Ralph Moberly, ralph@soest.hawaii.edu
Technical Session Co-Chairs:	Henrietta Dulai, hdulaiov@hawaii.edu Greg Moore, gmoore@hawaii.edu Brian Popp, popp@hawaii.edu
Field Trip Co-Chairs:	Scott Rowland, scott@hawaii.edu Bruce Houghton, bhought@soest.hawaii.edu

See Meeting Flyer Next Page

Hawai'i Convention Center (*foreground*), Waikiki, and Diamond Head Crater.



HFA-Tor Johnson

HAWAII

GSA Cordilleran Section Meeting

HAWAII CONVENTION CENTER • HONOLULU HAWAII

23-25 May 2017



www.geosociety.org/Sections/cord/2017mtg/

Technical Sessions Planned

- Accretionary Prisms and Orogenic Wedges
- Plate Tectonics and the Cretaceous Quiet Zone
- Volcanology of Oceanic Islands and Volcanic Arcs
- Magmatic Processes and Sources of Hotspot Volcanoes
- Submarine Volcanism
- Volcanism Across the Solar System
- Science and Volcanic Hazard Communication in Hawaii
- Tsunami Hazards, Modeling, and the Geologic Record
- Using UAVs in Geology and Ocean Science
- Mineral Physics and Earth's Interior
- Engineering Geology
- Marine Minerals
- Geoarchaeology
- Paleomagnetism and Environmental Magnetism
- Pacific Coastal Processes
- Sedimentary Records of Coastal Evolution and Geologic Framework
- Impacts of Sea Level Rise on Pacific Shores
- Glacial Far-Field Sea Level Records
- Paleoclimatology: Modeling Past Climates
- Paleoecology, Paleogeography and Evolution of Pacific Marine Life
- Hydrology and Water Resource Assessment
- Land-Ocean Interactions: Natural and Anthropogenic Forcing
- Submarine Groundwater Discharge
- Coastal Aquifers and Sea Level Change
- Biogeochemistry of Sedimentary Carbonates: A Tribute to Bob Berner and John Morse
- Ocean Acidification – Past, Present, and Future: A Session to Honor the Work and Career of Fred T. Mackenzie



Pre- and Post-Meeting Short Courses

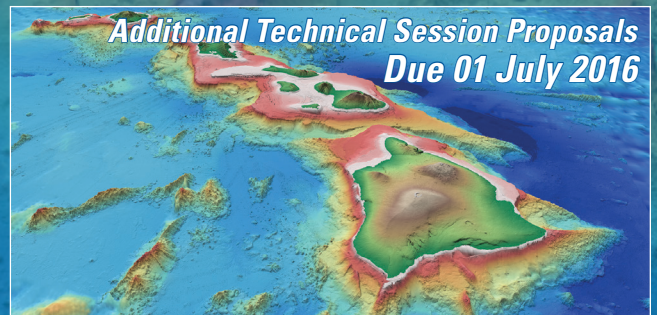
- GMT for Geologists
- Natural Hazards (FEMA)

Pre- and Post-Meeting Field Trips

- Explosive and Effusive Eruptions at the Summit of Kilauea
- Phreatomagmatic and Magmatic Explosive Deposits in Kilauea Caldera, 1500–1800 AD
- Structural Geology of Kilauea
- Paleotsunami Deposits, Island of Kaua'i
- Field Trips on the Islands of O'ahu, Kaua'i, and Maui

GSA Mentor Programs and Geoscience Workshops

- Roy J. Shlemon Mentor Program in Applied Geoscience Luncheon
- John Mann Mentors in Applied Hydrogeology Program Luncheon
- Geoscience Career Workshops



Contact

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY
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