School of Ocean and Earth Science and Technology

The Department of Earth Sciences

2013-2018
Academic Review
University of Hawai‘i at Mānoa

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Cover: The 2018 Maile Mentoring cohort used traditional motifs in making ceremonial kīhei.

4.0 The Department of Earth Sciences

1. What is the mission of the department? How do the mission and objectives align with the School/College, UH Mānoa, and UH System strategic plans?

The 2011–2015 Draft Strategic Plan for the University of Hawai‘i at Mānoa states "*As a land, sea, and space grant university, the University of Hawai`i at Mānoa is dedicated not only to academic and research excellence but also to serving with aloha the local, national and international communities around us. Tasking as its historic trust the Native Hawaiian values imbedded in the concepts of kuleana, ‘ohana, and ahupua’a that serve to remind us of our responsibilities to family, community, and the environment, Mānoa’s hallmark is a culture of community engagement that extends far beyond the classroom to bridge theory and practice, fostering creative and critical thinking, and promoting student’s intellectual growth and success as contributing members of society*". The plan also emphasizes that the goals are: a transformative teaching and learning environment; a global, leading research university; an engaged university; and facilitating excellence.

The Dean of the School of Ocean and Earth Science and Technology (SOEST) has written that the "*four-fold vision of the school is to: Advance understanding of the Ocean, Earth, and Planets; Provide world-class education; Foster a high-tech community; and Promote sustainable use of the environment*".

Regarding the Department of Earth Sciences (EARTH) his statement reads "*The purpose of the Department of Earth Sciences is to provide, through its faculty for instruction, research, and services, (a) a properly-taught undergraduate curriculum in geology and geophysics, including introduction, core, and advanced courses and laboratories, (b) conduct research and provide graduate-student instruction in scientific areas in which Hawai`i has certain natural advantages by virtue of its geography and existing faculty members, namely Hydrology, Engineering Geology, Marine Geology and Geophysics, Seismology and Solid Earth Geophysics, and Volcanology-Geochemistry-Petrology, and (c) provide public service in the earth and marine sciences at the local, national, Pacific-wide, and world-wide levels*."

In other words, the department's mission is an elaboration and extension of the School's, which expands from the School to the University as appropriate.

Students on a field trip visit the ash deposits at Lana'i Lookout.

2. What is the vision for the next five years? Discuss how planned or pending academic program actions fit within the vision.

In the area of instruction, we are shifting our introductory (i.e., 100 level) courses to on-line instruction in order to make our offerings more widely available nationally and within the islands of Hawaii and other Pacific Islands. This strategy has already resulted in a doubling of net enrollments (sum of on-line and in-person enrollments) from about 250 to 500 in such courses, compared to the previous five-year interval.

MS and PhD enrollments remain strong, with slight improvement over the past 5 years, but our professional master's (MGeo) degree has struggled with low enrollments, possibly because of currently robust economic conditions. Accordingly, we are in the process of terminating the MGeo and planning for a school-wide professional MS degree with our sister departments Oceanography, Meteorology, and Ocean Resources Engineering. In this program each department will offer different tracks but will share a central administration that is better equipped to handle outreach and marketing.

Following years of careful introspection and discussion we have taken the major step of changing our name from Geology and Geophysics to Earth Sciences. The main reason for this name change is (to be candid) that few local high school students know what the words geology and geophysics mean. We conjecture that the Greek roots of those words suggest arcane pursuits rather than the knowledge necessary to work on climate change, sea level rise, sustainable energy generation and the other pressing problems of our island state. However, the new name also better describes who we are and what we do.

At the time of this writing, University approval of the requested name change is only a few months old. We have just begun our updates of websites, course catalogs and the rest of our electronic presence. When this preliminary phase has concluded we will redouble our already significant outreach efforts in local high schools and make pathways for UH community college students with Associate Degrees in the Natural Sciences to enter directly into our major degree programs. We expect to complete curricula revisions including assessment implementations during a two-day department retreat in Spring of 2019. Our goal during the next five years is to double our undergraduate and graduate student populations via a coordinated effort in recruitment and advertisement.

In the area of research, recent and pending retirements have created an opportunity for the department to reinvigorate itself. We are currently conducting a search for an earthquake seismologist and have planned future strategic hires in the areas of Coastal Geology, Geohydrology, Geodesy and Crustal Deformation, and Physical Volcanology. These hires will help sustain our globally high rank in those fields and contribute to the planned increase in graduate student enrollment.

3. In what ways does the department foster a climate of respect for diversity of backgrounds, ideas, and perspectives among the faculty, staff and students? How are academic program decisions made? Is communication regarding campus and college priorities adequate?

The department selects new faculty and graduate students based on the academic merits of the applicant and the best fit into the department, but we explicitly strive to increase our diversity. For example, the majority of our graduate students are female, and the majority of our declared majors are female. Our young female faculty members (Henrietta Dulai in Geochemistry and Bridget Smith-Konter in Geophysics) have helped us considerably in this respect. In our pending hires we are making extraordinary efforts to field diverse candidates.

We believe that diversity within the faculty will foster respect for diversity at all levels. A weekly seminar series is in place, allowing faculty and visitors to the department to discuss their views and research, with an underlying code of behavior that a person's views are to be respected, even if not agreed with.

Communication within the department is excellent. Searches and hiring decisions undergo vigorous examination and discussion by all members of the department. Prior to advertising

new positions, faculty lunches are held as needed to make sure that our advertisements are appropriate with respect to diversity and discipline. Hires are made only after hearing the recommendations of the relevant standing committee followed by a faculty vote.

Historically department chairs have always forwarded communications from campus authorities to faculty, with a follow up discussion, if necessary, at faculty meetings. If communications relate to student issues, then undergraduate or graduate students are consulted through the Geology Club or the Graduate Student Organization (both are somewhat informal organizations run by the students).

Field trip experiences are an important part of the learning opportunities offered in the Department of Earth Sciences

4. What is the national/international reputation and/or ranking of the department? What are your areas of program distinction? Please include any program rankings, and the source of ranking (e.g., National Research Council). Is the department satisfied with the level of the ranking?

In 2018 US News ranked us internationally at #54 of 198 (73rd percentile), a modest improvement from #34 of 108 (69th percentile) in 2012. Specializations are not ranked by US News, but our areas of distinction include Geophysics, Coastal Geology and Volcanology.

US News ranks six professional disciplines at UH Mānoa, in the categories of Engineering, Environment and Ecology, Geosciences, Social Sciences and Public Health, Plant and Animal Science, and Space Science. UH Mānoa Geosciences scored 68 overall, while the mean overall score of five other disciplines was 44. Similarly, US News gives UH Mānoa Geosciences a Global Research Reputation Rank of 78, compared to a mean rank of 220 for the rest of the group. Of course, there is some satisfaction in these numbers, but we are more concerned with our international ranking. We are never satisfied with our ranking and seek continually to improve it, both by innovating and by generally doing things better.

5. Please identify peer programs at other U.S. institutions. How does the general quality of your programs compare with those of other institutions? What data support these comparisons?

From the US News rankings it appears this department is on a roughly equal footing with earth science departments at Oregon State University; Stony Brook University-SUNY; University of Illinois-Urbana-Champaign; and University of Oregon. It is difficult to make direct comparisons among these departments.

Table 1. Comparison of faculty, undergraduate, and graduate courses offered

	University of Hawai`i at Mānoa	Oregon State University	Stony Brook University	University of Illinois-Urbana	University of Oregon
Faculty	25	30	19	12	18
Undergrad course offered	40	75	36	38	38
Grad courses offered	48	73	63	21	37

Based on our ongoing surveys, >90% of our Bachelor's graduates are employed in their profession within three months of graduation. Many of our BS and BA graduates remain in Hawaii to work in environment-related specialties such as hydrology.

Thirty-four percent of our Masters students go on to PhD's; 47% are employed in geology related industries; 7% go into non-geology industries and 2% are unaccounted for.

Among PhD students, 70% find post-doc or faculty positions; 22% go into earth science industries, and 6% succeed as self-employed consultants.

1. Outline research productivity

Over the five-year period 2013 to 2017, Department of Earth Sciences faculty members have attracted more than $13.7M in new external funding (166 grants), and published ~160 first-authored papers (with an additional ~290 co-authored) in peer-reviewed journals or books. We have had 33,632 citations to our work since 2013. Faculty members' H-indices range from 13-58 for Professors, 13-37 for Associate Professors and 12 for our single Assistant Professor. Funding profile details are shown in Figure 1.

2. Describe efforts to generate research.

EARTH faculty are internationally recognized researchers in the Earth Sciences and have been successful in raising extramural funds for supporting their research. As of the writing of this report, in FY13-18, faculty members have received 187 grants as PIs, totaling $16.2M; most originate from the US National Science Foundation. In addition, many EARTH faculty members collaborate with SOEST researchers in other departments and institutes and are co-PIs on grants. Those grants will be listed under the PI's department or institution and are not counted here.

a. Grants, fellowships, awards, contracts

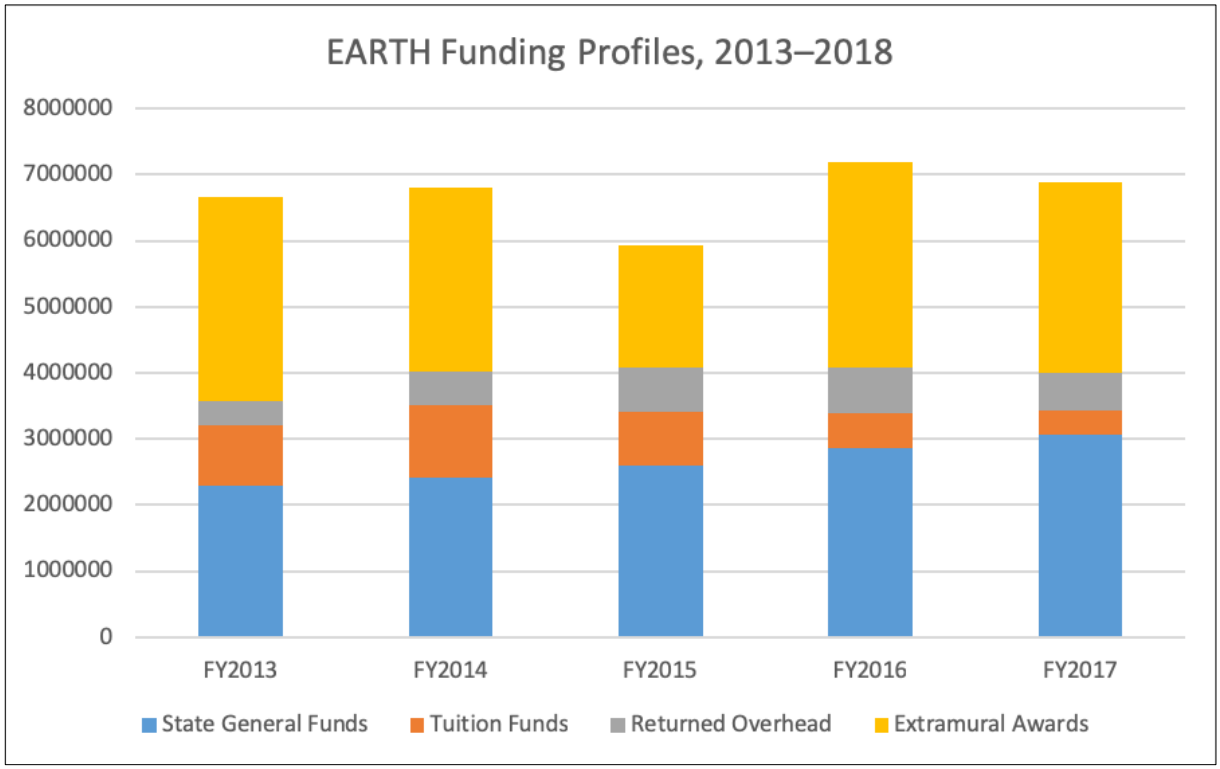


Figure 1. *EARTH funding profiles for the review period. A detailed summary of the grants received for each faculty member is included in the appendix. Average extramural awards per year is $2.75M. For FY2019 we are presently on track to exceed this average ($1.68M for the 4 months July–October) and are close to $18M and ~200 grants since last review.*

b. Explain increases or decreases over past 5 years

The extramural awards have averaged ~$2.75M over the review period. The temporary reduction in FY2015 does not seem to correlate with anything in particular, such as retirements or departures of faculty.

3. What is the average research, instructional, and service workload of faculty?

SOEST faculty are expected to spend approximately 40% of their time on teaching duties, 40% on research and 20% on service. EARTH faculty generally teach one course each

semester. All faculty advise/mentor graduate students, with their effort ranging from a few hours to several days per week, depending on the number of students (see Table 2 for further details).

4. To what extent are scholarship/research/creative activity linked to improvement of teaching and learning?

With such an active research program EARTH faculty often update the materials taught and methods of teaching in their courses to reflect the current trends in their fields. Prof. C. Fletcher produced two introductory textbooks on Physical Geology (now in its 3rd edition) and Climate change (now in its 2nd edition) as well as books specifically about local coastal Geology that are used in our classes.

a. Are library sources sufficient to support research and teaching?

Library resources are sufficient for teaching. For research, online journals are being used almost exclusively. While most of the important journals are accessible online through the UH library, many subscriptions are too restrictive in terms of the back dates available.

5. How effectively can department/institute balance expectations of research with teaching/mentoring?

Most EARTH faculty are generally successful in obtaining the right balance. They are able to spend the required time to be both successful teachers and successful researchers.

6. To what extent are adjunct faculty used in teaching? How are they engaged in assessment?

EARTH rarely uses adjunct faculty for teaching. An exception has been the recent use of Terry Naumann (University of Alaska) who introduced an online Physical Geology introductory course and helped several EARTH faculty members develop similar online curricula. EARTH faculty currently offer 2– 3 online Physical Geology sections each semester that consistently attract 50-100 students/section as well as an online Physical Geology Laboratory section (60 students/semester). All regular faculty members are strongly

committed to teaching and we are able to cover all of our current courses with regular faculty. We routinely survey students at the end of each term to receive input on how to improve each course.

7. Discuss recruitment and retention efforts. How connected to changing needs?

Since our program review in 2012, we made three new hires, one of which was a dual career partner hire (Smith-Konter and Konter) and the other a young scientist (Thomas Shea). While Shea is probationary tenure-track faculty, both Professors Smith-Konter and Konter have had successful applications for tenure and promotion during the review period. We have lost four faculty members to retirement (John Sinton) and other job opportunities (Hope Jahren, Clint Conrad, Janet Becker). The dual career couple Jahren/Conrad was recruited by the Center of Excellence for Earth Dynamics at the University of Oslo, Norway, while Becker and career partner Mark Merrifield (OCE, SOEST) were both recruited to positions at Scripps Institution of Oceanography (UCSD).

2018 Puna Eruption Volcanological research and graduate education combined during the response to the 2018 Kīlauea eruption. PhD student Brett Walker (shown below) joined front line field crews from HVO that tracked the lava flows (for County Civil Defense) and took advantage of the unique opportunity to collect video footage of the fountaining vents, which will be analyzed with USGS colleagues for her dissertation. Her advisor Bruce Houghton, the Gordon A. Macdonald Chair in the Department of Earth Sciences, said that a sympathetic attitude from NSF allowed the modification of a pending $470K award from a focus on the (now deceased) Halemaʻumaʻu lava lake to the 2018 eruption has permitted the study. The field crews consisted of only two rotating scientists at any time which meant that Walker was able to work with a wide range of USGS volcanologists during an intense month of 24/7 monitoring. She gained exposure to a diverse and rapidly evolving set of field skills and techniques. Houghton commented “this is part of a long-established symbiosis between SOEST and USGS, as shown by the fact that the 20 HVO-affiliated scientists who worked 24/7 at the lava flows included nine past or present UH graduates in volcanology”.

Table 2 EARTH faculty, rank, tenure status, year Ph.D. received, year hired, research area, number of graduate students supported from 2012 to 2018 and the courses that they taught from 2012 to 2018.

Name	Rank	Tenure Status	Ph.D.	Hire	Research Area	Students Supported	Courses Taught
Apuzen-Ito, G.	Professor	Tenured	1996	2002	Geophysics & Tectonics	4	GG101(2x), ATM/GG/OCN150, GG/OCN312(3x) GG410, GG413(3x), GG610, GG632(2x),GG740(2x)
Dulai, H.	Associate Professor	Tenured	2005	2009	Coastal Hydrology & Geochemistry	6	GG106(4x), GG200(2x), GG399(2x), GG640(2x)
Dunn, R. A.	Professor	Tenured	1999	2002	Marine Geophysics & Seismology	4	GG101, GG304, GG450(4x), GG610, GG630(4x), GG631, GG650
El-Kadi, A. I.	Professor	Tenured	1983	1989	Hydrology	4	GG454(7x), GG656(7x)
Fletcher, C. H.	Professor	Tenured	1986	1991	Coastal Geology & Climate Change	7	GG101(14x), GG420/620(7x)
Frazer, L. N.	Professor	Tenured	1978	1982	Data Analysis	0	GG250(6x), GG695(5x), GG691, GG699(2x)
Gaidos, E.	Professor	Tenured	1996	2001	Planetary Science & Astro/Geobiology	4	GG101(5x), GG200, GG610(3x), GG711
Garcia, M. O.	Professor	Tenured	1976	1976	Igneous Petrology, Volcanology & Marine Geology	3	GG302(6x), GG614(2x), GG616 (3x), GG711(3x)
Glenn, C. R.	Professor	Tenured	1987	1988	Coastal Hydrology, Groundwater and Sediment Geochemistry, Sedimentology	10	GG309(6x), GG410, GG423(4x), GG711(2x)
Hammer, J. E.	Professor	Tenured	1998	2002	Volcanology; Igneous, Experimental, and Planetary Petrology	2	GG101(2x); GG101L(2x); GG300; GG301(5x); GG402; GG602(3x); GG610
Hellebrand, E.	Specialist	Tenured	2001	2006	Petrology	0	GG621(7x)
Houghton, B.	Professor	Tenured	1977	2000	Physical Volcanology	10	GG300(5x), GG601(3x), GG604(8x)
Konter, J. G.	Associate Professor	Tenured	2007	2014	Isotope Geochemistry of Volcanic Rocks	1	GG711, GG325(5x), GG103(4x)

Martel, S. J.	Professor	Tenured	1987	1992	Engineering & Structural Geology	0	GG303(7x), GG399, GG454(3x), GG610(x22x
Moore, G. F.	Professor	Tenured	1977	1988	Marine Geophysics	5	GG130(2x), GG135, GG423(4x), GG610, GG711(3x)
Popp, B. N.	Professor	Tenured	1986	1990	Stable Isotope Biogeochemistry	2	GG101(4x), GG101 online (3x), GG639(3x), GG711
Ravizza, G. E.	Associate Professor	Tenured	1991	2002	Radiogenic Isotope & Sediment Geochemistry	1	GG200(7x),GG407(3x), GG410(4x), GG102, GG740
Rowland, S. K.	Specialist	Tenured	1987	2004	Lava Flows & Hawaiian Geology	1	GG101, GG101L(10x), GG103(2x),GG104(3x), GG130(2x),GG305(7x), GG306(3x),GG460(4x), GG461(4x)
Rubin, K. H.	Professor	Tenured	1991	1995	Volcanology, Sea Level & Geochemistry	3	GG325(2x),GG425(6x), GG607(2x), GG614, GG625(2x)
Ruttenberg, K. C.	Professor (50% EARTH)	Tenured	1990	2002	Sediment Geochemistry, Nutrient cycling in aquatic systems	3	GG/OCN644 (2x); GG410; GG610 (2x); OCN401 (7x); OCN622, OCN 790
Shea, T.	Assistant Professor	Not Tenured	2010	2018	Volcanology-Petrology	2	GG461, GG605
Smith-Konter, B. R.	Associate Professor	Tenured	2005	2014	Crustal Deformation	6	GG711, GG105(3x) GG101, GG101 online, GG451, GG631(2x)
Stanley, S. M.	Professor	Tenured	1968	2005	Paleontology	0	
Wessel, P.	Professor	Tenured	1990	1991	Plate Tectonics, Geoscientific Software	2	GG250(2x),GG413(3x), GG632(2x),GG675(4x), GG691(3x), GG711

8. List faculty awards and recognitions last 5 years (2013-2018)

Over the last five years several faculty members have been recognized for their outstanding achievements (Table II.2). In addition to these recent recognitions, EARTH is the current home of one National Academy of Sciences member (Stanley), one American Academy of Arts and Sciences Fellow (Stanley), three American Geophysical Union Fellows (Garcia, Houghton, Wessel), 11 Geological Society of America Fellows (Dunn, Fletcher, Garcia, Glenn, Hammer, Houghton, Martel, Moore, Rowland, Rubin, Wessel), one Fellow of the Geochemical Society and European Association of Geochemists (Popp), one Fellow of the Paleontological Society (Stanley), and one Fellow of the Mineralogical Society (Garcia). Fletcher also recieved the 2018 Lifetime Achievement Award from the Hawaii Chapter of the

Surfrider Foundation, and the 2018 leadership award from the Pacific Risk Management Ohana (PRIMO – a Pacific organization that guides governments in managing disasters).

9. Attach brief cv for each faculty

See cumulative productivity of EARTH faculty (publications, grants) in appendix and individual CVs on our website. http://www.soest.hawaii.edu/GG/people/gg_faculty.html

Table 3 EARTH faculty, position and the award(s) and recognition(s) received from 2013 to 2018.

Name	Position	Award
Biass, S.	Postdoctoral Fellow	George Walker Medal from the International Association of Volcanology and Chemistry of the Earth's Interior
Close, H. G.	SOEST YIP	Raymond L. Lindeman Award from the American Society for the Sciences of Limnology and Oceanography
Conrad, C.	Professor	National Science Foundation Career Award
Garcia, M. O.	Professor	Fellow of the American Geophysical Union
Garcia, M. O.	Professor	Fellow of the Mineralogical Society of America
Hammer, J. E.	Professor	University of Hawai'i Board of Regents' Medal for Excellence in Teaching
Hammer, J. E.	Professor	Fellow of the Geological Society of America
Houghton, B.	Professor	Thorarinsson Medal from the International Association of Volcanology and Chemistry of the Earth's Interior
Houghton, B.	Professor	Fellow of the American Geophysical Union
Jahren, H.	Professor	Time Magazine as one of the 100 Most Influential People
Rowley, S. J.	Postdoctoral Fellow	Sir David Attenborough Award for Fieldwork from the Systematics Association and the Linnean Society of London
Rowley, S. J.	Postdoctoral Fellow	Fellow of the Linnean Society of London
Shea, T.	Assistant Professor	Mineralogy, Geochemistry, Petrology and Volcanology Young Scientist Award from the Geological Society of America
Stanley, S. M.	Professor	Penrose Medal form the Geological Society of America

Guiding WASC Standard: The institution achieves its institutional purposes and attains its educational objectives through the core functions of teaching and learning, scholarship and creative activity, and support for student learning and success. It demonstrates that these core functions are performed effectively and that they support one another in the institution's efforts to attain educational effectiveness. (Standard II)

1. What actions were taken in response to previous program review recommendations? What has transpired in the unit since submission of your one-year progress report following the previous program review?

The Department of Earth Sciences sprang into action following the last review. We have expanded our footprint on campus by adding several online introductory courses to attract new students. Every semester, we aim to offer three such courses in addition to an online

physical geology laboratory course. This effort has so far resulted in a near doubling of our introductory course enrollment.

Furthermore, we have added to our existing lower division/general education offerings two additional courses to broaden our offerings while also addressing “foundation” requirements at the introductory level. These are Global Change, which meets GenEd quantitative reasoning benchmarks (GG102, FQ) and Natural Disasters and Human History, which also satisfies one of UH’s core foundational requirements in history (GG135, FGC; added in the Spring of 2018).

In Spring 2019 we will offer a new online introduction to volcanology (GG111). In addition, with our partners in HIGP, we recently rolled out a studio learning course (GG107) called Solar System Studio, to provide hands-on, experiment-based learning to introductory students. In summary, our introductory offerings will have eight courses (GG101-107, GG111).

Our BA in Geology was reinvented with two tracks: Environmental Earth Science and Earth Science Education. We have also secured funds for an NSF REU Site (Research Experience for Undergraduates) which we hope will attract interest from both our undergraduate and graduate programs as well as serving underrepresented STEM students (native Hawaiians and Pacific Islanders). At the graduate level, we have accelerated the admission of self-funded students into our skill-based Master’s coursework program MS (“Plan B”) and MGEO (now under transformation to be merged with Plan B). About ~20% of the last few graduate cohorts at the MS level are now self-funded.

2. How are disciplines changing, and what research/data support these changes?

Within the Earth Sciences, there has been an increasing emphasis on the environmental implications of human activities on the planet. Climate change is a key driver, but its impact on the environment here in Hawaii is easier seen by how increased sea level effects coastal erosion, and issues pertaining to the quality and sustainability of our drinking water. There is also a growing awareness of natural hazards driven by the great engine of plate tectonics and manmade hazards as impacts of land use, agriculture and resource extraction. Grade school students are increasingly being exposed to environmental science and less so to the traditional precepts of geology. Thus, there is a greater student demand for courses and degrees that satisfy their interest in the environment.

The funding focus in Earth science research is also changing toward more interdisciplinary research with a clearer connection to the needs of our population and the environment;

witness the incipient “Coastlines and People” (CoPe) program being organized by NSF. Locally, the effect of King Tides, coastal erosion, and volcanic hazards (witness the Kilauea eruption during Summer 2018) provide further impetus for a more environmentally focused degree program.

Computational considerations are also changing, with “Big Data” and data science coming to the forefront. Historically, our department faculty have strong computational skills and offer several courses in statistics, data analysis and numerical modeling. Traditional geological topics and modern methods of analysis will both be needed to interpret geological observations and perform modeling of causes and effects of environmental changes.

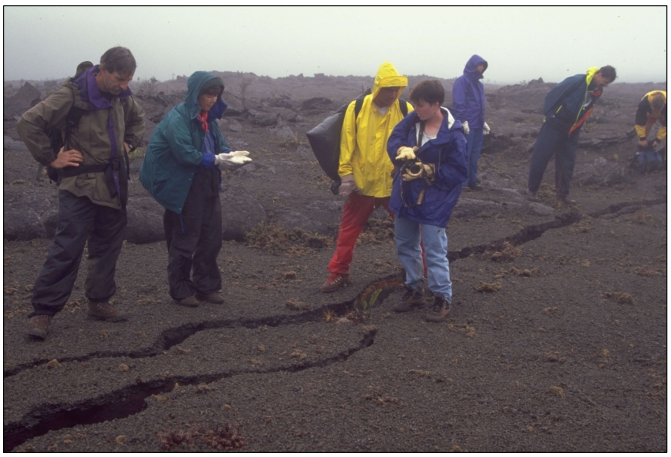
3. To what extent are scholarship, research and creative activity linked to the curricula?

Many senior undergraduate students enroll in *GG499 Undergraduate Thesis*, an elective course. 62 student semesters of GG499 were recorded by the registrars in the past decade. Such students engage in a small original research project that leads to a senior thesis. For some of our students this work is of high enough quality to enable them to attend and present their work at conferences such as the GSA and AGU annual meetings.

We have a research track in the BS and several faculty members routinely mentor undergraduates preparing a thesis. We are considering adding a required research experience to the BS and we will discuss this further during the current academic year as we design an environmental Earth science track.

Our undergraduate degree includes *GG410 Undergraduate Seminar* and our graduate degree requires *GG610 Graduate Seminar*. In both courses, students are taught techniques, gain practice, and demonstrate competence in creating and presenting scientific talks and posters. New trends in our fields can be offered via topical graduate seminar courses (GG 710, 711). Finally, graduate theses and dissertations are directly linked to faculty research projects, many of which in turn drive the content of our graduate courses.

4. In what ways have courses and programs been modified to reflect new knowledge and/or changes in the needs of society?



Early during the review period, we realized we were not well-positioned to take advantage of the aforementioned opportunities. After much soul-searching and research into national trends, we finally decided it was time to change the name of our department and our degree programs to better advertise who we are and to attract students looking for ways to study environmental Earth science.

Thus, as of September 2018, our Department of Geology & Geophysics was reborn as the Department of Earth Sciences, which is a much more comprehensive description of the research activities of our faculty. Our undergraduate (BS and BA) degrees are now named "Earth Sciences" and "Environmental Earth Science" (resp.), while our graduate degrees (MS, PhD) are named "Earth and Planetary Sciences".

New upper division courses are likely needed to build a truly environmental earth science BS degree program, and this challenge will be the focus during the coming academic years. The work has started: We have modified one course (environmental geochemistry) so it could be included in the campus wide sustainability program, with several more on the way. Our data analysis and programming courses are adding support for R and Python as well as MATLAB. Several courses have begun to incorporate modern pedagogical practices promoting active learning, flipped classrooms, and group learning. Our lab-based upper-division courses and our field methods course all now incorporate some of these practices.

At the graduate level, these challenges are manifesting themselves as students interested in a skill-based education. These students do not want a long research-based graduate career but are satisfied with a solid foundation of courses that enables them to contribute to the needs of society and thus get jobs. We are responding to this need by admitting more self-funded students to our coursework MS track.

5. In what ways have resources been shifted to respond to these changes?

Our educational resources have always been quite limited and thus there has not been much to shift around. Continued reduction of state support has not helped. Yet, we have experimented with how we assign our limited TAs to support new innovative courses at the lower division level, such as online courses and those who satisfy general education foundation requirements. One aspect of our science that has changed quite a bit over the decade is the use of personal computers. We have now reached a point where all degree-seeking students have a personal computer, perhaps no longer necessitating institutional support for a department computer room. Such a change could free up some resources and add new flexibility to classroom management.

The new budget model for the campus provides a clearer picture for how departments can raise funds. In our case, the budget mathematics clearly support bringing in more self-funded graduate students. New tuition dollars returned to the department could be used to experiment with new courses, add field trip support and equipment, implement improvements to our degree programs such as additional TA positions, assist with recruitment costs, and even offer modest financial incentives for new majors.

6. What are the learning objectives for each certificate, undergraduate and graduate program? How has the department ensured that its degree and certificate programs remain rigorous and aligned with educational objectives?

The department began to spin up a formal assessment program more than a decade ago at the direction of the university, defining learning objectives (listed below) and mapping them onto course offerings. In 2014, the Mānoa campus Assessment Office began a stepped-up activity in which each program was asked to revisit and evaluate learning objectives, and to develop and enact procedures to evaluate the program's effectiveness at measuring and realizing learning outcome goals.

All program and individual course learning objectives were added and remain a part of course syllabi. Subsequently, the campus introduced institutional learning objectives, and the department responded by ensuring they aligned with program objectives. Thus, learning objectives exist at three levels: (1) the university level; (2) the program (departmental) level; and (3) the course level.

Early in his tenure, former dept. chair Rubin (2014-2018) assigned faculty member Steve Martel the role of assessment coordinator, tasking him to develop a departmental assessment process in conjunction with the department's Curriculum Committee. In conjunction with the Mānoa Assessment Office he completed a review of the existing assessment framework and identified a series of steps to develop and employ tests and evaluation metrics. The group of faculty who teach required upper division undergraduate courses agreed to evaluate various assessment options, and discuss ways to improve achievement and empirical validation of learning objectives. This was a limited scope activity that lacked follow-through. Formalized assessment activities are not universally supported on our faculty, making this effort challenging.

Separately, objectives of the ongoing NSF-AGU-AGI “Future of Undergraduate Geoscience Education” effort to develop a community vision for undergraduate geoscience education in the USA are being evaluated for incorporation into our degree programs. Rubin attended two of the three large workshops for educators and dept. heads held in the past few years.

One of the key ideas of this effort is to revamp degrees along the lines of an educator---researcher---industry approved list of topical competencies rather than traditional topics, and to use program assessment to map competencies directly onto curricula (and revise courses as needed). These concepts were introduced to EARTH faculty in 2016 but were not universally endorsed at the time; hopefully they will play a significant role moving forward as the department works to realign the degree programs to specific topics and competencies that will help students with post-graduate employment or graduate school needs. We are planning a two-day faculty retreat in late Spring to review and strengthen our undergraduate programs and build in assessment from the start.

Undergraduate Student Learning Objectives (BA and BS)

1. Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawaii, and are able to discuss issues related to geology and its impact on society and planet Earth.

2. Students can apply technical knowledge of relevant computer applications, laboratory methods, field methods, and the supporting disciplines (math, physics, chemistry, biology) to solve real-world problems in geology and geophysics.

3. Students use the scientific method to define, critically analyze, and solve a problem in earth science.

4. Students can reconstruct clearly and ethically, geological knowledge in both oral presentations and written reports.

5. Students can evaluate, interpret and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

Learning Objectives for the MS

1. MS graduates are proficient in applying technical knowledge of theory, laboratory methods, field methods, computer applications, and the supporting disciplines (math, physics, chemistry, biology) to help advance the field of Earth sciences. *(assessed by performance in coursework)*

2. MS graduates are able to (a) construct scientific hypotheses, (b) define and carry out research to evaluate them in a timely manner, (c) analyze and synthesize the results of their research, and (d) derive conclusions that help advance the field of Earth sciences. The highest standards of ethical practice are emphasized. (*assessed by success in the thesis proposal, semester progress report to MS committee, and annual evaluations)*

3. MS graduates are able to effectively communicate the findings of their research in writing at a level comparable to that of a scientific journal publication, and defend it orally to the satisfaction of a scientific audience. They are also able to communicate orally about Earth sciences through seminar or conference presentations. (*assessed by success in the thesis proposal, and oral and written defense)*

4. MS graduates have acquired the knowledge and skills needed to pursue employment or other activities that contribute to the advancement of the Earth sciences and/or the solution of societal problems. (*assessed through presentations at professional conferences, publications, the thesis defense, and/or successfully gaining employment in a relevant area.)*

Learning Objectives for the MGEO (stopped out presently, but active over the review period)

1. MGeo graduates are proficient in applying technical knowledge of theory, laboratory methods, field methods, computer applications, and the supporting disciplines (math, physics, chemistry, biology) in solving practical problems in the Earth sciences. *(assessed by performance in coursework)*

2. MGeo graduates are able to (a) identify a problem and define a set of project goals to address the problem, (b) define a strategy for meeting the goals, (c) successfully execute the strategy in a timely manner, (d) analyze and synthesize the results of their executed strategy, and (e) derive conclusions that help advance future related endeavors. The highest standards of ethical practice are emphasized. (*assessed by success in the project proposal, semester progress report to MGeo committee, and annual evaluations)*

3. MGeo graduates are able to effectively communicate the findings of their work in writing at a level comparable to that of a professional report, and defend it orally to the satisfaction of a scientific and professional audience. They are also able to communicate orally about geoscience related work through seminar or conference participation. (*assessed by success in the project proposal, and the oral and written reports)*

4. MGeo graduates have acquired the knowledge and skills needed to pursue employment or other activities in the geoscience related fields. (*assessed through presentations at*

professional conferences, publications, the oral and written reports, and/or successfully gaining employment in a relevant area)

Learning Objectives for the PhD

1. PhD graduates are proficient in applying technical knowledge of relevant theory, laboratory methods, field methods, computer applications, and the supporting disciplines (math, physics, chemistry, biology) to advance the Earth sciences. *(assessed by performance in coursework and the comprehensive examination)*

2. PhD graduates are able to comprehensively synthesize, evaluate, and interpret relevant fundamental knowledge in her or his sub-discipline. *(assessed by performance in the comprehensive and PhD qualifying examinations)*

3. PhD graduates are able to independently (a) construct scientific hypotheses, (b) design and carry out research to evaluate them in a timely manner, (c) analyze and synthesize the results of their research, and (d) derive conclusions that advance the Earth sciences. *(assessed through the dissertation proposal, the PhD qualifying examination, semester progress reports to the PhD committee, and annual evaluations)*

4. PhD graduates are able to effectively communicate the findings of their research in writing at a level comparable to that of scientific journal publications, and defend it orally to the satisfaction of a scientific audience. They are also able to communicate orally about Earth science through seminar or conference participation. (*assessed by success in the dissertation proposal and defense)*

5. PhD graduates have acquired the knowledge and skills in the profession needed to pursue employment or other activities that contribute to the advancement of the Earth sciences and/or the solution of societal problems. (*assessed through presentations at professional conferences, publications, the dissertation defense, and/or successfully gaining employment in a relevant area.)*

7. What indicators and sources of evidence do you use to assess whether students develop core learning abilities and competencies before they graduate? (Please summarize assessment findings.) How have these findings led to modifications in your curricula?

In addition to the undergraduate survey mentioned above, data from essays, laboratory exercises, and homework assignments from our required upper division undergraduate courses have been collected to specifically address how well our undergraduates meet course learning outcomes. The assessment findings to date indicate that the department

needs to direct more attention to learning outcomes in writing; mathematics, and physics; and field skills (particularly for the BA students).

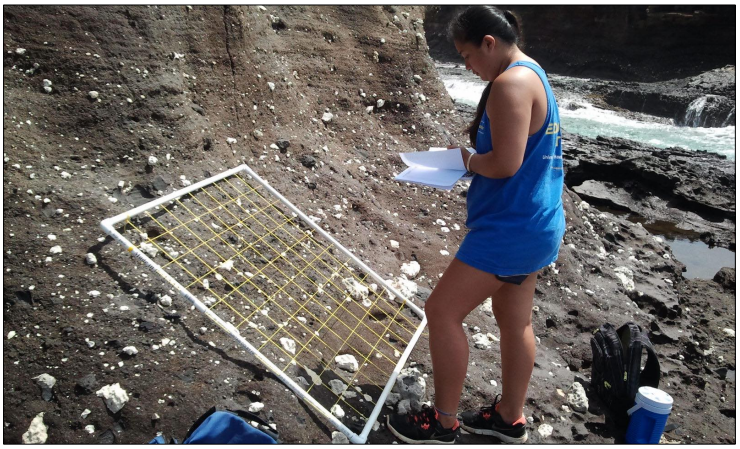
The department has responded to these findings in the following ways so far: (a) course instructors have met to codify writing standards that can be applied in writing intensive classes across the department; (b) the programming class has been modified to include the programming language R in addition to MATLAB; and (c) the department is reviewing the learning outcomes for our relatively new BA programs, with a specific focus on whether and how a new course for BA students could be implemented to bolster their preparation for the required field methods class.

8. How would you assess the role general education plays in preparing your undergraduate students for the major(s)? In what areas are students well prepared? Where do you see deficiencies?

Earth science is a truly multi-disciplinary field and requires general education in chemistry, mathematics (calculus and linear algebra), physics and biology, as well as soft skills in abstract thinking (e.g., in space and time), programming, lab and field learning, working in groups, and expressing one's self verbally and in writing. All of these skills figure prominently in the degree. All of these subjects/skills are necessary for a student to succeed in the upper division EARTH courses.

Overall, EARTH undergraduate students are reasonably well prepared in these subject areas, but some struggle in math and physics. In response, EARTH has created its own math courses such as *GG312 Advanced Mathematics for Scientists and Engineers* and *GG413 Introduction to Statistics and Data Analysis*. GG312 has also become popular among oceanography and engineering students. We also continue to engage with the Mathematics, Physics and Chemistry departments on campus on ways to improve student learning in these important pre-requisite topics. EARTH also participates in the SOEST tutor program (where grad students tutor our undergrads in math, chemistry, and physics).

9. To what extent does the faculty regularly engage in discussing effective approaches to assessing teaching and learning within the department?



Effective teaching methods are discussed in many faculty meetings, in curriculum committee meetings, at some seminars, and occasionally with an outside expert coming in to explain new techniques. Most faculty are aware of changing trends in teaching strategies and some of our faculty have learned and employed new methods, such as flipped courses, all or partially online courses, active learning modalities (e.g., via the use of "clickers"), and other "hands-on" activities. We expect this trend to accelerate as new hires result from upcoming retirements.

Graduation Rates

10. What factors prohibit students in your major(s) from graduating in 4 years? What data support these assumptions?

In general, course availability and course scheduling are not impediments to graduation rates. The inferred reason that some EARTH majors take more than 4 years is based on anecdotal evidence and exit interview comments. Many of our majors are transfer students who need additional time to fulfill EARTH as well as UHM requirements. Additionally, some of our students must repeat some supporting course work (esp. math and physics), or much less frequently, their EARTH courses in order to earn the minimum required grade of C in these classes. Like most UHM students, EARTH majors typically have part- or full-time jobs as well as family responsibilities that limit the time they can dedicate to study.

Scheduling of courses is frequently an issue. Comments by students have suggested that availability of space in lower division, non-EARTH courses has been an issue. EARTH's undergraduate advisors are committed to helping students plan their coursework appropriately, but sometimes students do not seek or follow the advice given; some students simply declare their major too late to finish in 4 years. A related issue is the introductory science requirements of the College of Arts and Sciences. As more Arts and Science majors have the option to take EARTH courses to fulfill these credits, more should have the opportunity to gain earlier exposure to EARTH courses, thus speeding time to graduation for those who decide to change majors to EARTH.

Finally, in 2014 former chair Rubin instituted two policies that have enhanced student access to courses (especially less-frequently taught upper division electives): a) faculty

teach every semester, whereas previously they taught 3 in 4 semesters and b) course schedules are now developed with as much deconfliction and time slot optimization as possible, whereas previously faculty preference drove the schedule, with the result of too many courses being offered on Tu-Th and too much overlap for some students to get all of their classes without complicated changes after the fact. Since enacting the deconfliction policy student complaints about overlapping course has been reduced to effectively zero.

11. How does the department ensure that its programs can be completed within a timely manner? What is the rotation for required courses in your majors?

Program velocity has been a topic of great interest on campus, particularly for degrees with very scaffolded curricula. EARTH did a top to bottom assessment of prerequisites and typical course order several years ago, and on that basis revised/removed some prerequisites at the upper division level to make it easier for students to find suitable pathways through the degree program. The advent of the UH's STAR system to track student advancement and velocity has also been helpful. The redesign of the BA 3 years ago was done specifically with velocity and flexibility in mind. We hope to incorporate similar changes to the BS program soon.

The also department has two undergraduate advisers who are committed to helping the students plan their degree programs efficiently. The department has developed a timetable for required courses that would enable a student to enroll in courses in a natural progression into the subject area and to complete degree requirements within four years. Most courses are taught once a year. In addition, SOEST provides a tutor for our undergraduates to help them with their general education course work.

12. Assess the overall health of your academic programs.

The health of our academic programs is good and steadily improving. Undergraduate students enter as freshman and as transfer students from other degree programs and the UH community college system (**Figure 2**). While enrollments in our undergraduate degree programs remain modest by national standards, our programs remain strong, well-founded in fundamentals, popular with our students, and forward-looking as to both content and method of delivery. Graduate program enrollment remains strong and on upward trends with the recent shift to enrolling some self-supporting students in addition to the traditional RA or TA support pathway. Simultaneously, the department has started to grow its enrollment in lower division introductory courses, as an additional pillar of the undergraduate academic programs. We are also poised to create a smooth pathway for community college students to enter into our upper division courses and enroll in our degree programs.

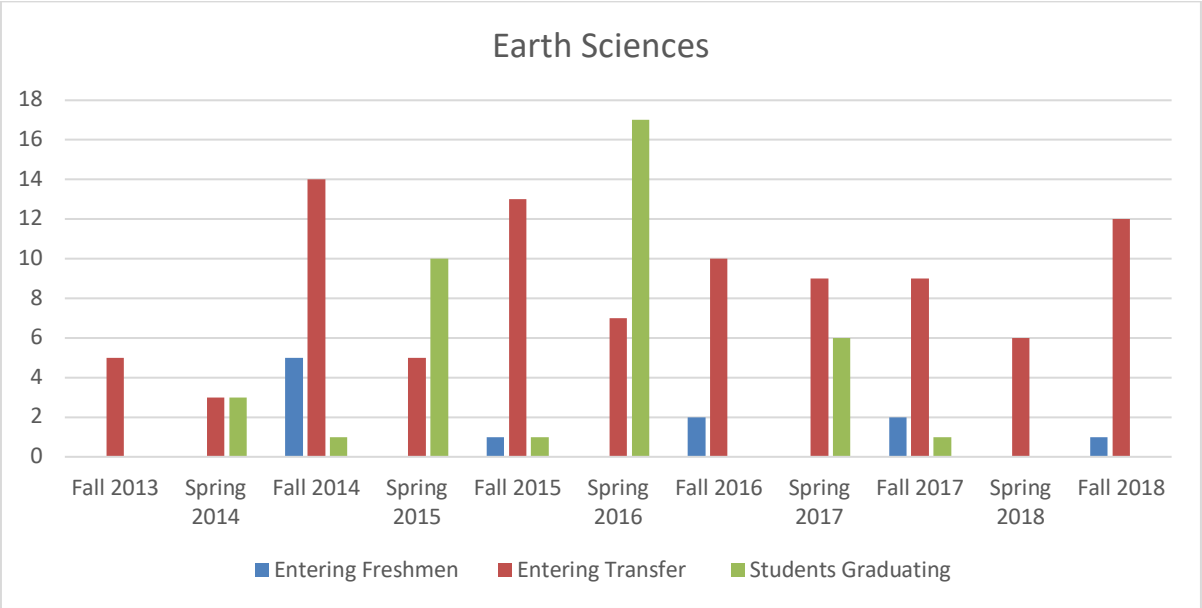


Figure 2 *Enrollment and graduation among undergraduates.*

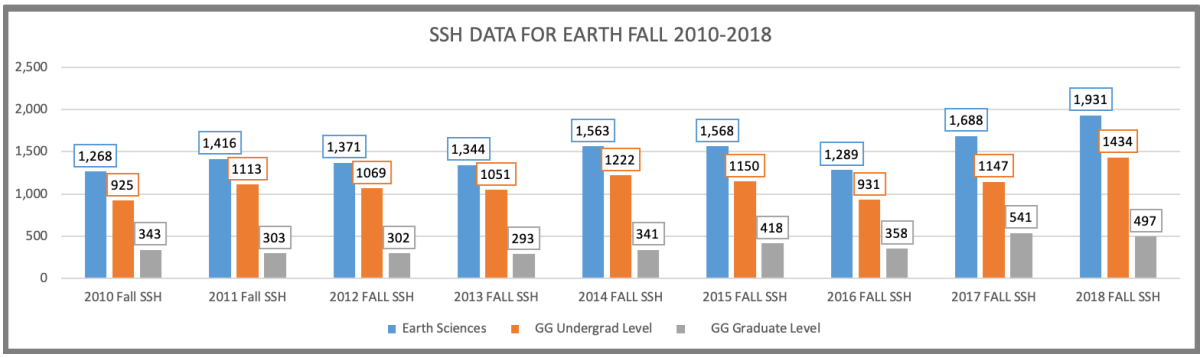


Figure 3 *Enrollment in graduate and undergraduate courses for 2010-2018 Fall semesters.*

The previous Chair's emphasis on online introductory courses has borne fruit, as evidenced by **Figure 3**. As can be seen, the average SSH (Student Semester Hour) count during the last four fall semesters is 1527, compared with the 4-year average of 1350 for the earlier period. This suggest a modest increase of ~15%. As more of our introductory courses go online we expect this trend to continue. We also expect our other newly added introductory courses to grow as they mature and gain a positive reputation across campus. **Figure 4** illustrates our longest time-series of enrollment data, showing the total enrollment in 100-level courses since 1998. While the reasons for the high variability in the 2000±5 era are many and convoluted, the more recent history shows that the addition of new and varied offerings at the introductory level has been very encouraging; we aim to maintain the new levels.

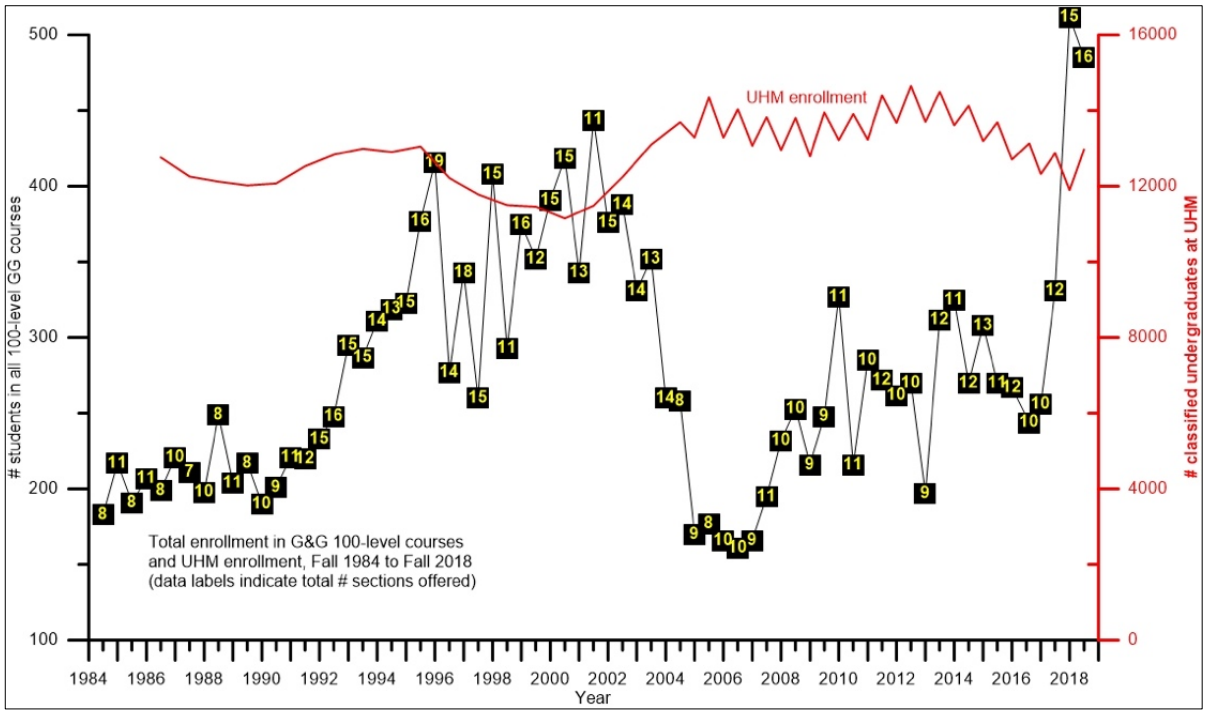


Figure 4 *Total introductory enrollment since 1984, with comparison to UHM enrollment. The numbers in the boxes indicate the total number of sections offered.*

Figure 5 graphs graduation rates in the Earth sciences. Here, the trends are positive. Over the previous review period (2008-13) we graduated a total of 76 students. In contrast, the current review period produced 113 graduates, a five-year average increase of roughly one-third. This improvement shows we are making good progress, with room for more growth as we target more self-funded students for enrollment in our course-work master's program.

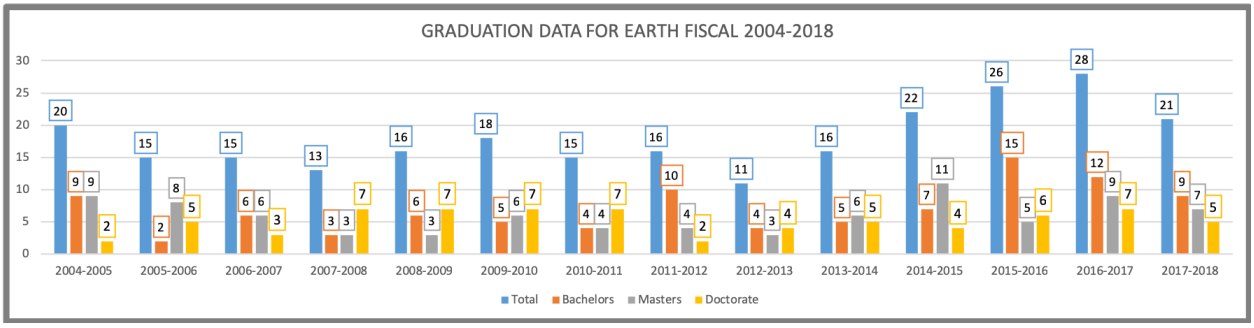


Figure 5 *Number of graduations at all levels since the 2004-2005 academic year.*

It is true that the number of EARTH students remains smaller than those of similar programs at many mainland institutions. We argue that this is in many ways a false comparison. Hawaii is the only US state that has no hydrocarbon or mineral extraction industries, typically a steady employer of Earth scientists. However, our graduates readily find employment as the state (and the broader market on the mainland) depends on well

qualified Earth scientists who can work in geohydrology, mitigate natural hazards, and provide expertise for environmental and geotechnical companies large and small.

Hawaii is also the only state exposed to the fullest array of natural hazards, most of which are amplified by climate change: seismic, volcanic, hurricane, sea level rise, wildfire, drought, marine heat wave, tsunami, high wind, coastal erosion, and intense precipitation are all common. Hence, retaining state expertise in those areas remains an important goal. Consequently, many of our graduates are employed by institutions mitigating natural disasters, such as the USGS Hawaii Volcano Observatory and the Pacific Tsunami Warning Center.

We take pride in having a high faculty-to-student ratio, allowing EARTH faculty to give individual attention to students and tailor learning to suit each student and the particular needs of the State of Hawaii. This closeness also allows many of our undergraduates to obtain part-time employment in the department, often in areas of their studies. It is thus disconcerting and frustrating that this strength is increasingly taking a backseat in the metrics the university uses to gauge success (i.e., higher enrollments and more SSH/class) which naturally correlate with a lower faculty-to-student ratio. However, given the reality that student-derived revenue is a large component of the operating budget, this is a trend we cannot avoid. Continuing program success, individualized attention to students, and the current university budget model, remain a challenge for the future.

Program sheets for our undergraduate degrees can be found in the Appendix.

1. What is the department's overall satisfaction with the quality of your current students?

Each year Earth Sciences admits about 10–15 new undergraduate students to our major (**Figure 6**). Many of our undergraduates come from the West Coast of the mainland, taking advantage of a WASC-related schools discount on fees. The ability of these students ranges from mediocre to excellent. There is no selection process at the undergraduate level – if a student wishes to major in Earth Sciences she can, although she must satisfy the core course requirements to graduate. In order to attract more high-caliber students we have increased our outreach programs, as discussed below.

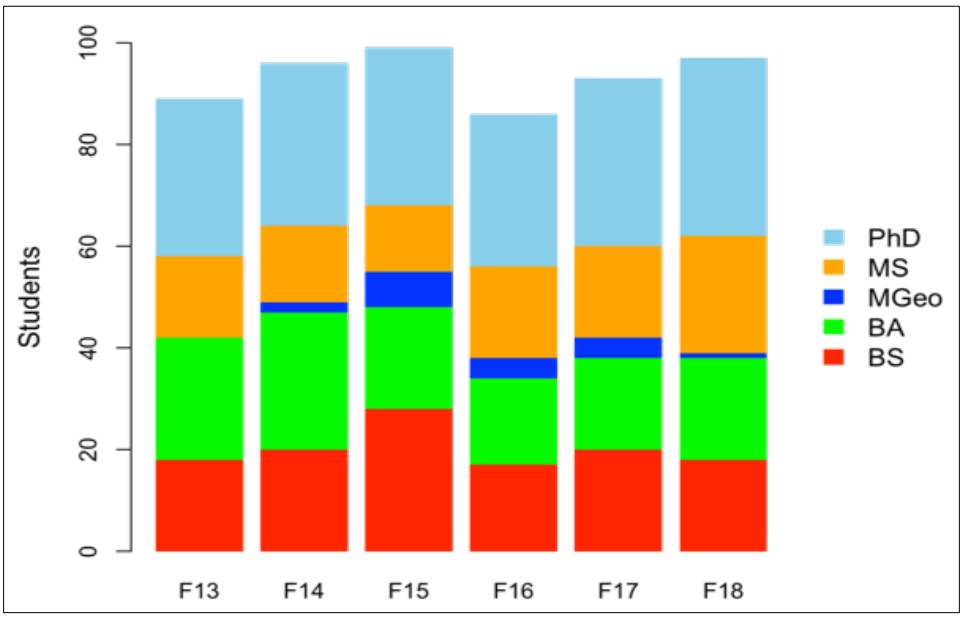


Figure 6 *Enrollment in Earth Sciences over the study period.*

At the graduate level, admissions are much more discriminating. Each fall semester, the department receives about 80 applications for the Masters and PhD programs combined. The average GPA of those applicants is about 3.45. Graduate students are selected on a mix of criteria: GPA and GRE grades, references, content of undergraduate degree, and the suitability of a student to work with a particular professor on a specific topic.

In being selective, the department has a high graduation rate amongst those it accepts. The quality of applicants is reflected in the fact that many of our Graduate applicants also apply to the top schools in the country (e.g. Stanford, Harvard, MIT), and some choose UHM. Competition for research grants has become increasingly competitive over the past ten years, and the department is pleased that it has been able to continue offering Research Assistant positions to 10–12 incoming Graduate students each Fall, with on-average 9–10 accepting. The proportion of applications coming from females and overseas applicants (especially from China) is increasing, and our admissions reflect those trends.

In order to recruit and retain good students, Earth Sciences is attentive to the quality of teaching, assessed in part by class evaluations submitted by the students themselves. Near the end of each semester the students in every course are asked to complete a survey consisting of 24 five-level Likert Scale items. For example, Item 17 reads: “The instructor’s overall performance was excellent” and the possible answers are: Strongly agree (5), Agree (4), Neutral (3), Disagree (2), and Strongly disagree (1). **Figure 7** shows the results for Item 17 during the self-study period, and it can be seen there that roughly 95% of the responses are at 4+, 80% are at 4.5+ and 40% are at 5, the maximum possible.

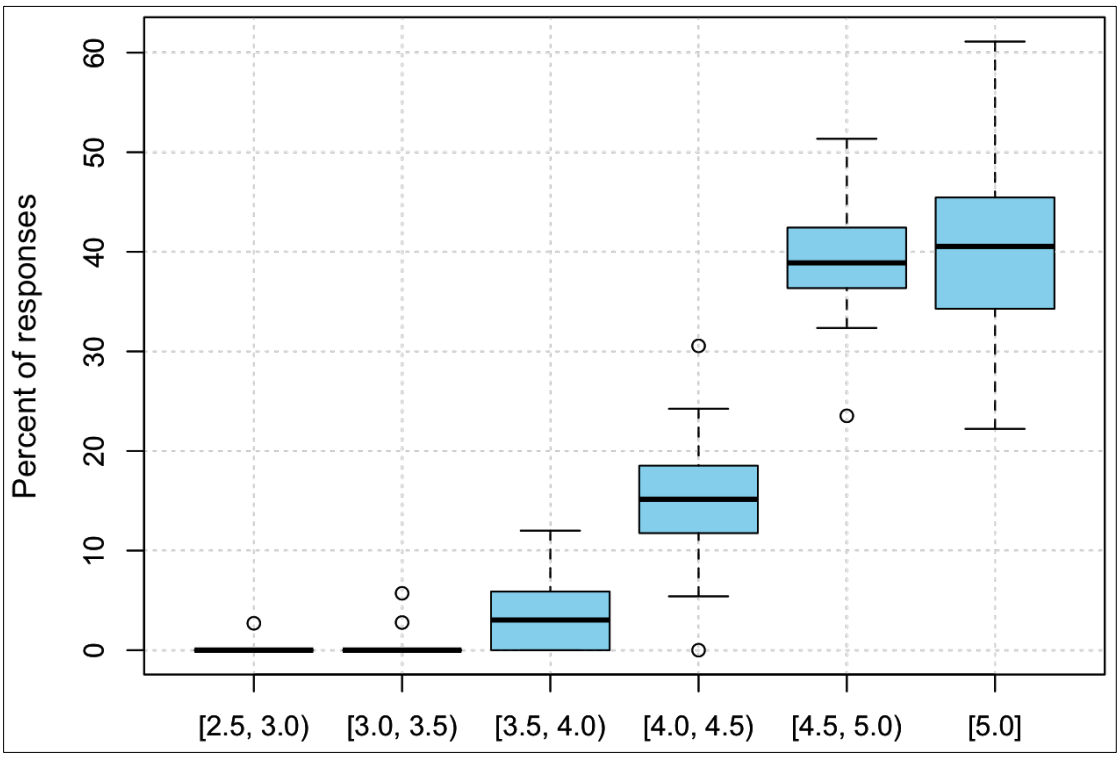


Figure 7 *Student class evaluations for all courses and instructors in Earth Sciences. Notably, over 80% of students agreed or strongly agreed with the statement: “The instructor’s overall performance was excellent.” Not surprisingly, the low scores at the left of the figure are for mathematically intensive courses such as structural geology and scientific programming. No temporal trends were evident during the self-study period.*

2. To what extent is the department satisfied with enrollment trends and the number of degrees earned?

The department has never been satisfied with enrollments and number of majors. In an era when most professions require an advanced degree, it is a mystery why so few students enroll in Earth Sciences where a bachelor level degree continues to be a near-guarantee of well-paid professional employment. The mystery deepens when one considers that employment in our fields frequently affords opportunities for outdoor fieldwork in fascinating natural areas, as well as the opportunity to work on pressing societal problems. As noted in

Part I, Overview, we have recently changed the name of our department from Geology and Geophysics to Earth Sciences, in order to market ourselves better. This name change has just taken place, and as soon as we have updated our websites and course offerings we will redouble our outreach to local high schools and community colleges via the new NSF geoscience pathways; we also plan to play a video recruitment at local movie theaters.

3. Describe briefly how the department markets its programs and recruits students. What percentage of applicants are accepted, and enrolled in your graduate programs?

The Department's formal marketing efforts are coordinated by the SOEST Director of Student Services. These activities primarily involve displays at various events (e.g., Hawaii State Science and Engineering Fair, recruitment events at local high schools, community college recruitment fairs, Fall AGU Meeting). Individual faculty members and graduate students often assist at these events. Our department website, together with SOEST's website, is also an important marketing tool, which we are working to improve.

We have high hopes for our most recently developed recruitment tool, an NSF-funded Research Opportunities for Undergraduates (REU) program that brings 10 students from across the nation to our department for a nine-week research experience. Each year, about 600 undergraduates apply to this program, and we look at each applicant carefully to make sure that applicants from disadvantaged backgrounds are fairly represented among those we admit. Special courses are put together for these students, including a research vessel cruise on which they assist in gathering geophysical data.

At the graduate level, our most important recruitment mechanism appears to be the international and national reputations of our faculty members. The department receives frequent inquiries from prospective students, to which interested faculty respond; and prospective students often contact individual faculty members directly.

Our graduate program receives about 40 formal applications each year. About 15% of these applicants receive offers and about 10% accept these offers. This represents a 66% success rate for recruitment.

4. What financial support is provided?

Undergraduate majors are eligible to compete annually for two fellowships, which provide funds for research projects: William T. Coulbourn Fellowship in Marine Geology and Harold T. Stearns Fellowship. No other financial support is provided to undergraduates.

Until recently our policy for graduate admissions has been to admit only students for whom an individual faculty member was able to fund full time support from his or her research grants. Thus, nearly all of our graduate students received financial support of some kind, and only rarely did a student go for even a semester without support. Since the previous self-study period this policy has changed, and we now admit a small but growing number of fee-paying graduate students. We look extra carefully at such students before deciding to admit them, to make sure they are likely to succeed.

The department has only five Teaching Assistantship positions (50% salary) funded by the University. The Fred M. Bullard Fellowship is a competitive award that provides stipends for outstanding new recruits or existing graduate students. The J. Watumull Merit Scholarship, the Stearns Fellowship, the Coulbourn Fellowship and a new Don Swanson Fellowship provide a supplementary level of research funds annually. Occasionally students obtain funds from national fellowships. The major source of funding for essentially all graduate students is research assistantships supported by individual faculty grants, most of which come from federal agencies such as NSF. The associated graduate student tuition waivers provide an important advantage for faculty to compete for these grants and recruit the best students.

5. In what ways does the department cultivate a research-oriented culture of inquiry at the undergraduate and graduate levels?

The heavy involvement of EARTH faculty in research combined with the large student-to-faculty ratio naturally leads to research-oriented activities both within and outside of coursework. As discussed previously, undergraduate students seeking part time employment often find this within EARTH, and this has frequently led to the undergraduate taking the GG399 – Senior Thesis topic. Often students present their findings at a national/international conferences or workshops, with expenses paid by the supervisor. Faculty members encourage undergraduate students to apply to graduate programs, and willingly write letters of reference. Again, the vast majority of graduate degrees are based on extramurally funded research projects. In addition to theses and dissertations, EARTH

students present their research (and win awards) in national and international conferences and in peer-reviewed journal publications.

Advising and Mentoring

6. To what extent are instructional faculty engaged in the advising and mentoring of undergraduate students?

At all times, the department has two faculty members with the assigned task of mentoring and advising the declared major undergraduate students. These advisers meet personally with every undergraduate at least once per semester to discuss course selection and academic career goals. Mentoring activities by other faculty occur through class projects, student employment, and GG399-Senior Thesis.

7. Has the department connected the major to co-curricular programs and services, such as development of field settings, service learning, or other similar opportunities for practical engagement? Which co-curricular activities within the college and across campus enhance learning opportunities and development for your students?

Student employment by faculty provides outstanding opportunities for students to gain practical work experience. In addition, the department has a long history of offering field trips as part of its course work, as well as requiring an intensive field methods course at the 300-level. The study of Earth Science is synonymous with being out in the field, and many faculty members include it within their course work. This can range from the GG100 lab course of three hours per week for a semester; a long-weekend trip for 100-level students to the volcanoes of Hawaii Island; weekend excursions around Oahu and again more specialized field trips to the other islands and even the US mainland. These activities are all done in-house, hence the department has not used co-curricular programs offered elsewhere in the university.

8. How effectively have advising and mentoring helped students to take advantage of and benefit from available educational opportunities and resources within the department and across campus?

Experience suggests that once a student has declared Earth Sciences as his/her major, the student takes full advantage of the many opportunities offered by the department. Our high student-to-faculty ratio, employment opportunities, and class activities promote this culture. In addition, we give our majors their own dedicated undergraduate lounge with microwave and soda machine, access to computers and printers 24 hours a day, tutoring in basic science subjects, and a social club that organizes many outings each semester. Several of our graduate-undergraduate course pairs are taught in combined classes, in which our undergrads become accustomed to having graduate students as classmates, and graduate students find opportunities to mentor.

Governance

9. How does the department define the role of students in departmental decision-making, and how is that role exercised?

The Department has 7 standing committees – personnel, graduate studies, (undergraduate) student, honors and relations, graduate admissions, curriculum and departmental. An undergraduate student is nominated to be a full member of the student, relation and honors, and curriculum committees with full voting rights. Similarly, a graduate student is a full member of the student, curriculum, and departmental committees. These student consult with their constituent groups as part of their service. In addition, the Chair meets with all the graduate students as a group once a semester.

10. What are the grievance procedures for students, and how are these communicated to them? How does the department ensure that grievances and complaints are addressed promptly, appropriately and equitably?

Grievances are rare in our department because we work hard at not letting problems develop. An important preventive mechanism is the annual Graduate Studies Committee interview of each student separately. The atmosphere of these meetings is supportive, not critical, and the student's advisor is never allowed to attend. Students are asked specifically whether they are getting the help they need from their advisor in several categories, and action is taken if they aren't. The Graduate Studies Committee includes senior faculty who follow up on such situations and are willing to go past the chair to the Dean if improvement does not ensue.

We also have a formal grievance procedure. Depending on the seriousness of the issue, the grievance is written up and taken to the Department Chair, who may decide to act him/herself, liaise with a committee or its members or take it further to the Associate Dean of SOEST, who oversees educational issues. If the issue cannot be resolved at this level, then it is taken to the appropriate person at the University level. At the undergraduate level, students commonly seek assistance from SOEST's Director of Student Services, the two undergraduate advisors, and/or the Departmental Chair. In rare cases, assistance is sought from UHM's Counseling and Student Development Center or the Dean's office. Again, this

is a small department, and students quickly find someone whom they trust sufficiently to share their concerns.

11. Please provide any student recognitions over last five years.

The annual awards to students in our department include the **Agatin Abbott Memorial Award**, presented to the outstanding senior, annually, in memory of department faculty member Agatin Abbott; the **Fred M. Bullard Fellowship,** endowed by Thaïs Freda Bullard in memory of her father, Fred M. Bullard, a pioneer in the studies of Volcanology and general Geology & Geophysics; the **J. Watumull Scholarship**, presented to the department's outstanding graduate student from an endowment from the Watumull Foundation; the **William T. Coulbourn Fellowship,** endowed by friends and family in memory of department alumnus and faculty member William T. Coulbourn**;** the **ARCS Award, a**warded by the Achievement Rewards for College Scientist foundation**; G&G Achievement Scholarships,** based on meritorious service to others, achievements and outstanding grades; and the recently added **Don Swanson Fellowship**, supported by a generous gift from USGS Scientist and long-time Earth Sciences Department friend and collaborator Dr. Swanson.

4.5 Staff Support and Facilities

1. Assess the continuing adequacy of physical and staff resources.

Office space for four administrative staff is adequate or better, as all offices have only one occupant or are large enough for the necessary furniture for more than one. However, two fiscal staff currently share a small interior office without natural light and poor WiFi connectivity.

Secretarial staff computers vary in age and operating system and are being updated. In some areas filing cabinets are old, rusty, beaten up and can be difficult to open. Office seating in some cases is also poor and by today's ergonomic standards below basic levels.

1a. Identify space and equipment managed by the department that support research and instruction.

Undergraduate and graduate students have access to and regularly use facilities in the Department of Earth Sciences for their research as do national and international visitors. In addition, these laboratories are used in many departmental graduate-level courses offered annually or biannually.

The Department houses the SOEST Isotope Laboratory, a facility for radiogenic/radioactive isotope geology and non-traditional stable isotope studies. It houses two thermal ionization mass spectrometers, one multi-collector inductively coupled plasma mass spectrometer (ICPMS), 24 radioactive counting detectors and a full-time (50% State-funded) laboratory

manager. It also includes a dedicated, 4-room clean-room facility, a sample preparation space, and a stand-alone wet laboratory to support solution ICPMS sample preparation.

The Department also houses the SOEST Stable Isotope Biogeochemistry Laboratory with five gas ratio mass spectrometers used for C, H, N, and O stable isotope analysis of a variety of materials and a cavity ring-down spectrometer for H and O isotope measurements of water. A full-time (50% State-funded) laboratory manager oversees the facility who is aided by an analytical specialist (100% funded by the laboratory recharge account). There is sufficient space for sample preparations.

The Electron Microprobe Facility with its state-of-the-art field-emission gun electron microprobe and the X-ray Fluorescence Laboratory are operated together by one full-time State-supported laboratory manager.

The Department also operates a Lapidary Facility that prepares rock samples for petrographic, mineralogical and geochemical analyses for classroom and research use. It is staffed by a half-time state-funded technician.

The Seismic Reflection Processing and Interpretation Facility has several workstations with commercial seismic processing and interpretation software from Landmark Graphics and Paradigm Geophysical. Faculty and students use these computers and software for research and teaching.

The Geophysics Computational Facility is a Dell Linux cluster with 168 CPU cores (Intel X5550), each with 3GB RAM. The 21 nodes are connected with Mellanox DDR Infiniband and link to a 20 TB of Raid storage.

2. In what ways does the department support and continue to develop non-academic staff (APT and civil service personnel) in a manner that encourages their effectiveness and actively furthers the mission of the department?

Non-academic staff regularly attend free training sessions offered by the campus as a whole (e.g. introduction to the new online financial system; briefings on Retirement funds; Title IX, etc.) but no special on-job trainings are organized or encouraged.

One staff member who acts as the assessment coordinator is encouraged to attend Assessment workshops run by the Assessment office.

3. Is the ratio of APT and civil service staff in relation to faculty sufficient for the department to achieve its mission and goals?

At present, there is sufficient administrative staff for the department. Replacement of a recently retired senior fiscal staff professional is currently being evaluated to determine if the two current staff members can handle the current workload. The professional expertise in student services has declined. Many years ago, the Department had its own Student

Services Advisor. However, as this person was promoted, extra school-wide duties were added to the job description resulting in a gradual decrease in services to the Department, so we are now being asked to shoulder many of the Student Services advisor's duties through use of the administrative staff, with no extra training or remuneration.

4. Please provide a list of staff awards and recognitions, 2013-2018

None

4.6 Extension and Outreach Activities

1. Please describe any relationships with organizations/individuals in the community. In what ways do these relationships contribute to the curriculum, student experience, development, faculty research, or budgetary resources in the department?

Online Teaching

The Department of Earth Science (EARTH) is developing online courses to provide greater access to our undergraduate courses. This program has been extremely successful in reaching students who might not have otherwise have taken an EARTH introductory course. Currently, we are offering two courses (GG101 and 101L) and we are adding a new course in spring 2019 (Introduction to volcanology). The two courses have reached maximum capacity each time they have been offered.

SOEST Open House

Every two years, SOEST holds a two-day Open House for schools and members of the public. This event involves all academic and research institutes within the School, including the Department of Earth Sciences. Since EARTH is one of the largest teaching departments within the School, all of our classrooms are used for exhibits and demonstrations, as well as some outside areas that are used for the "messier" or "louder" demonstrations. Close to 4000 school students and teachers attend, with our undergraduate and graduate students assisting faculty with exhibits and demonstrations. The purposes are to let the public know how their state and federal dollars are spent, to provide children of all ages an exposure to earth science fields and science activities outside of their own classrooms, and to allow students, teachers and parents to meet SOEST/EARTH faculty, students and staff. The SOEST Open House is a valuable community-building event both between SOEST/EARTH and the public, but also among students, faculty, and staff within SOEST/EARTH.

EARTH faculty often give presentations at schools, community college classes and to media outlets both locally and nationally. Some of the faculty volunteer each year as judges for the

Hawaii State Science and Engineering Fair. Other formal outreach and education efforts are funded as part of faculty research programs. NSF for example, is increasingly emphasizing education and outreach. The relations developed and experiences with local organizations enhance the overall experience for EARTH faculty and students alike.

Alumni Relations

Every year the Earth Sciences Department publishes a newsletter that is posted on our web site and sent via electronic mail to alumni. This newsletter helps to keep our former students in touch with the Department and it is also a vehicle used by the Department to encourage alumni to make monetary gifts to the department either for a specific use, for general purposes or frequently into the field trip fund for students. Alumni also periodically visit the department and speak to current students about their careers. We are currently planning to add an annual "Alumni Day" when our alumni will be invited to various events on campus.

Professional Relations

Some EARTH faculty collaborate with and/or obtain funding from local companies and agencies such as the U.S. Geological Survey, U.S. Soil and Water Conservation District, Hawaii Department of Land and Natural Resources, Hawaii Department of Health, Hawaii Department of Transportation, City and County of Honolulu, Kauai and Maui counties, and U.S. Department of Interior. Besides stimulating research and funding for faculty and supporting students, these relationships provide practical experience and potential future employment opportunities for graduate and undergraduate students.

Each Spring semester, the GG740 MGeo Seminar (taught by Ito, Ravizza and El-Kadi) invite professionals from various local companies (e.g., Arcadis, HECO, Hawaii Geophysical Services LLC, Chevron, Yogi-Kwong Engineers) and state agencies (Hawaii State Commission on Water Resource Management, Sea Grant, DLNR, Hawaii State Dept of Health) and national agencies (USGS) to speak to and visit with our students (undergrads and grads). Their talks discuss current trends in their field, activities they do in their jobs and case studies, as well as skills needed for their profession.

Hawaiian Volcanic Eruptions

EARTH faculty are frequently called upon to provide local, national (PBS News hour) and international (Australia, Spain, Canada) interviews for TV and radio regarding volcanic eruptions. The 2018

May-August eruption is an outstanding example. EARTH faculty did more than 100 interviews on this dynamic eruption.

Federal, State and Country Advisory Relations

Michael Garcia is a part-time administrative judge for the U.S. Nuclear Regulatory Commission. Bruce Houghton serves as State Volcanologist providing expert advice to the Civil Defense and U.S. Geological Survey. Chip Fletcher is a member of the Honolulu Climate Change Commission. Steve Martel is a member of the State of Hawaii Earthquake and Tsunami Advisory Committee.

Active and dedicated Facebook, Instagram and Twitter channels

Developed for outreach and alumni relations year-round, reaching hundreds of people a month with items of note on research programs, department events, alumni news, course field trips, etc. The Facebook account (778 followers) seems to appeal more to our alumni, Instagram (377 followers) to our current or very recent students, and Twitter (485 followers) is more open. In total, an audience of ~1500 self-selected followers are engaged. In addition, the EARTH Undergrads have their own Instagram account with 768 followers.

Hawaii's K-12 Educational Community

Several times per year, EARTH faculty lead volunteer groups of EARTH students (undergrad and grad) to serve a small portion of the geoscience needs of Hawaii's K-12 educational community. Affectionately (and informally) called the "EARTH circus", our cohort delivers volcano and earthquake hands-on demos, visualizations, and customized educational activities to local classrooms upon invitation. We have also participated in several major outreach events, including the SOEST Open House (6,800 visitors), the Hawaii STEM Expo (5,000 visitors), the Mānoa Experience (2,000 visitors), Hawaii P-20 Middle School Career Fair (700 visitors), and the Kapiolani Community College STEM Pai'ina (~40 visitors). In-person connections with local classrooms have been established with Palolo Elementary, the UH Lab School, Waialae Elementary, Mānoa Elementary, Hawaii Baptist Academy, and The Early School.

We also lead the UHM effort to participate in the *Great Hawaiian ShakeOut* earthquake preparedness event each year in October (in conjunction with the international *Great ShakeOut* event). The program has grown to include over 300 UH students, faculty, and staff.

2. Attach copies of newsletters, relevant brochures.

Our most recent Annual Alumni newsletter can be found in the Appendix; it is also available from http://www.soest.hawaii.edu/GG/resources/gg_news_2018.pdf.

4.7 Concluding Statement

1. What is your overall assessment of the department? What are the strengths, weaknesses, opportunities and threats? Are you poised to meet these challenges in the future?

During the 5-year period covered by this self-assessment, the Department of Earth Sciences (EARTH) has seen increased engagement by faculty on issues that were identified during the previous self-assessment. We also are responding to new challenges that have moved to the fore during the last few years. While many of our old challenges remain, we have been making steady progress on others (See Table VII-1).

Strengths

The core strengths of any academic department lie with its faculty. Our department strongly believes in its mission of teaching, research and service, and its faculty demonstrates this daily by exercising their responsibilities in those three key areas of engagement. Their dedication and contributions to their profession continue to be recognized, as evidenced by new faculty being elected Fellows of professional societies, such as the American Geophysical Union and the Geological Society of America. Among seven UH Mānoa members of the US National Academy of Sciences, four are in SOEST with one in EARTH. Fueled by a wide range of extramural grants (almost $18M via ~200 grants to date since the previous self-evaluation study) EARTH faculty, their graduate students and post-doctoral fellows conduct high-impact research in a wide range of disciplines, as evidenced by publications in the top peer-reviewed geoscience journals, including the most prestigious journals (e.g., Nature, Nature Geoscience, Science, Proceedings of the National Academy of Science, and more). The EARTH faculty believe in the deep integration of research and education, and unlike many institutions we are known for encouraging our best faculty to engage in the introductory classes. The quality of instruction is a source of pride to our department and several of our professors have received UHM awards for their excellence in teaching. We will continue to expand our educational footprint while retaining the excellence for which we are known.

Weaknesses

Our previous self-study report lamented that the mean age of EARTH faculty is increasing. While we have had a few retirements and faculty departures since then, only some of those positions have been returned to us for recruitment. Thus, the aging trend has continued and we now anticipate five or more of retirements will take place during the next five-year period.

Consequently, this coming period will be critical for the renewal of the department. It will take a collective effort and engagement by EARTH and the SOEST Deans' office to ensure new hires are responsive to student demands for more environmentally-oriented degrees, are addressing the pressing societal and discipline-specific challenges with potential to grow our extramural funding base, and are strengthening and augmenting areas of research in which EARTH and SOEST scientists have built a reputation for excellence. At the same time, we wish to continue to modernize our content delivery using modern pedagogical methods, such as "flipped" classrooms. We must also use this opportunity to address the lack of diversity of faculty. With the departure of two female Professors in the past 5 years, only three full-time professors are women while 20 are men; other measures of diversity are even more lopsided. Such stark biometrics form the backdrop to an undergraduate and graduate population that on average counts two females for every male student. Clearly, in our expected upcoming hires we must explore options with SOEST and UHM leadership, consider NSF programs such as ADVANCES, and pursue other avenues to ensure we evolve toward a more balanced EARTH faculty.

Table 4 Results of self-evaluation by SWOT analysis

Strengths	**Opportunities**
-Academic diversity -Unique geographic/geologic location -External grant funding base -Faculty excellence -National leadership in some geologic sub-disciplines -Faculty collegiality -Over 50 years of history and tradition of research, teaching, and service excellence	-Changing face of Earth Sciences -Emerging interdisciplinary research fields -Land degradation and sea level rise, impending environmental crises, and the resulting hazards -Lack of a state geological survey -Unexploited ties to the rest of SOEST -Pending retirements
Weaknesses	**Threats**
-Limited resources for response to external changes -Limited resources for graduate student support -Geographic isolation -Lack of coverage of some key geologic sub-disciplines -Lack of funded technical support -Few interdisciplinary research programs -Academic preparation of incoming undergraduates -Incomplete group cohesion on curricular matters -Historical reduction in faculty complement -Limited collaborations with other units -Limited faculty diversity	-Insufficient monetary resources -Political nature of resource allocation at UH -Bureaucratic inertia -Unfilled faculty complements -Large swings in island tourism

Opportunities

While an engaged faculty during recruitment is critical, such opportunities also require strong and dedicated leadership at the Departmental level. At UHM, the standard rotation of Department Chairs has been 3 years, but in response to previous reviews this duration was increased to four, at least within SOEST (the faculty collective bargaining agreement stipulates 3 years, hence a fourth year is an optional extension offered by the Dean). While this increase may give the Chair a longer time-horizon to effect change, departmental leadership also represents a career choice that most faculty are increasingly unwilling to make due to the negative effects on their personal research portfolio. Hence, we typically struggle to find faculty willing to take over the reins of the department. Furthermore, EARTH is an academic department with a strong research component, yet the Chair's activities have largely revolved around academic matters. In contrast, the organized research units in SOEST are led by a Director who overseas research activities. The expectations of excellence in both research and teaching place strong demands on department leadership and it may be time to discuss alternate leadership models going forward, such as a non-rotating Department Head or reassigning the undergraduate and/or graduate oversight duties to separate Undergraduate and Graduate Chairs. The department has begun discussions of such options but effective changes will require additional funds to support the new model as well as evidence of program growth. In SOEST, academic Chairs have limited authority and most decisions of consequence are made by the Dean.

It is now 20 years since the Department of Earth Sciences moved to its present location in the POST building. Twenty years ago, office and classroom space seemed plentiful and laboratories were new and purpose built. Today, space is more restricted and the original layout of space is not effective for encouraging collaborative activities. While space distribution for faculty and student offices can be solved relatively inexpensively, the larger problems for a research-intensive unit such as EARTH are related to the aging air-conditioning, electrical, and laboratory (e.g., deionized water, compressed air, EVAC) infrastructure in the building. Expensive and sensitive instruments across multiple laboratories place strict requirements on the interior environment (temperature, humidity, air quality) and as the building ages more challenges are surfacing. Concerns about mold and water dripping from pipes and ducts above the false ceiling have been increasing during the review period. Access to dedicated scientific instrumentation remains a core component of an Earth Sciences department's research portfolio and it is imperative that SOEST, with support from UHM, ensures the absolute highest standard in maintenance, tech support, and timely infrastructure upgrades. Since our previous review, the indirect cost rate has increased from 36.7% to 41.5%, yet we are lagging far behind institutions that we are competing with for extramural support. The main increase in overhead is related to fringe benefits, in particular medical insurance. Thus, we must repeat an earlier recommendation that a much higher level of infrastructure support returned to the unit in a form that can be spent on infrastructure will be required if faculty are to maintain their productive level of research and to allow for growth in an increasingly competitive funding environment.

The Department of Earth Sciences is fortunate to have a vast array of World-class laboratories, some with state-of-the-art instruments, and some with older and more difficult to maintain instruments. Consolidation in the scientific instrument space has led to dramatic changes in user and instrument support, with the loss of a la carte service from most large vendors, replaced by costly pre-paid service plans. Thanks to the success of the faculty in obtaining equipment support from the National Science Foundation's Major Research Instrumentation Program we have some of the best and newest instruments available (e.g., several new ThermoFisher isotope gas ratio mass spectrometers, JEOL microprobe). However, other instruments (both thermal mass spectrometers and the multi-collector inductively coupled plasma mass spectrometer are 1 to 3 decades old and need constant attention and repair to enable data collection. This aging equipment must be replaced and while highly competitive proposals for this equipment are envisioned, awards will not come unless there is sufficient and appropriate space to house this equipment and continuity of technical and Specialist support.

The Department of Earth Sciences prides itself in its dedication to education. The largest portion of faculty service on standing committees relates to the development and upkeep of curricula, oversight of degree programs, and the tracking of student progress. Under the previous Chair (Ken Rubin), the department made great strides into online learning and we now regularly offer several sections of our introductory courses online. The department also significantly revised its BA curriculum, and added several new courses that satisfy the university General Education (as recommended by our last external review). Even our introductory geology laboratory course can now be taken online. In addition, we maintain in-class versions of the same courses, thus offering students a choice between physical and online education experiences. We are somewhat ambivalent about the educational benefits to students enrolled in online courses covering hands-on subjects such as geology, but as 3-D visualization of rock and fossil specimens becomes more immersive and software offer improved augmented reality field experiences we expect such hurdles are likely to diminish.

Over the last five years, SOEST and its academic departments have been under pressure by the Regents to increase its educational footprint in terms of student credit hours (SSH). This pressure coincides with a revamping of how the campus budget model allocates funding to individual units, shifting to a new model where tuition generation and graduation numbers take on larger weights. In addition to the changes outlined above, EARTH has responded to this pressure in several ways: (1) we added graduate course equivalents to popular upper division courses so graduate students can receive graduate credits; (2) we added three general education courses to serve the wider campus and to increase our SSH count; (3) we improved course scheduling, added some late afternoon and evening offerings, and regulated graduate seminar offerings to maximize enrollment and course menu consistency; (4) we added more writing (W) and oral (O) focusses to existing courses to eliminate common obstacles to graduation; (5) we added two new “3+2” degree programs with Chinese Universities (Wuhan and Zhejiang), currently still in the exploratory phase; (8) we placed more emphasis on admitting self-funded students into our professional (MGEO)

and non-thesis (MS Plan B) degree programs; and (9) we emphasized higher enrollment offerings when assigning electives to faculty. Furthermore, we have had numerous committee deliberations, faculty meetings and luncheons dedicated to the idea of making our department more relevant to today's student population, with an eye to increasing our undergraduate enrollment. It has been a long and engaging discussion that has now culminated in how we name ourselves and our degree programs: The old name "Geology & Geophysics" was retired in Sept., 2018. As mentioned in Section I, the department is now called "Earth Sciences", our graduate degree is "Earth and Planetary Sciences" (about a third of our graduate students work with our cooperating graduate faculty in Hawaii Institute of Geophysics and Planetology), and our undergraduate degree is "Earth Sciences". We believe our new names are much better aligned with faculty identity and student interest. While we dream that the name changes alone will lead to an increased enrollment, we are now redoubling our efforts to recruit more undergraduate students into our major. Specifically, we are (i) exploring targeted advertising by purchasing e-mail contacts from the College Board for all students interested in STEM fields and who have been admitted to UH Mānoa, (ii) increasing our collaboration with UH Community Colleges to provide pathways for their students to enroll in our program after completing preparatory coursework at their institutions, and (iii) considering the production of 30-second promotional videos to run at local movie theaters.

Our data show that we typically host ~60 graduate students (with two-thirds mentored by graduate faculty whose home-base is EARTH and one-third whose home-base is HIGP) and ~40 undergraduate students, but we are now setting new goals to increase both of these populations. To increase graduate student enrollment, we have begun to admit significantly more self-paying students into our master's program than before, now representing up to 20–25% of the last three incoming cohorts. This is somewhat of a sea-change in EARTH where almost all student support comes from extramural grants (we only have 5 TA positions and one Fellowship that can support a graduate student). Many of the new MS students are seeking a skill-based education, hence coarse work is the largest requirement followed by a "culminating experience", usually a modest research report. Thus, mentoring of such students is less intense than our typical research-track MS and it is believed that the department could accommodate twice as many MS students than at present, which will also help boost enrollment in our graduate courses. Thus, a key goal for the department is to increase our share of self-funded MS students to 25 (approximately one per faculty member) by the end of the next 5-year cycle. While improving our skill-based MS program we also wish to strengthen and expand our graduate research opportunities at the MS and PhD levels, hence we will pursue new and collaborative funding opportunities across EARTH, SOEST, and beyond. Graduate research is the life-blood of a research school and it is vital we remain at the forefront of scientific research within our expertise.

The new department and undergraduate degree names offer another opportunity to expand our footprint on campus. Many of the topics that naturally fall within our purview (volcanology and natural hazards, coastal studies, geohydrology, and other geo-

environmental fields) build on existing department strengths and furthermore are targets for expansions or realignment following the aforementioned retirements. We will continue to explore recruitment opportunities for both local and transfer students and build bridges to both our community colleges and local high schools. SOEST is the jewel at our Research 1 University, with EARTH making important contributions to research (especially the integration of research and education), and it is imperative that we examine new ways to recruit potential local students. We have just started a campaign to double our undergraduate enrollment; such an increase can easily be accommodated with existing resources. While much of these activities remain under the oversight of the department Chair, we have believed for some time that such efforts could be accelerated by a dedicated educational specialist.

Threats

The State of Hawaii is very dependent upon the health of the local tourism industry, more so than most other states. The state's level of support for its flagship university has steadily eroded over the past decade, yet it remains higher than at comparable institutions on the mainland. The reduction in state funding has placed more emphasis on both extramural grants and tuition revenue, with private funding lagging behind. The department will work with the UH Foundation is finding new ways to obtain private funding for critical research and educational programs of special importance to the State and its citizens.

In the Earth Sciences, it is essential that students experience the real geologic environment via numerous field trips. While theoretical concepts and historical treatments can be covered in books and lectures, we cannot recreate the natural environment at the scales necessary to appreciate the complexity of most geologic phenomena. On one hand, Hawaii offers excellent exposure of volcanic features, coral reefs, coastal processes, and island hydrogeology. Yet on the other hand, most of the traditional rock types and geologic structures discussed in our curriculum have no local equivalents given the youthfulness and geologic/tectonic setting of our volcanic island chain. This discrepancy necessitates field trips to the mainland which imposes considerable logistic and budget restrictions on what we can offer. Our undergraduate capstone course in field methods (GG 305) combines local exposure with a weeklong California field experience that typically adds a cost of over $1000 per student. We are fortunate that some of our alumni remain very supportive of our field trip programs and contribute financially to help the department support as many field trips as it can. However, even a trip to a neighbor island, in particular for access to active eruptions on the Big Island, requires around $200 in airfare alone. Hence, these fiscal realities limit the number of field trips we can reasonably require of our majors and it may be one of several obstacles to future enrollment growth. The department will continue to explore new funding sources for our field trip component and will build a closer bond with our alumni to explore if additional financial support could be generated from this group.

Summary

In summary, the Department of Earth Sciences is looking forward to our next few years with hopes of improvement along several lines of attack. Chair Wessel has outlined several priorities for the department, some of which start on a foundation built by former Chair Rubin:

1. Increase our online presence in the introductory classes and move into our lower division courses; the latter may enable community college students to prepare for a transfer to UHM and enroll in our degree programs.
2. With new program names, hold a two-day faculty retreat to work on many aspects of our undergraduate and graduate programs, such as relevance of course work, synergies between courses, modernizing methods of delivery, revitalizing the user of data science, and create an assessment system that actually works.
3. Double our undergraduate enrollment by enabling the community college pathway, target incoming science students to UH Mānoa via marketing and outreach, and produce and launch a 30-second video commercial to be played on Oahu movie theaters.
4. Update our teaching spaces with modern furniture, layout and technology.
5. Double our "grantmanship" by organizing ad hoc group meetings to tackle larger and more interdisciplinary agency solicitations.
6. Improve faculty collegiality by adding social events for the department and work with the other SOEST academic Chairs to increase mingling of faculty across SOEST in social settings.
7. Improve alumni relations by instituting an annual Alumni Day and encourage alumni to be more engaged in the department, coupled with more efforts directed towards securing a wider donor base.

Much of what is needed to accomplish these goals are within ourselves, some may depend on circumstance and luck, while others are limited by our sparse resources. For instance, more TA positions and Fellowships would mean more student research and opportunities for spinning up more research proposals, and things cost money. Improved collegiality can lead to more opportunities for collaborations. The Chair serves a vital role in directing many of these activities. However, having a rotating academic Chair also tasked with maintaining his or her research and teaching portfolios limits how many balls any given chair can juggle successfully. Perhaps the current external review can provide new input to this ongoing discussion.

2. What is your assessment of how the department fits within the School/College? What is your assessment of interdisciplinary collaboration and communication across the departments?

The Department of Earth Sciences is a natural fit within SOEST, deriving as it does in part from the original geology department going back to the 1930s and in part from the influx in

Earth Science research support following Statehood in 1959, the subsequent creation of Hawaii Institute of Geophysics and the hiring of more research faculty. SOEST and its departments and institutes cover all of what we call the Geosciences, and much more. In particular, there are close collaborations between EARTH and both HIGP and Department of Oceanography (OCN), with room for further growth. Many EARTH faculty members serve as graduate faculty in OCE and vice versa, allowing our students to receive critical mentorship despite the partitioning of faculty in different units. Also, many EARTH faculty members have research collaborations with faculty in OCE and the Center of Marine Microbial Oceanography: Research and Education (C-MORE). In particular, most faculty in HIGP are on our cooperating graduate faculty and their students have their degree programs administered through our department. The degree of collaboration and synergy among units in SOEST is good but here the sky truly is the limit. Recently, the four academic Chairs in SOEST have started to meet regularly (once a month) to work on barriers to collaboration and building on synergies between our faculties.

Collaborative endeavors extend beyond SOEST as well: Faculty maintain active collaborations with the faculty in Astronomy, Chemistry, Geography, Physics, Engineering, Water Resources and Urban and Regional Planning. There is also collaboration with faculty at UH-Hilo as well.

3. Please identify individuals or groups that you recommend the visiting team meet during the campus visit.

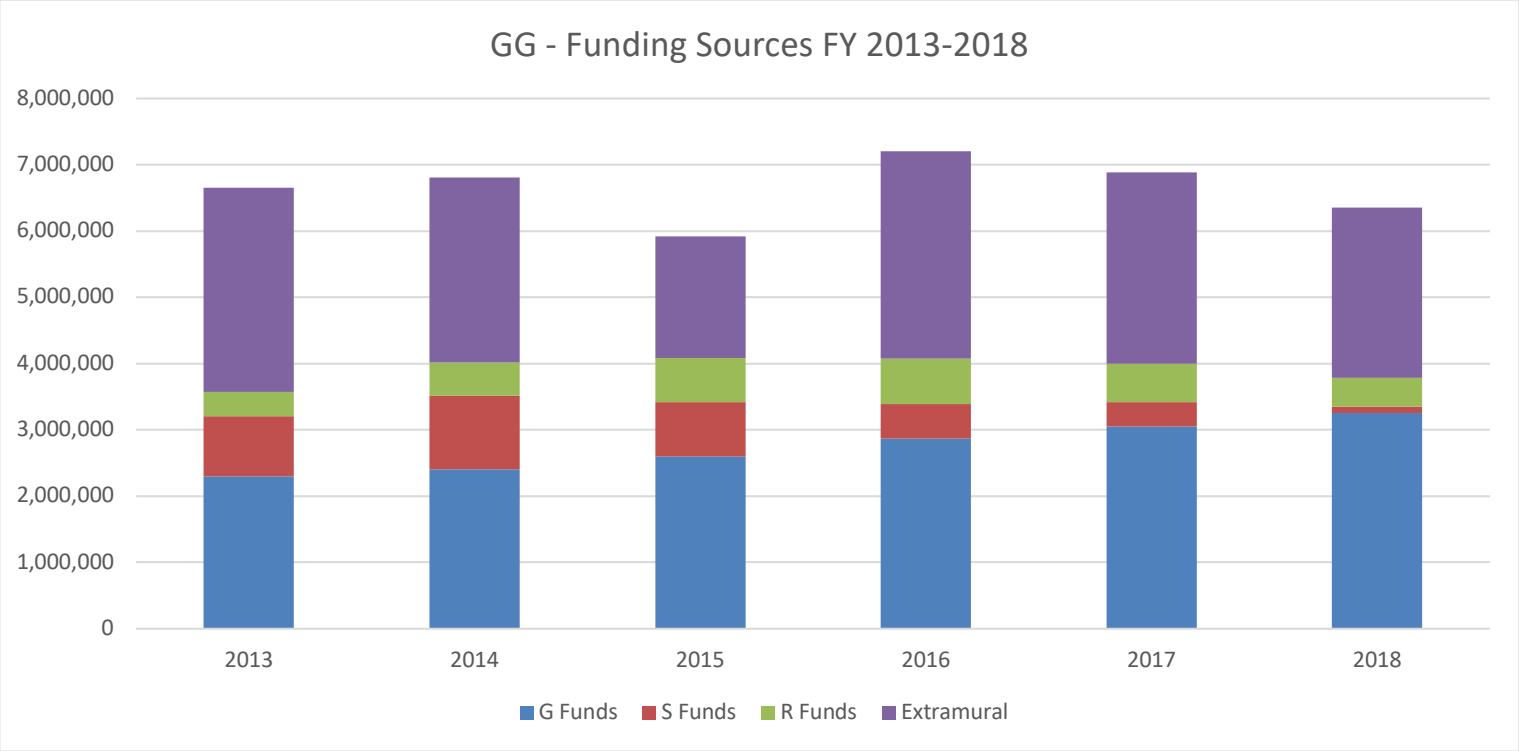
Bruce Houghton's group – Volcanic Hazards, collaborations with social scientists and others across campus
Craig Glenn/Henrietta Dulai/Aly El-Kadi – collaborations across campus and with UH Hilo
Garrett Ito, Rob Dunn and Bridget Smith-Konter - New developments in Geophysics
Paul Wessel and Ken Rubin - Chair and former Chair of Earth Sciences

4. Please identify facilities that the team should tour during the visit.

POST 621 – SOEST electron microprobe and XRF (Eric Hellebrand)
POST 604/630 – SOEST Isotope Laboratory (Ken Rubin)
POST 724/725/726 - SOEST Stable Isotope Biogeochemistry Laboratories (Brian Popp)
POST 732 - High-temperature experimental petrology (Julia Hammer)

Appendix – Funding Profile, Department of Earth Sciences

Year	2013	2014	2015	2016	2017	2018
G Funds	2,295,517	2,409,075	2,601,304	2,864,813	3,054,646	3,256,704
S Funds	911,621	1,108,594	813,325	523,253	366,648	96,879
R Funds	368,203	503,822	674,036	692,045	577,160	431,086
Extramural	3,081,862	2,785,379	1,833,840	3,122,001	2,891,391	2,566,204
Total	6,657,203	6,806,870	5,922,505	7,202,112	6,889,845	6,350,873



Appendix – Earth Sciences, BS Pathway

UHM General Education Core Requirements

Foundations

- ❑ FW ENG 100, 100A, 190, ESL 100, or AMST 111
- ❑ FQ* MATH 241
- ❑ FG (A / B / C)
- ❑ FG (A / B / C)

**Note: This requirement changed in Fall 2018. If you entered the UH System prior to that, please see your college/school advisor.*

Diversification

- ❑ DA / DH / DL
- ❑ DA / DH / DL
- ❑ DB BIOL 171, ZOOL 101, or MICR 130
- ❑ DP GG 101
- ❑ DY GG 101L
- ❑ DS
- ❑ DS

** See degree, college and major requirements for courses that can also fulfill these.*

UHM Graduation Requirements

Focus

- ❑ H
- ❑ E (300+)
- ❑ O (300+)

- ❑ W
- ❑ W
- ❑ W
- ❑ W (300+)
- ❑ W (300+)

Hawaiian / Second Language

The Hawaiian or Second Language requirement is **not** required for students admitted to the School of Ocean and Earth Science and Technology.

Credit Minimums

- 120 total applicable
- 30 in residence at UHM
- 45 upper division (300+ level) credits

Grade Point Average

- 2.0 cumulative or higher *(Note: Other GPAs may be required)*
- Good academic standing

University of Hawai'i at Mānoa
School of Ocean and Earth Science and Technology Program Sheet 2018-2019

Bachelor of Science (BS) in Earth Sciences

Admissions: Open Process: Declaration
Min. Total Credits: 120 (77 in core & major + 23 in electives)

Degree Requirements

Bachelor of Science Requirements

- ❑ MATH 241*FQ
- ❑ MATH 242
- ❑ CHEM 161*DP / ❑ 161L*DY
- ❑ CHEM 162*DP / ❑ 162L*DY
- ❑ PHYS 170*DP / ❑ 170L*DY
- ❑ PHYS 272*DP / ❑ 272L*DY

College Requirements

Exit Requirements

- Submit the Graduation Worksheet to the SOEST Student Academic Services Office at least two semesters preceding the award of the degree.
- Exit interview by SOEST Student Academic Services Office.

Major Requirements for BS in Geology and Geophysics

Admission: Open
Application: NA
Min. major credits: 48 (77-78 with related requirements)
Min. C grade (not C-) in all courses

Requirements

Geology and Geophysics Related Requirements (29-30 credits)

- ❑ BIOL 171*DB/BIOL 171L*DY, ZOOL 101*DB, or MICR 130*DB
- ❑ CHEM 161*DP / ❑ 161L*DY
- ❑ CHEM 162*DP / ❑ 162L*DY
- ❑ PHYS 170*DP / ❑ 170L*DY
- ❑ PHYS 272*DP / ❑ 272L*DY
- ❑ MATH 241*FQ
- ❑ MATH 242
- ❑ OEST 100

Geology and Geophysics Core Courses (37 credits)

- ❑ GG 170*DP/DY, GG 101*DP/101L*DY, or GG 103*DP/101L*DY
- ❑ GG 200
- ❑ GG 250
- ❑ GG 301
- ❑ GG 302
- ❑ GG 303
- ❑ GG 304 or 450
- ❑ GG 305
- ❑ GG 309
- ❑ GG 325
- ❑ GG 410

Geology and Geophysics Upper Division Science Electives (11 credits)

- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

List of approved upper division science electives: GG 300, 304, 312, 325, 395, 399, 402, 406, 407, 413, 420, 421, 423, 425, 444, 450, 451, 454, 455, 460, 461, 466, 499

Notes

School of Ocean and Earth Science and Technology: Student Academic Services, HIG 135; (808) 956-8763; www.soest.hawaii.edu

Department of Geology and Geophysics: POST 701; (808) 956-7640; ggdept@soest.hawaii.edu; www.soest.hawaii.edu/asp/GG/index.asp

Appendix – Environmental Earth Science, BA Pathway

UHM General Education Core Requirements

Foundations

- ❑ FW ENG 100, 100A, 190, ESL 100, or AMST 111
- ❑ FQ* MATH 241 or 215
- ❑ FG (A / B / C)
- ❑ FG (A / B / C)

**Note: This requirement changed in Fall 2018. If you entered the UH System prior to that, please see your college/school advisor.*

Diversification

- ❑ DA / DH / DL
- ❑ DA / DH / DL
- ❑ DB BIOL 171, ZOOL 101, MICR 130, or OEST 103
- ❑ DP GG/ERTH 101
- ❑ DY GG/ERTH 101L
- ❑ DS
- ❑ DS

** See degree, college and major requirements for courses that can also fulfill these.*

UHM Graduation Requirements

Focus

- ❑ H
- ❑ E (300+)
- ❑ O (300+)

- ❑ W
- ❑ W
- ❑ W
- ❑ W (300+)
- ❑ W (300+)

Hawaiian / Second Language

The Hawaiian or Second Language requirement is **not** required for students admitted to the School of Ocean and Earth Science and Technology.

Credit Minimums

- 120 total applicable
- 30 in residence at UHM
- 45 upper division (300+ level) credits

Grade Point Average

- 2.0 cumulative or higher *(Note: Other GPAs may be required)*
- Good academic standing

University of Hawai'i at Mānoa
School of Ocean and Earth Science and Technology Program Sheet 2019-2020

Bachelor of Arts (BA) in Environmental Earth Science

Admissions: Open Process: Declaration
Min. Total Credits: 120 (86 in core & major + 34 in electives)

Degree Requirements

Bachelor of Arts: Math and Science Requirements

- ❑ MATH 241*FQ or MATH 215*FQ
- ❑ CHEM 161*DP / ❑ 161L*DY
- ❑ CHEM 162*DP / ❑ 162L*DY
- ❑ PHYS 151*DP / ❑ 151L*DY
- ❑ PHYS 152*DP / ❑ 152L*DY

College Requirements

Exit Requirements

- Submit the Graduation Worksheet to the SOEST Student Academic Services Office at least two semesters preceding the award of the degree.
- Exit interview by SOEST Student Academic Services Office.

Major Requirements for BA in Envcironmental Earth Science
Admission: Open
Application: NA
Min. major credits: 63
Min. C grade (not C-) in all courses
Requirements
Environmental Earth Science Required Support Course (24 credits)
❑ BIOL 171*DB, ZOOL 101*DB, MICR 130*DB, or OEST 103
❑ CHEM 161*DP / ❑ 161L*DY
❑ CHEM 162*DP / ❑ 162L*DY
❑ PHYS 151*DP / ❑ 151L*DY
❑ PHYS 152*DP / ❑ 152L*DY
❑ MATH 241*FQ or MATH 215*FQ
❑ OEST 100
Environmental Earth Science Core Courses (27 credits)
❑ GG/ERTH 170*DP/DY, GG/ERTH 101*DP/101L*DY, or GG/ERTH 102*FQ/101L, or GG/ERTH 103*DP/101L*DY, or GG/ERTH 104/101L, or GG/ERTH 106/101L, or GG/ERTH 130/101L
❑ GG/ERTH 200
❑ GG/ERTH 305
❑ GG/ERTH 309
❑ GG/ERTH 325
❑ GG/ERTH 410
❑ GG/ERTH 455
❑ GG/ERTH 461
Environmental Earth Science Science Electives (15 credits)
❑ _____ ❑ _____
❑ _____ ❑ _____
List of approved upper division science electives: GG/ERTH 250, 300, 301, 302, 303, 304, 312, 325, 395, 399, 402, 406, 407, 413, 420, 423, 425, 444, 450, 451, 454, 466, 499; NREM 477; OCN 320; TPSS 304. Consult with an undergraduate advisor for details.
Notes
School of Ocean and Earth Science and Technology: Student Academic Services, HIG 135; (808) 956-8763; www.soest.hawaii.edu Department of Earth Sciences: POST 701; (808) 956-7640; earth-dept@soest.hawaii.edu; www.soest.hawaii.edu/asp/GG/index.asp

Appendix – Earth Science Education, BA Pathway

UHM General Education Core Requirements
Foundations
❑ FW ENG 100, 100A, 190, ESL 100, or AMST 111
❑ FQ* MATH 241 or 215
❑ FG (A / B / C)
❑ FG (A / B / C)
**Note: This requirement changed in Fall 2018. If you entered the UH System prior to that, please see your college/school advisor.*
Diversification
❑ DA / DH / DL
❑ DA / DH / DL
❑ DB BIOL 171
❑ DP GG/ERTH 101
❑ DY GG/ERTH 101L
❑ DS
❑ DS
** See degree, college and major requirements for courses that can also fulfill these.*
UHM Graduation Requirements
Focus
❑ H
❑ E (300+)
❑ O (300+)
❑ W
❑ W
❑ W
❑ W (300+)
❑ W (300+)
Hawaiian / Second Language
The Hawaiian or Second Language requirement is **not** required for students admitted to the School of Ocean and Earth Science and Technology.
Credit Minimums
• 120 total applicable
• 30 in residence at UHM
• 45 upper division (300+ level) credits
Grade Point Average
• 2.0 cumulative or higher *(Note: Other GPAs may be required)*
• Good academic standing

University of Hawai'i at Mānoa
School of Ocean and Earth Science and Technology Program Sheet 2019-2020

Bachelor of Arts (BA) in Environmental Earth Science

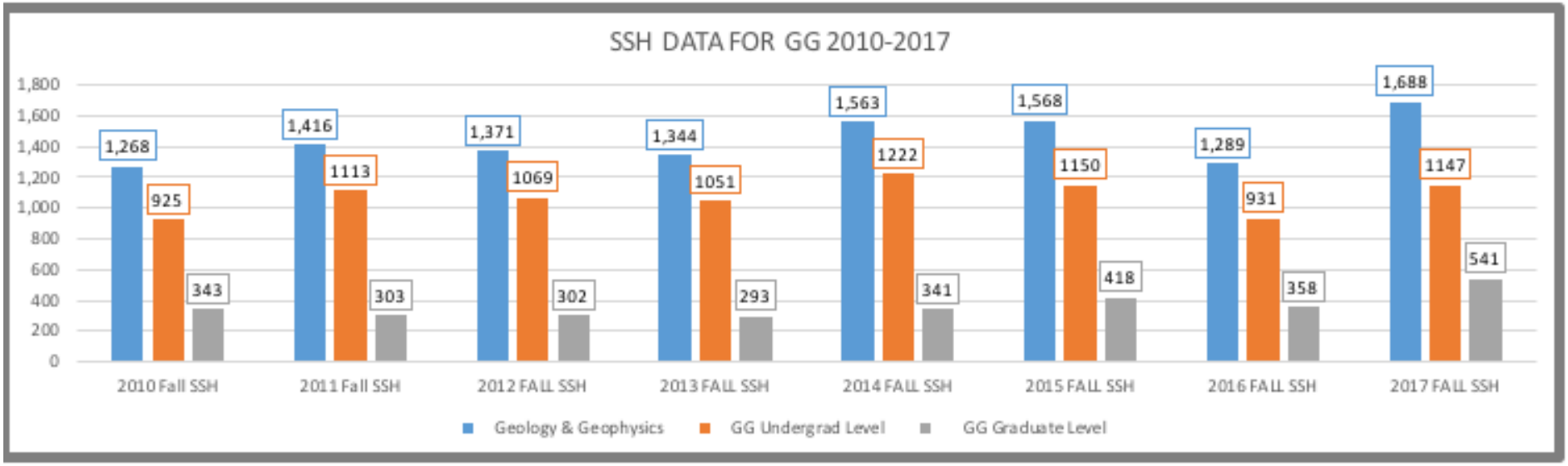
Track: Earth Science Education
Admissions: Open Process: Declaration
Min. Total Credits: 120 (86 in core & major + 34 in electives)

Degree Requirements
Bachelor of Arts: Math and Science Requirements
❑ MATH 241*FQ or MATH 215*FQ
❑ BIOL 171*DB / ❑ 171L*DY
❑ CHEM 161*DP / ❑ 161L*DY
❑ CHEM 162*DP / ❑ 162L*DY
❑ PHYS 151*DP / ❑ 151L*DY
❑ PHYS 152*DP / ❑ 152L*DY
College Requirements
Exit Requirements
• Submit the Graduation Worksheet to the SOEST Student Academic Services Office at least two semesters preceding the award of the degree.
• Exit interview by SOEST Student Academic Services Office.

Major Requirements for BA in Environmental Earth Science
Specialization: Earth Science Education
Admission: Open
Application: NA
Min. major credits: 69
Min. C grade (not C-) in all courses
Requirements
Environmental Earth Science Required Support Course (42 credits)
❑ ATMO 101/ ❑ ATMO 101L
❑ ATMO 200
❑ BIOL 171*DB/ ❑ 171L*DY
❑ CHEM 161*DP / ❑ 161L*DY
❑ CHEM 162*DP / ❑ 162L*DY
❑ PHYS 151*DP / ❑ 151L*DY
❑ PHYS 152*DP / ❑ 152L*DY
❑ MATH 241*FQ or MATH 215*FQ
❑ OCN 201/ ❑ 201L
❑ OCN 310
❑ OEST 100
❑ ITE 401
Environmental Earth Science Core Courses (22 credits)
❑ GG/ERTH 170*DP/DY, GG/ERTH 101*DP/101L*DY, or GG/ERTH 102*FQ,101L, or GG/ERTH 103*DP/101L*DY, or GG/ERTH 104/101L, or GG/ERTH 106/101L, or GG/ERTH 130/101L
❑ GG/ERTH 105 or ASTR 110
❑ GG/ERTH 200
❑ GG/ERTH 300
❑ GG/ERTH 305
❑ GG/ERTH 406
❑ GG/ERTH 410
Geology Upper Division Science Electives (5 credits)
❑ _____
❑ _____
List of approved upper division science electives: GG/ERTH 300, 304, 312, 325, 395, 399, 402, 406, 407, 413, 420, 421, 423, 425, 444, 450, 451, 455, 460, 466, 499; BOT 450; GEOG 388, 405; NREM 477; OCN 320, 457; TPSS 304
Notes
School of Ocean and Earth Science and Technology: Student Academic Services, HIG 135; (808) 956-8763; www.soest.hawaii.edu Department of Earth Sciences: POST 701; (808) 956-7640; earth-dept@soest.hawaii.edu; www.soest.hawaii.edu/asp/GG/index.asp

Appendix – Student Data in Earth Sciences (Geology and Geophysics) Student Semester Hours

COURSE OFFERING	2010 Fall SSH	2011 Fall SSH	2012 FALL SSH	2013 FALL SSH	2014 FALL SSH	2015 FALL SSH	2016 FALL SSH	2017 FALL SSH
Geology & Geophysics	1,268	1,416	1,371	1,344	1,563	1,568	1,289	1,688
GG Undergrad Level	925	1113	1069	1051	1222	1150	931	1147
GG Graduate Level	343	303	302	293	341	418	358	541



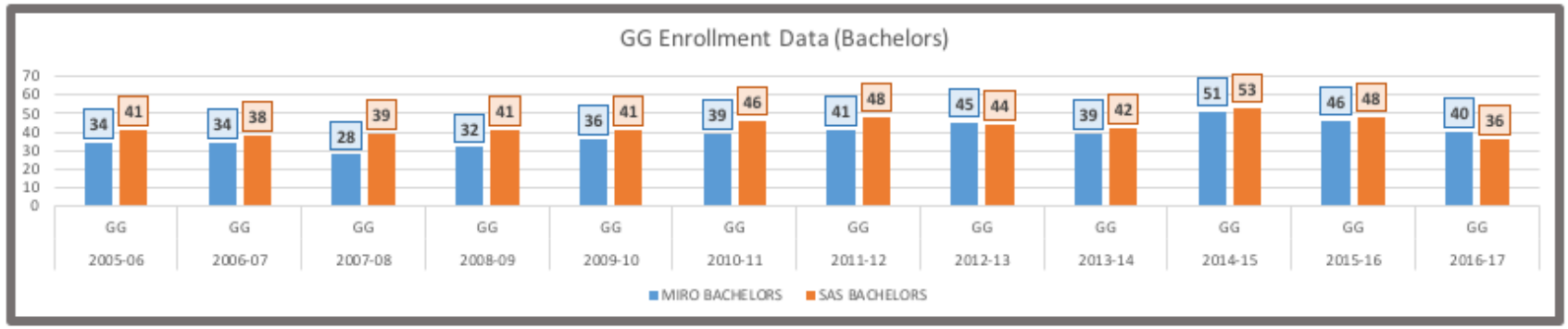
Appendix – Student Data in Earth Sciences, Enrollment

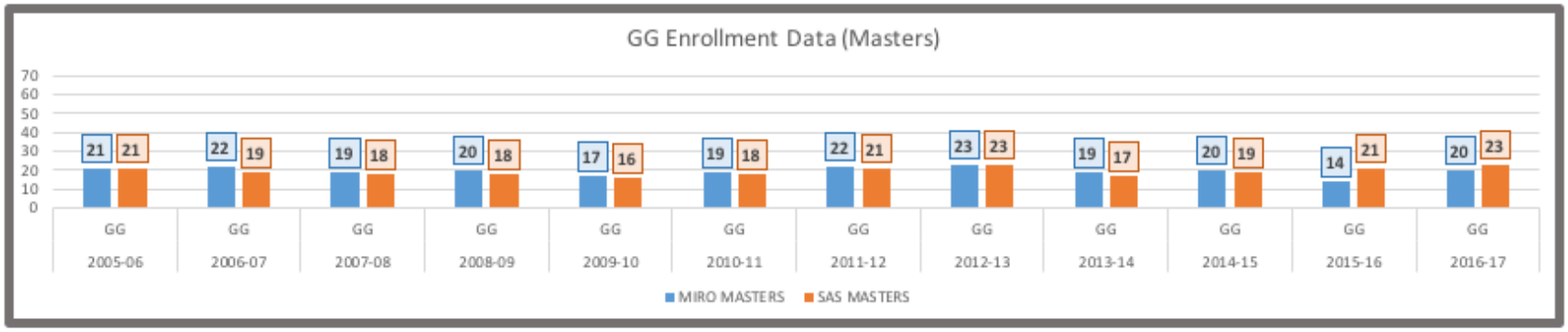
Note - There are 2 sources for student data: SAS = SOEST data; MIRO = UH data

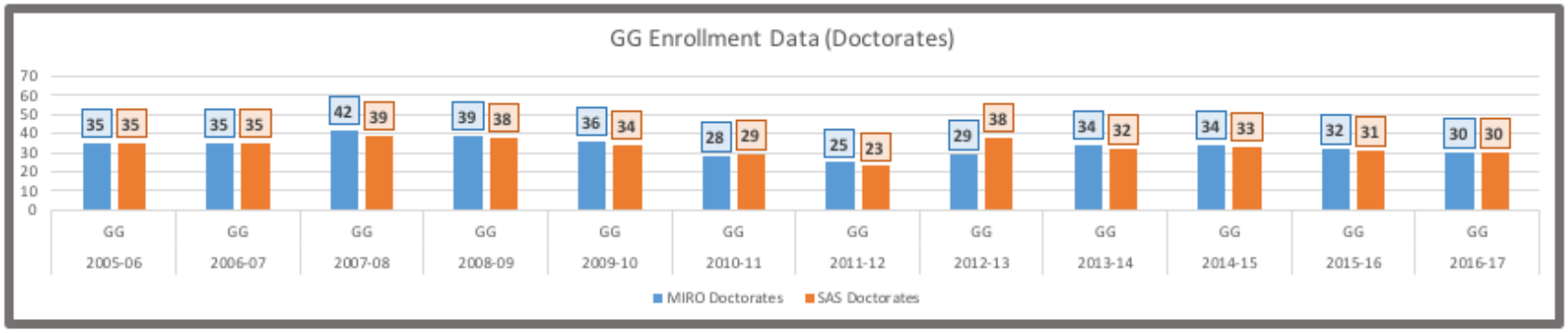
Academic Year	Department	Bachelors	SAS Bachelors	Masters	SAS Masters	Doctorate	SAS Doc
2005-06	GG	34	41	21	21	35	35
2006-07	GG	34	38	22	19	35	35
2007-08	GG	28	39	19	18	42	39
2008-09	GG	32	41	20	18	39	38
2009-10	GG	36	41	17	16	36	34
2010-11	GG	39	46	19	18	28	29
2011-12	GG	41	48	22	21	25	23
2012-13	GG	45	44	23	23	29	38
2013-14	GG	39	42	19	17	34	32
2014-15	GG	51	53	20	19	34	33
2015-16	GG	46	48	14	21	32	31
2016-17	GG	40	36	20	23	30	30

Appendix – Student Data in Earth Sciences, Enrollment (cont.)

Note - There are 2 sources for student data: SAS = SOEST data; MIRO = UH data

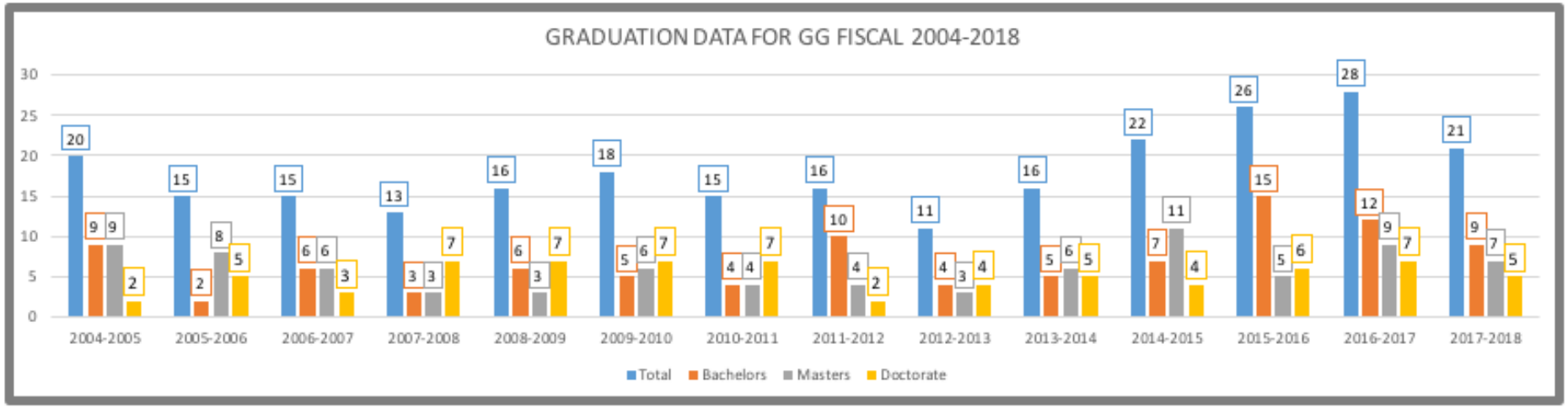






Appendix – Student Data in Earth Sciences, Graduation

Fiscal year	Total	Bachelors	Masters	Doctorate
2004-2005	20	9	9	2
2005-2006	15	2	8	5
2006-2007	15	6	6	3
2007-2008	13	3	3	7
2008-2009	16	6	3	7
2009-2010	18	5	6	7
2010-2011	15	4	4	7
2011-2012	16	10	4	2
2012-2013	11	4	3	4
2013-2014	16	5	6	5
2014-2015	22	7	11	4
2015-2016	26	15	5	6
2016-2017	28	12	9	7
2017-2018	21	9	7	5



Appendix – Quantitative Indicators in Earth Sciences

		2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
		F13	**F14**	**F15**	**F16**	**F17**
	HEADCOUNT MAJORS	**63**	**65**	**73**	**60**	**74**
1/	Geology and Geophysics (BS)	6	6	13	4	10
	Geology (BA)	8	8	9	4	9
	Geoscience (Mgeo)	0	2	7	4	4
	Geology and Geophysics (MS)	17	16	13	18	18
	Geology and Geophysics (PhD)	32	33	31	30	33
		F13	**F14**	**F15**	**F16**	**F17**
	COURSE DATA					
	Lower Division SSH	**758**	**737**	**688**	**579**	**799**
	Headcount of Students Taking courses	300	303	296	266	345
2/	Percent of Own Majors	7.3%	10.9%	9.8%	7.1%	5.8%
	Percent of Majors Within College	4.7%	5.9%	7.4%	7.5%	7.8%
	Percent of Majors From Other Colleges	88.0%	83.2%	82.8%	85.3%	86.4%
	Upper Division SSH	**293**	**485**	**462**	**352**	**348**
	Headcount of Students Taking courses	93	157	138	93	107
	Percent of Own Majors	80.6%	66.9%	73.4%	59.3%	54.3%
	Percent of Majors Within College	4.3%	17.5%	13.6%	30.5%	23.3%
	Percent of Majors From Other Colleges	15.1%	15.7%	13.0%	10.2%	22.4%
	Graduate Division SSH	**293**	**341**	**418**	**358**	**541**
	Headcount of Students Taking courses	88	105	123	102	153
	Percent of Own Majors	89.8%	94.4%	88.9%	93.4%	83.8%
	Percent of Majors Within College	9.1%	4.7%	7.9%	5.7%	10.6%
	Percent of Majors From Other Colleges	1.1%	0.9%	3.2%	0.9%	5.6%
		F13	**F14**	**F15**	**F16**	**F17**
3/	**COURSE FTE ENROLLMENT**	**95**	**109**	**112**	**92**	**121**
	Lower Division	51	49	46	39	53
	Upper Division	20	32	31	23	23
	Graduate Level	24	28	35	30	45
		F13	**F14**	**F15**	**F16**	**F17**
4/	**NUMBER OF CLASSES**	**25**	**33**	**35**	**32**	**38**
	Lower Division	13	14	13	12	13
	Upper Division	8	9	10	9	9
	Graduate Level	4	10	12	11	16
		F13	**F14**	**F15**	**F16**	**F17**
5/	**AVERAGE CLASS SIZE**	**17**	**16**	**15**	**14**	**15**
	Lower Division	23	22	23	22	27
	Upper Division	12	16	15	13	13
	Graduate Level	11	7	7	6	8
6/	**GRADUATE FACULTY HEADCOUNT (2018.8)**					
	Regular Faculty (home-based)					
		department decides what to use from the grad faculty data				
7/	**GRADUATE STUDENT-FACULTY RATIO**					
		Department decides what to use from the grad faculty data and grad student enrollment				

7/	**GRADUATE STUDENT-FACULTY RATIO**	**Department decides what to use from the grad faculty data and grad student enrollment**				
8/	**YEAR-TO-YEAR DEPARTMENT LEVEL PERSISTENCE RATE (%)**	**F12 cohort**	**F13 cohort**	**F14 cohort**	**F15 cohort**	**F16 cohort**
	Geology (BA)	87.5%	75.0%	87.5%	55.6%	75.0%
	All UHM BA for Comparison	61.2%	62.1%	62.9%	64.3%	63.5%
	Geology and Geophysics (BS)	67.6%	87.5%	78.0%	77.5%	75.0%
	All UHM BS for Comparison	78.2%	78.2%	77.2%	76.1%	75.4%
	Masters (MS)	90.5%	88.2%	93.8%	100.0%	100.0%
	All UHM MS for Comparison	91.5%	89.9%	91.3%	93.8%	90.4%
	Doctorate (PhD)	100.0%	93.8%	97.0%	100.0%	93.3%
	All UHM PhD for Comparison	91.8%	91%	90.8%	91.9%	93.3%
		FY14	**FY15**	**FY16**	**FY17**	**FY18**
9/	**DEGREES AWARDED (FY)**	**18**	**23**	**29**	**30**	**24**
	Geology (BA)	2	1	3	2	3
	Geology and Geophysics (BS)	5	7	15	12	9
	Masters (MS)	6	11	5	9	7
	Doctorate (PhD)	5	4	6	7	5
10/	**MEDIAN TIME TO DEGREE (FY)**	**F13 cohort**	**F14 cohort**	**F15 cohort**	**F16 cohort**	**F17 cohort**
	Geology (BA)	4.33	5.33	4.66	3.66	data not available
	All UHM BA for Comparison	4.33	4.33	4.33	4.33	3.99
	Geology and Geophysics (BS)	6.33	4.99	4.00	5.00	4.32
	All UHM BS for Comparison	4.66	4.66	4.33	4.33	4.33
	Masters (MS)	3.65	2.98	3.16	2.58	1.72
	All UHM Masters for Comparison	1.98	1.98	1.97	1.93	1.97
	Doctorate (PhD)	6.86	5.32	4.98	4.73	4.73
	All UHM PhD for Comparison	5.99	5.73	5.32	5.32	4.73
11/	**AVERAGE CREDITS EARNED AT GRADUATION**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**
	Geology (BA)	142	134	160	163	144
	All UHM BA for Comparison	141	140	139	139	139
	Geology and Geophysics (BS)	161	139	174	146	139
	All UHM BS for Comparison	156	152	148	149	149
	Masters (MS)	54	63	53	51	45
	All UHM MS for Comparison	54	53	55	53	56
	Doctorate (PhD)	101	89	105	101	61
	All UHM PhD for Comparison	88	87	83	85	81
11/	**AVERAGE CUMULATIVE GPA AMONG DEGREE EARNERS (FY)**	**FY14**	**FY15**	**FY16**	**FY17**	**FY18**
	Geology (BA)	2.99	3.35	3.20	2.90	3.32
	All UHM BA for Comparison	3.20	3.22	3.21	3.21	3.23
	Geology and Geophysics (BS)	2.78	3.27	3.20	2.87	3.25
	All UHM BS for Comparison	3.24	3.23	3.24	3.24	3.24
	Masters (MS)	3.82	3.84	3.77	3.81	3.73
	All UHM MS for Comparison	3.73	3.75	3.77	3.79	3.77
	Doctorate (PhD)	3.87	3.91	3.90	3.94	3.94
	All UHM PhD for Comparison	3.88	3.85	3.86	3.89	3.89

1/ Lower Division refers to Freshman and Sophomore levels; Upper Division refers to Junior and Senior levels.
2/ Percent of Students taken courses disaggregated by own majors, non-majors within college and non-majors from other colleges.
3/ FTE course enrollment (SSH divided by 15 for undergraduate-level and by 12 for graduate-level courses). Sourse: IRAO Course Registration Report.
4/ Number of Class data sourse: IRAO Course Registration Report.
5/ Average class size (total student registrations divided by number of classes offered). Sourse: IRAO Course Registration Report.
6/ Department decides what to use from the grad faculty data and grad student enrollment
7/ Student-faculty ratio (graduate headcount divided by home-based regular faculty headcount), use headcount instead of FTE due to FTE data not available from Grad Division.
8/ Year-to-Year persistence numbers are generated by the persistence report through MIRO's decision support system. Cohorts are fall semesters' degree-seeking students. Department level persistence rates are used to reflect % of students left the department within a year.
9/ Graduate faculty headcount are self-reported data from departments to the grad division. This report only inlude regular faculty whose home department is the one being reviewed.
10/ Undergraduate time to degree data (Median) are generated by the MIRO TTD web app (first time full time freshmen cohort), graduate TTD data (Median) are provided by the Grad Division.
11/ Average Credits Earned and average GPA data are generated by the degree web app through MIRO's decision support system.
12/ "F" refers to fall semester, "FY" refers to Fiscal Year.

Appendix – Extramural Awards in Earth Sciences

SOEST - Department of Geology and Geophysics - Extramural Awards
Between July 1, 2012 and June 30, 2018

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Anne Hope Jahren	2013	Paleoclimate Analysis of a Miocene Arctic Forest from the Kolyma River Basin, Northeastern Russia	NATIONAL SCIENCE FOUNDATION	National Science Foundation	85,683	Initial	4/1/2013	3/31/2015	Research
Anne Hope Jahren	2013	SIPsmartER: A Nutrition Literacy Approach to Reducing Sugar-Sweetened Beverages	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	44,835	Increment	7/12/2011	4/30/2012	Research
Bruce Frank Houghton	2013	Relationships Between Eruption Rate, Tephra Dispersal and Total Grain Size at Hekla and Askja volcanoes, Iceland: Enhancing the Source Term for Tephra Modeling	NATIONAL SCIENCE FOUNDATION	National Science Foundation	121,896	Increment	8/1/2012	7/31/2015	Research
Bruce Frank Houghton	2013	Relationships Between Eruption Rate, Tephra Dispersal and Total Grain Size at Hekla and Askja volcanoes, Iceland: Enhancing the Source Term for Tephra Modeling	NATIONAL SCIENCE FOUNDATION	National Science Foundation	128,743	Initial	8/1/2012	7/31/2015	Research
Bruce Frank Houghton	2013	Cities on Volcanoes 7: Advanced Understanding of Volcanic Hazard Mitigation for Graduate Students	NATIONAL SCIENCE FOUNDATION	National Science Foundation	25,785	Initial	8/15/2012	7/31/2013	Non-Research
Bruce Houghton	2013	Hazards Platform - Social Science and Natural Hazards Themes	INSTITUTE GEOLOGICAL & NUCLEAR SCIENCES (NZ)	Foreign	76,500	Initial	10/1/2012	12/31/2014	Research
Charles Fletcher	2013	Pacific Islands Climate Change Education Partnership	PAC RESOURCES FOR ED & LEARNING (PREL)	Hawaii- Non-Profit Organizations	18,500	Initial	9/15/2012	9/14/2014	Non-Research
Craig Glenn	2013	Lahaina Groundwater Tracer Study, Lahaina, Maui, Hawaii: Phase II	HEALTH, DEPT-HI SAFE DRINKING WATER BRANCH	Hawaii-Government Agencies	79,169	Supplement	5/17/2011	4/15/2013	Research
Craig Glenn	2013	Lahaina Groundwater Tracer Study, Lahaina, Maui, Hawaii: Phase II	HEALTH, DEPT-HI SAFE DRINKING WATER BRANCH	Hawaii-Government Agencies	15,563	Time & Cost Extension	5/17/2011	6/30/2013	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Eric Gaidos	2013	A Doppler and Transit Search for Signpost Planets Around Nearby M Dwarf Stars	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	74,949	Increment	1/1/2011	12/31/2013	Research
Eric Gaidos	2013	A Doppler and Transit Search for Signpost Planets Around Nearby M Dwarf Stars	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	50,000	Increment	1/1/2011	12/31/2013	Research
Eric Gaidos	2013	Formation, Evolution, and Detection of Ocean-Bearing Planets Close to Cool Stars	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	122,742	Increment	8/3/2010	8/2/2013	Research
Gregory Frank Moore	2013	Participation as Co-Chief Scientist in IODP Exp. 338	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	166,560	Initial	10/13/2012	1/31/2014	Research
Gregory Frank Moore	2013	RAPID Response to Tohoku Earthquake: Participation in Marine Geophysical Surveys of the Quake Rupture Zone	NATIONAL SCIENCE FOUNDATION	National Science Foundation	10,997	Supplement	7/15/2011	12/31/2012	Research
Gregory Moore	2013	Deformation Processes at the Toe of the Japan Trench off Tohoku	NATIONAL SCIENCE FOUNDATION	National Science Foundation	199,157	Initial	6/15/2013	5/31/2015	Research
Henrieta Dulaiova	2013	Radionuclide Measurement Assurance for Radiobioassay	COMMERCE, DEPT-NATIONL INST STANDARDS &TECH-FED	DOC-Dept of Commerce	189,553	Increment	9/1/2010	8/31/2013	Research
Julia Eve Hammer	2013	Experimental and Microanalytical Study of Dendritic Crystal Growth in CMAS and Basaltic Magma	NATIONAL SCIENCE FOUNDATION	National Science Foundation	270,928	Initial	7/15/2012	6/30/2014	Research
Julia Eve Hammer	2013	Static and Shock Pressure Treatment of Synthetic Mars Basalts: Understanding the Evolution of Crustal Magnetic Anomalies	Montclair State University	US Colleges and Universities	87,245	Time & Cost Extension	7/13/2011	7/12/2013	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Kevin TM Johnson	2013	Integrated Experimental and Modeling Studies of Mineral Carbonation as a Mechanisms for Permanent Carbon Sequestration in Mafic/Ultramafic Rock	YALE UNIVERSITY	US Colleges and Universities	141,486	Increment	10/1/2010	9/30/2013	Research
Kevin TM Johnson	2013	Integrated Experimental and Modeling Studies of Mineral Carbonation as a Mechanisms for Permanent Carbon Sequestration in Mafic/Ultramafic Rock	YALE UNIVERSITY	US Colleges and Universities	-	Increment	10/1/2012	9/30/2013	Research
Michael O Garcia	2013	Hawaiian Ridge Age, Source, Composition and Melt Flux Variations: Implications for Plume Dynamics and Plate Kinematics	NATIONAL SCIENCE FOUNDATION	National Science Foundation	349,922	Initial	9/1/2012	8/31/2014	Research
Robert Dunn	2013	Investigation of the Rainbow	SCIENCE	Foundation	133,964	Initial	2/15/2013	1/31/2016	Research
Scott Rowland	2013	Eleventh NASA Volcanology Field Workshop: Analogs to Volcanic and Volcano-Sedimentary Features in Satellite and Rover Images	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	80,700	Initial	8/1/2012	7/31/2013	Non-Research
Scott Rowland	2013	University of Hawaii Participation in Mars Science Laboratory (MSL)	MALIN SPACE SCIENCE SYSTEMS	Mainland-Business and Other	295,710	Increment	1/1/2012	9/30/2014	Research
Stephen Martel	2013	Exfoliation Revealed: A Proposal to the Yosemite Fund	INTERIOR, DEPT-NATIONAL PARK SVC	DOI-Dept of Interior	39,500	Increment	7/1/2011	2/28/2014	Research
Thomas Shea	2013	Pursuing the Nucleus: Experimental, Theoretical, and Analytical Investigations of Bubble and Crystal Formation in Magma	NATIONAL SCIENCE FOUNDATION	National Science Foundation	80,184	Initial	7/1/2013	6/30/2016	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Thomas Shea	2013	Analyses of Volatiles in Volcanic Glasses: Bridging the Gap between the Macroscopic and the Micron Scale	NATIONAL SCIENCE FOUNDATION	National Science Foundation	191,591	Initial	3/1/2013	2/28/2015	Research
Anne Hope Jahren	2014	SIPsmartER: A Nutrition Literacy Approach to Reducing Sugar-Sweetened Beverages	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	42,679	Increment	7/12/2011	4/30/2015	Research
Anne Hope Jahren	2014	SIPsmartER: A Nutrition Literacy Approach to Reducing Sugar-Sweetened Beverages	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	45,852	Increment	7/12/2011	4/30/2014	Research
Anne Hope Jahren	2014	Development of new Biomarkers for Surficial Earth Processes	ENERGY, DEPT	DOE-Dept of Energy	135,000	Time & Cost Extension	2/1/2009	7/31/2014	Research
Anne Hope Jahren	2014	Paleoclimate Analysis of a Miocene Arctic Forest from the Kolyma River Basin, Northeastern Russia	NATIONAL SCIENCE FOUNDATION	National Science Foundation	64,317	Increment	4/1/2013	3/31/2015	Research
Anne Hope Jahren	2014	Development of new Biomarkers for Surficial Earth Processes	ENERGY, DEPT	DOE-Dept of Energy	122,000	Increment	2/1/2009	7/31/2015	Research
Anne Hope Jahren	2014	Paleoclimate Analysis of a Miocene Arctic Forest from the Kolyma River Basin, Northeastern Russia	NATIONAL SCIENCE FOUNDATION	National Science Foundation	20,000	Supplement	4/1/2013	9/30/2015	Research
Bridget R Smith-	2014	Collaborative Research: Strain	NATIONAL	National Science	162,056	Initial	1/6/2014	5/31/2015	Research
Bridget R Smith-Konter	2014	Strike-slip Faulting Processes on Ganymede: Morphological Inferences and Failure Mechanics	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	50,000	Initial	2/12/2014	2/11/2017	Research
Bridget R Smith-Konter	2014	Strike-slip Faulting Processes on Ganymede: Morphological Inferences and Failure Mechanics	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	42,504	Increment	2/12/2014	2/11/2017	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Bridget R Smith-Konter	2014	CAREER: An Integrated Geologic, Geodetic, and Paleoseismic Study of Plate Boundary Stress Evolution and Geoscience Education Utilizing the EarthScope Database	NATIONAL SCIENCE FOUNDATION	National Science Foundation	196,795	Initial	1/6/2014	5/31/2014	Research
Bruce Frank Houghton	2014	Relationships Between Eruption Rate, Tephra Dispersal and Total Grain Size at Hekla and Askja volcanoes, Iceland: Enhancing the Source Term for Tephra Modeling	NATIONAL SCIENCE FOUNDATION	National Science Foundation	116,119	Increment	8/1/2012	7/31/2015	Research
Bruce Houghton	2014	Hazards SEES Type 1: Persistent Volcanic Crises in the USA: From Precursors to Resilience	NATIONAL SCIENCE FOUNDATION	National Science Foundation	291,722	Initial	9/1/2013	8/31/2014	Research
Bruce Houghton	2014	Strombolian and Hawaiian Explosions: New Insights From Synchronizing Videos and Exsolved Volatiles	NATIONAL SCIENCE FOUNDATION	National Science Foundation	86,462	Initial	7/1/2014	6/30/2016	Research
Bruce Houghton	2014	Cooperative Research between University of Hawaii at Manoa and Hawaiian Volcano Observatory: Real Time Understanding of Eruption Dynamics and Mechanisms in Hawaii	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	(2)	Deobligation	9/1/2010	8/31/2012	Research
Bruce Houghton	2014	Ending a Powerful Explosive Eruption: The Case Study of Novarupta 1912, Alaska	NATIONAL SCIENCE FOUNDATION	National Science Foundation	243,414	Initial	3/1/2014	2/28/2017	Research
Charles Fletcher	2014	Empirical Projection of Future Shoreline Position and Inundation Due to Sea Level Rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii-Government Agencies	50,000	Initial	8/27/2013	8/31/2018	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Charles Fletcher	2014	Empirical Projection of Future Shoreline Position and Inundation Due to Sea Level Rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii-Government Agencies	-	Initial	9/1/2013	8/31/2018	Research
Craig Glenn	2014	THERMAL INFRARED MAPPING OF HECO POWER PLANT DISCHARGE	Tenera Environmental	Mainland-Business and Other	32,319	Initial	4/1/2013	12/31/2013	Research
Garrett Apuzen-Ito	2014	Beyond the 'Classical' mantle Plume Concept: Upwelling Dynamics, Seismic Structure, and Partial Melting of Thermochemical Plumes	NATIONAL SCIENCE FOUNDATION	National Science Foundation	21,454	Supplement	8/1/2012	7/31/2014	Research
Garrett Apuzen-Ito	2014	Beyond the 'Classical' mantle Plume Concept: Upwelling Dynamics, Seismic Structure, and Partial Melting of Thermochemical Plumes	NATIONAL SCIENCE FOUNDATION	National Science Foundation	92,904	Increment	8/1/2012	7/31/2014	Research
Gregory Frank Moore	2014	Participation as Co-Chief Scientist in IODP Exp. 338	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	11,810	Supplement	10/13/2012	1/31/2014	Research
Gregory Moore	2014	Deformation Processes at the Toe of the Japan Trench off Tohoku	NATIONAL SCIENCE FOUNDATION	National Science Foundation	39,750	Supplement	6/15/2013	5/31/2015	Research
Gregory Moore	2014	Fred M. Bullard Graduate Fellowship	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	32,600	Initial	1/1/2014	12/31/2015	Non-Research
Gregory Moore	2014	Oceanic Crustal Structure of the NE Hawaiian Arch	NATIONAL SCIENCE FOUNDATION	National Science Foundation	71,170	Initial	12/15/2013	11/30/2014	Research
Gregory Moore	2014	Participation by Brian Boston in IODP Exp 348	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	9,850	Initial	11/26/2013	11/26/2014	Research
Jasper Gerard Konter	2014	Collaborative Research: Using the Rurutu Hotspot to Evaluate Mantle Motion and Absolute Plate Motion Models	NATIONAL SCIENCE FOUNDATION	National Science Foundation	137,715	Initial	1/6/2014	9/30/2014	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Julia Eve Hammer	2014	Static and Shock Pressure Treatment of Synthetic Mars Basalts: Understanding the Evolution of Crustal Magnetic Anomalies	Montclair State University	US Colleges and Universities	16,577	Increment	7/13/2011	7/12/2014	Research
Julia Eve Hammer	2014	Static and Shock Pressure Treatment of Synthetic Mars Basalts: Understanding the Evolution of Crustal Magnetic Anomalies	Montclair State University	US Colleges and Universities	9,870	Supplement	7/13/2011	7/12/2014	Research
Julia Hammer	2014	Collaborative Research: Experimental Investigation of Magmatic Processes at Volcan Quizapu	NATIONAL SCIENCE FOUNDATION	National Science Foundation	191,331	Initial	3/1/2014	2/28/2017	Research
Michael Garcia	2014	Ni Systematics in Olivine as Fingerprints of Magmatic Processes in Hawaiian Basalts	NATIONAL SCIENCE FOUNDATION	National Science Foundation	167,194	Initial	2/1/2014	1/31/2016	Research
Paul Wessel	2014	Collaborative Research: Improving the Generic Mapping Tools for Seismology, Geodesy, Geodynamics and Geology	NATIONAL SCIENCE FOUNDATION	National Science Foundation	36,997	Initial	5/1/2014	4/30/2017	Research
Robert Dunn	2014	Investigation of the Rainbow	SCIENCE	Foundation	120,420	Increment	2/15/2013	1/31/2016	Research
Stephen Martel	2014	Probing the Effects of Topography on Bedrock Fracture in the Shallow Subsurface	MASSACHUSETTS INSTITUTE OF TECH	US Colleges and Universities	16,625	Initial	2/1/2014	9/30/2015	Research
Thomas Shea	2014	Pursuing the Nucleus: Experimental, Theoretical, and Analytical Investigations of Bubble and Crystal Formation in Magma	NATIONAL SCIENCE FOUNDATION	National Science Foundation	107,875	Increment	7/1/2013	6/30/2016	Research
Anne Hope Jahren	2015	d13c Added Sugar Intake Biomarker: Determining Validity in Children	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	-	Initial	7/14/2014	6/30/2016	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Anne Hope Jahren	2015	d13c Added Sugar Intake Biomarker: Determining Validity in Children	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	8,379	Initial	7/14/2014	6/30/2015	Research
Brian Popp	2015	Collaborative Research: Isotopic insights to mercury in marine food webs and how it varies with ocean biogeochemistry	NATIONAL SCIENCE FOUNDATION	National Science Foundation	10,400	Supplement	8/1/2014	7/31/2017	Research
Brian Popp	2015	Collaborative Research: Isotopic insights to mercury in marine food webs and how it varies with ocean biogeochemistry	NATIONAL SCIENCE FOUNDATION	National Science Foundation	399,730	Initial	8/1/2014	7/31/2017	Research
Bridget R Smith-Konter	2015	Strike-slip Faulting Processes on Ganymede: Morphological Inferences and Failure Mechanics	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	97,467	Increment	2/12/2014	2/11/2017	Research
Bruce Houghton	2015	Collaborative Research: ELUCIDATING CONDUIT, ERUPTION AND PYROCLAST TRANSPORT DYNAMICS OF LARGE SILICIC SUBMARINE ERUPTIONS	NATIONAL SCIENCE FOUNDATION	National Science Foundation	73,032	Initial	12/1/2014	11/30/2017	Research
Charles Fletcher	2015	Coastal Evolution, Hazards, and Climate Change Impacts in the U.S. Pacific Islands	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	25,000	Initial	8/1/2014	1/31/2015	Research
Charles Fletcher	2015	Empirical projection of future shoreline position and inundation due to sea level rise	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	132,020	Initial	9/1/2014	8/31/2016	Research
Charles Fletcher	2015	Coastal Evolution, Hazards, and Climate Change Impacts in the U.S. Pacific Islands	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	15,000	Increment	8/1/2014	1/31/2015	Research
Charles Fletcher	2015	Empirical Projection of Future Shoreline Position and Inundation Due to Sea Level Rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii-Government Agencies	48,134	Increment	8/27/2013	8/31/2018	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Charles Fletcher	2015	Pacific Islands Climate Change Education Partnership	PAC RESOURCES FOR ED & LEARNING (PREL)	Hawaii- Non-Profit Organizations	18,000	Time & Cost Extension	9/15/2012	8/31/2015	Non-Research
Charles Fletcher	2015	Coastal Evolution, Hazards, and Climate Change Impacts in the U.S. Pacific Islands	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	-	Initial	8/1/2014	7/31/2019	Research
Charles Fletcher	2015	Empirical Projection of Future Shoreline Position and Inundation Due to Sea Level Rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii-Government Agencies	150,000	Supplement	8/27/2013	8/31/2018	Research
Charles Fletcher	2015	Coastal Evolution, Hazards, and Climate Change Impacts in the U.S. Pacific Islands	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	36,300	Increment	8/1/2014	7/31/2019	Research
Clinton Conrad	2015	CAREER: Understanding the Solid Earth's Influence on Sea Level	NATIONAL SCIENCE FOUNDATION	National Science Foundation	87,486	Increment	6/15/2012	5/31/2017	Research
Gregory Moore	2015	Participation by Brian Boston in IODP Exp 348	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	12,000	Time & Cost Extension	11/26/2013	1/31/2015	Research
Gregory Moore	2015	Participation by Katie B. Taladay in IODP Exp 353	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	11,017	Initial	11/29/2014	2/28/2015	Research
Gregory Ravizza	2015	Mudrock Geochemistry	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	55,000	Initial	8/1/2014	7/31/2016	Research
Henrieta Dulaiova	2015	Radionuclide Measurement Assurance for Radiobioassay	COMMERCE, DEPT-NATIONL INST STANDARDS &TECH-FED	DOC-Dept of Commerce	(969)	Deobligation	9/1/2010	12/31/2013	Research
Kenneth Rubin	2015	CIF21 DIBBs: Collaborative Research: Cyberinfrastructure for Interpreting and Archiving U-series Geochronologic Data	College of Charleston	US Colleges and Universities	24,071	Initial	9/1/2014	8/31/2015	Research
Kenneth Rubin	2015	Fred M. Bullard Graduate Fellowship	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	36,878	Supplement	1/1/2014	12/31/2015	Non-Research

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Kenneth Rubin	2015	CIF21 DIBBs: Collaborative Research: Cyberinfrastructure for Interpreting and Archiving U-series Geochronologic Data	College of Charleston	US Colleges and Universities	-	Initial	9/1/2014	8/31/2017	Research
Michael Garcia	2015	Uncovering Hotspot Volcanism: Mantle Melting, Magmatic Plumbing, Explosive Eruptions and Crustal Contamination at Kilauea Volcano, Hawaii	NATIONAL SCIENCE FOUNDATION	National Science Foundation	238,562	Initial	7/1/2015	6/30/2018	Research
Paul Wessel	2015	Completing the Global Seafloor Fabric and Magnetic Lineation Project	NATIONAL SCIENCE FOUNDATION	National Science Foundation	35,503	Initial	8/1/2014	7/31/2015	Research
Paul Wessel	2015	Collaborative Research: Improving the Generic Mapping Tools for Seismology, Geodesy, Geodynamics and Geology	NATIONAL SCIENCE FOUNDATION	National Science Foundation	43,945	Increment	5/1/2014	4/30/2017	Research
Paul Wessel	2015	Support for the Generic Mapping Tools	NATIONAL SCIENCE FOUNDATION	National Science Foundation	21,927	Supplement	9/1/2010	8/31/2015	Research
Robert Dunn	2015	Investigation of the Rainbow	SCIENCE	Foundation	112,680	Increment	2/15/2013	1/31/2016	Research
Scott Rowland	2015	University of Hawaii Participation in Mars Science Laboratory (MSL)	MALIN SPACE SCIENCE SYSTEMS	Mainland-Business and Other	119,949	Time & Cost Extension	1/1/2012	9/30/2016	Research
Scott Rowland	2015	University of Hawaii Participation in Mars Science Laboratory (MSL)	MALIN SPACE SCIENCE SYSTEMS	Mainland-Business and Other	(55,812)	Deobligation	1/1/2012	9/30/2016	Research
Thomas Shea	2015	Pursuing the Nucleus: Experimental, Theoretical, and Analytical Investigations of Bubble and Crystal Formation in Magma	NATIONAL SCIENCE FOUNDATION	National Science Foundation	78,141	Increment	7/1/2013	6/30/2016	Research
Anne Hope Jahren	2016	SIPsmartER: A Nutrition Literacy Approach to Reducing Sugar-Sweetened Beverages	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	44,142	Increment	7/12/2011	4/30/2016	Research

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Anne Hope Jahren	2016	Development of new Biomarkers for Surficial Earth Processes	ENERGY, DEPT	DOE-Dept of Energy	122,000	Increment	2/1/2009	7/31/2016	Research
Anne Hope Jahren	2016	d13c Added Sugar Intake Biomarker: Determining Validity in Children	VIRGINIA POLYTECHNIC INST & STATE UNIV	US Colleges and Universities	52,304	Non-Competing Cont.	7/14/2014	6/30/2016	Research
Brian Popp	2016	Collaborative Research: Direct Oxidation of Organic Nitrogen by Marine Ammonia Oxidizing Organisms	NATIONAL SCIENCE FOUNDATION	National Science Foundation	232,316	Initial	12/1/2015	11/30/2018	Research
Bridget R Smith-Konter	2016	Strike-slip Faulting Processes on Ganymede: Morphological Inferences and Failure Mechanics	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	57,657	Increment	2/12/2014	2/11/2017	Research
Bridget R Smith-Konter	2016	SCEC 4: 4d Stress Evolution Models of the San Andreas Fault System Using Improved Geodetic and Paleoseismic Constraints	SOUTHERN CALIFORNIA, UNIVERSITY OF	US Colleges and Universities	22,000	Initial	2/1/2016	1/31/2017	Research
Bruce Frank Houghton	2016	Cooperative research between University of Hawaii at Manoa and Hawaiian Volcano Observatory: Understanding of eruption dynamics and mechanisms	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	(107)	Deobligation	7/1/2012	6/30/2014	Research
Bruce Houghton	2016	Ending a Powerful Explosive Eruption: The Case Study of Novarupta 1912, Alaska	NATIONAL SCIENCE FOUNDATION	National Science Foundation	90,077	Increment	3/1/2014	2/28/2017	Research
Bruce Houghton	2016	Hazards SEES: Persistent volcanic crises resilience in the face of prolonged and uncertain risk	State University of New York	US Colleges and Universities	431,987	Initial	9/1/2015	8/31/2016	Research

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Bruce Houghton	2016	Collaborative Research: ELUCIDATING CONDUIT, ERUPTION AND PYROCLAST TRANSPORT DYNAMICS OF LARGE SILICIC SUBMARINE ERUPTIONS	NATIONAL SCIENCE FOUNDATION	National Science Foundation	381,839	Increment	12/1/2014	11/30/2017	Research
Charles Fletcher	2016	Empirical Projection of Future Shoreline Position and Inundation Due to Sea Level Rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii- Government Agencies	12,036	Increment	8/27/2013	8/31/2018	Research
Charles Fletcher	2016	Pacific Islands Climate Change Education Partnership	PAC RESOURCES FOR ED & LEARNING (PREL)	Hawaii- Non-Profit Organizations	20,000	Initial	9/1/2015	8/31/2016	Non-Research
Charles Fletcher	2016	Empirical Projection of Future Shoreline Position and Inundation Due to Sea Level Rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii- Government Agencies	200,000	Increment	8/27/2013	8/31/2018	Research
Clinton Conrad	2016	CAREER: Understanding the Solid Earth's Influence on Sea Level	NATIONAL SCIENCE FOUNDATION	National Science Foundation	(141,000)	Deobligation	6/15/2012	5/31/2017	Research
Eric Gaidos	2016	Giants Orbiting Giants: A Search for Transiting Planets around Oscillating Red-Giant Branch Stars with K2	SETI Institute	Mainland- Non-Profit Organizations	38,525	Initial	6/1/2016	5/31/2017	Research
Garrett Apuzen-Ito	2016	The Rheology of the Lithosphere Beneath the Hawaiian Ridge	NATIONAL SCIENCE FOUNDATION	National Science Foundation	225,931	Initial	8/1/2016	7/31/2018	Research
Gregory Moore	2016	Participation by Katie B. Taladay in IODP Exp 353	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	12,000	Increment	11/29/2014	2/28/2016	Research
Gregory Ravizza	2016	Mudrock Geochemistry	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	40,000	Time & Cost Extension	8/1/2014	7/31/2017	Research
Julia Hammer	2016	Collaborative Research: Experimental Investigation of Magmatic Processes at Volcan Quizapu	NATIONAL SCIENCE FOUNDATION	National Science Foundation	84,199	Increment	3/1/2014	2/28/2017	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Kenneth Rubin	2016	CIF21 DIBBs: Collaborative Research: Cyberinfrastructure for Interpreting and Archiving U-series Geochronologic Data	College of Charleston	US Colleges and Universities	27,299	Increment	9/1/2014	8/31/2017	Research
Kenneth Rubin	2016	Fred M. Bullard Graduate Fellowship	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	30,047	Time & Cost Extension	1/1/2014	12/31/2016	Non-Research
Kenneth Rubin	2016	Temporal/spatial scales of mantle wedge composition and processes investigated with young boninites and basalts from the unusually active NE Lau Basin	NATIONAL SCIENCE FOUNDATION	National Science Foundation	275,379	Initial	8/15/2015	7/31/2017	Research
Kenneth Rubin	2016	RAPID - High precision radiometric dating of Axial Seamount 2015 eruption products with 210Po-210Pb	NATIONAL SCIENCE FOUNDATION	National Science Foundation	49,841	Initial	11/15/2015	10/31/2016	Research
Paul Wessel	2016	Support for the Generic Mapping Tools	NATIONAL SCIENCE FOUNDATION	National Science Foundation	157,365	Initial	6/1/2016	5/31/2018	Research
Paul Wessel	2016	Collaborative Research: Super-Plateau Breakup and Cretaceous Quiet Zone Tectonics	NATIONAL SCIENCE FOUNDATION	National Science Foundation	329,297	Initial	9/1/2016	8/31/2018	Research
Paul Wessel	2016	REU Site: Earth Science on Volcanic Islands	NATIONAL SCIENCE FOUNDATION	National Science Foundation	185,229	Initial	10/1/2016	9/30/2019	Non-Research
Paul Wessel	2016	Collaborative Research: Improving the Generic Mapping Tools for Seismology, Geodesy, Geodynamics and Geology	NATIONAL SCIENCE FOUNDATION	National Science Foundation	41,571	Increment	5/1/2014	4/30/2017	Research
Scott Rowland	2016	The 12th NASA Planetary Volcanology Field Workshop	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	90,069	Initial	9/1/2015	8/31/2016	Non-Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Stephen Martel	2016	Probing the Effects of Topography on Bedrock Fracture in the Shallow Subsurface	MASSACHUSETTS INSTITUTE OF TECH	US Colleges and Universities	9,998	Increment	2/1/2014	5/31/2016	Research
Benoit Welsch	2017	Advances in Crystal Growth: Experimental and Microscopic Study of Olivine Phosphorus Zoning	NATIONAL SCIENCE FOUNDATION	National Science Foundation	133,428	Initial	2/15/2017	1/31/2020	Research
Brian Popp	2017	Collaborative Research: Isotopic insights to mercury in marine food webs and how it varies with ocean biogeochemistry	NATIONAL SCIENCE FOUNDATION	National Science Foundation	7,075	Supplement	8/1/2014	7/31/2017	Research
Brian Popp	2017	Collaborative Research: Chemoautotrophy in Antarctic Bacterioplankton Communities Supported by the Oxidation of Urea-derived Nitrogen	NATIONAL SCIENCE FOUNDATION	National Science Foundation	164,510	Initial	10/1/2017	9/30/2019	Research
Bridget R Smith-Konter	2017	Imaging Vertical Earthquake Cycle Crustal Deformation of the San Andreas Fault System Utilizing the GAGE Facility	NATIONAL SCIENCE FOUNDATION	National Science Foundation	224,596	Initial	8/15/2016	7/31/2019	Research
Bruce Houghton	2017	Hazards SEES: Persistent volcanic crises resilience in the face of prolonged and uncertain risk	State University of New York	US Colleges and Universities	(141,915)	Deobligation	9/1/2015	8/31/2017	Research
Bruce Houghton	2017	Hazards SEES: Persistent volcanic crises resilience in the face of prolonged and uncertain risk	State University of New York	US Colleges and Universities	241,124	Increment	9/1/2015	8/31/2017	Research
Charles Fletcher	2017	Empirical projection of future shoreline position and inundation due to sea level rise	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	(21)	Deobligation	9/1/2014	8/31/2016	Research
Charles Fletcher	2017	Simulating the Impacts of Sea Level Rise on Majuro Atoll Using a Digital Elevation Model and Delivery to the Marshall Islands Government	INTERIOR, DEPT-UNITED STATES GEO SURVEY	DOI-Dept of Interior	88,254	Initial	2/3/2017	7/31/2018	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Charles Fletcher	2017	Kaua'i Historical Shoreline Change Database Update	COUNTY KAUAI	Hawaii-Government Agencies	-	Initial	9/30/2016	9/29/2017	Research
Charles Fletcher	2017	Groundwater Inundation Model of Honolulu	WATER SUPPLY, BOARD OF	Hawaii-Government Agencies	-	Initial	9/23/2016	7/31/2018	Research
Charles Fletcher	2017	SLR Analysis and Impact on Fresh Water Resources and Infrastructure	HAWAII COMMUNITY FOUNDATION (HCF)	Hawaii- Non-Profit Organizations	40,000	Initial	4/1/2017	3/31/2019	Research
Charles Fletcher	2017	HKLC SOEST Sea Level	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	55,000	Initial	1/1/2017	12/31/2017	Research
Charles Fletcher	2017	Kaua'i Historical Shoreline Change Database Update	COUNTY KAUAI	Hawaii-Government Agencies	75,000	Initial	2/10/2017	2/9/2018	Research
Charles Fletcher	2017	Improved projections of future shoreline position and inundation due to sea level rise	LAND & NATURAL RESOURCES, DEPT (DLNR) OFC CONS COAST LDS	Hawaii-Government Agencies	75,000	Initial	8/3/2016	8/2/2017	Research
Charles Fletcher	2017	Kaua'i Historical Shoreline Change Database Update	COUNTY KAUAI	Hawaii-Government Agencies	-	Initial	2/10/2017	9/29/2017	Research
Charles Fletcher	2017	Groundwater Inundation Model of Honolulu	WATER SUPPLY, BOARD OF	Hawaii-Government Agencies	-	Initial	8/1/2016	7/31/2018	Research
Charles Fletcher	2017	Groundwater Inundation Model of Honolulu	WATER SUPPLY, BOARD OF	Hawaii-Government Agencies	91,850	Initial	9/23/2016	9/22/2018	Research
Gregory Moore	2017	U.S. Science Support Program Office Associated with the International Ocean Discovery Program (USSSP)	The Trustees of Columbia University in the City of New York	US Colleges and Universities	29,878	Initial	2/1/2016	2/28/2017	Research
Gregory Moore	2017	Oceanic Crustal Structure of the NE Hawaiian Arch	NATIONAL SCIENCE FOUNDATION	National Science Foundation	14,232	Supplement	12/15/2013	11/30/2017	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Gregory Moore	2017	Collaborative Research: A community 3D seismic investigation of fault property controls on slow-slip along the Hikurangi megathrust	NATIONAL SCIENCE FOUNDATION	National Science Foundation	34,974	Increment	9/15/2016	8/31/2019	Research
Gregory Moore	2017	Collaborative Research: A community 3D seismic investigation of fault property controls on slow-slip along the Hikurangi megathrust	NATIONAL SCIENCE FOUNDATION	National Science Foundation	73,956	Initial	9/15/2016	8/31/2019	Research
Gregory Moore	2017	Variations in Deformational Style at the Toe of the Nankai Accretionary Prism: Relation to Subducting Plate Sediment Thickness and Basement Topography	NATIONAL SCIENCE FOUNDATION	National Science Foundation	299,724	Initial	5/15/2017	4/30/2020	Research
Jasper Gerard Konter	2017	Wake Island Okeanos Expedition EX1606	UNIVERSITY CORP ATMOSPHERIC RSCH	Mainland- Non-Profit Organizations	26,189	Initial	6/30/2016	8/31/2016	Research
Jasper Gerard Konter	2017	Wake Island Okeanos Expedition EX1606	UNIVERSITY CORP ATMOSPHERIC RSCH	Mainland- Non-Profit Organizations	-	Initial	6/17/2016	8/31/2016	Research
Julia Eve Hammer	2017	Exploring the time-temperature history of the lunar interior with advanced materials characterization of troctolite 76535	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	156,218	Initial	7/28/2016	7/27/2019	Research
Kenneth Rubin	2017	CIF21 DIBBs: Collaborative Research: Cyberinfrastructure for Interpreting and Archiving U-series Geochronologic Data	College of Charleston	US Colleges and Universities	24,366	Increment	9/1/2014	8/31/2017	Research
Kenneth Rubin	2017	Fred M. Bullard Graduate Fellowship	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	39,198	Time & Cost Extension	1/1/2014	12/31/2018	Non-Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Kevin Johnson	2017	U.S. Science Support Program Office associated with the International Ocean Discovery Program (USSSP-IODP)	The Trustees of Columbia University in the City of New York	US Colleges and Universities	15,000	Supplement	9/1/2016	2/28/2018	Research
Kevin Johnson	2017	U.S. Science Support Program Office associated with the International Ocean Discovery Program (USSSP-IODP)	The Trustees of Columbia University in the City of New York	US Colleges and Universities	73,482	Initial	9/1/2016	2/28/2018	Research
Kevin Johnson	2017	Ocean Science for Rural Communities via Informal Science Education: Pop-Up/Drill Down Science	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	47,811	Initial	7/1/2016	6/30/2018	Research
Michael Garcia	2017	Uncovering Hotspot Volcanism: Mantle Melting, Magmatic Plumbing, Explosive Eruptions and Crustal Contamination at Kilauea Volcano, Hawaii	NATIONAL SCIENCE FOUNDATION	National Science Foundation	3,538	Supplement	7/1/2015	6/30/2018	Research
Michael Garcia	2017	Uncovering Hotspot Volcanism: Mantle Melting, Magmatic Plumbing, Explosive Eruptions and Crustal Contamination at Kilauea Volcano, Hawaii	NATIONAL SCIENCE FOUNDATION	National Science Foundation	121,397	Increment	7/1/2015	6/30/2018	Research
Paul Wessel	2017	REU Site: Earth Science on Volcanic Islands	NATIONAL SCIENCE FOUNDATION	National Science Foundation	154,521	Increment	10/1/2016	9/30/2019	Non-Research
Paul Wessel	2017	Support for the Generic Mapping Tools	NATIONAL SCIENCE FOUNDATION	National Science Foundation	150,000	Supplement	6/1/2016	5/31/2018	Research
Robert Dunn	2017	ABR: A Deeper Investigation of Oceanic Spreading Center Magmatic Processes	NATIONAL SCIENCE FOUNDATION	National Science Foundation	411,270	Initial	9/1/2016	8/31/2020	Research
Scott Rowland	2017	University of Hawaii Participation in Mars Science Laboratory (MSL)	MALIN SPACE SCIENCE SYSTEMS	Mainland-Business and Other	-	Time & Cost Extension	1/1/2012	11/30/2018	Research
Scott Rowland	2017	University of Hawaii Participation in Mars Science Laboratory (MSL)	MALIN SPACE SCIENCE SYSTEMS	Mainland-Business and Other	5,000	Time & Cost Extension	1/1/2012	11/30/2016	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Scott Rowland	2017	University of Hawaii Participation in Mars Science Laboratory (MSL)	MALIN SPACE SCIENCE SYSTEMS	Mainland-Business and Other	31,736	Time & Cost Extension	1/1/2012	9/30/2018	Research
Thomas Shea	2017	Experimental Investigation of Chemical Zoning in Olivine: Applications to Hawaiian Basalt	NATIONAL SCIENCE FOUNDATION	National Science Foundation	125,000	Initial	7/1/2017	6/30/2020	Research
Anne Hope Jahren	2018	Development of new Biomarkers for Surficial Earth Processes	ENERGY, DEPT	DOE-Dept of Energy	(654)	Deobligation	2/1/2009	12/31/2016	Research
Benoit Welsch	2018	Advances in Crystal Growth: Experimental and Microscopic Study of Olivine Phosphorus Zoning	NATIONAL SCIENCE FOUNDATION	National Science Foundation	133,194	Increment	2/15/2017	1/31/2020	Research
Bridget Renee Konter	2018	Strike-slip Faulting Processes on Ganymede: Morphological Inferences and Failure Mechanics	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	37,740	Increment	2/12/2014	2/11/2018	Research
Bridget Renee Konter	2018	SCEC5 Research Collaboration at University of Hawaii at Manoa	SOUTHERN CALIFORNIA, UNIVERSITY OF	US Colleges and Universities	20,000	Initial	5/1/2017	4/30/2018	Research
Bruce Frank Houghton	2018	Strombolian and Hawaiian Volcanism: Sub-second Parameterization of the Eruptive Dynamics of Explosions at Kilauea and Stromboli	NATIONAL SCIENCE FOUNDATION	National Science Foundation	471,897	Initial	6/1/2018	5/31/2021	Research
Bruce Frank Houghton	2018	GEOHAZARDS	INSTITUTE GEOLOGICAL & NUCLEAR SCIENCES (NZ)	Foreign	51,274	Initial	1/1/2018	12/31/2018	Research
Bruce Houghton	2018	Hazards SEES: Persistent volcanic crises resilience in the face of prolonged and uncertain risk	State University of New York	US Colleges and Universities	112,060	Increment	9/1/2015	8/31/2018	Research
Charles Fletcher	2018	Pacific Islands Climate Change Education Partnership	PAC RESOURCES FOR ED & LEARNING (PREL)	Hawaii- Non-Profit Organizations	10,000	Initial	5/30/2017	8/31/2017	Non-Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Charles Fletcher	2018	HKLC SOEST Sea Level	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	57,000	Time & Cost Extension	1/1/2017	12/31/2018	Research
Charles Fletcher	2018	HML Fellow Geology & Geophysics	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	31,109	Initial	8/1/2017	7/31/2018	Non-Research
Charles Fletcher	2018	SLR Analysis and Impact on Fresh Water Resources and Infrastructure	HAWAII COMMUNITY FOUNDATION (HCF)	Hawaii- Non-Profit Organizations	40,000	Increment	4/1/2017	3/31/2019	Research
Charles Henry Fletcher	2018	Updating the Hawaii Historical Shoreline Database: Modeling Past, Present, and Future Shoreline Change in Order to Empower Coastal Zone Management Agencies to Assess and Analyze Shoreline...	BUSINESS, ECON DEV & TOUR, DPT	Hawaii- Government Agencies	-	Initial	2/13/2018	2/28/2019	Research
Charles Henry Fletcher	2018	UH Coastal Data Center - Updating the historical shoreline database for Oahu	CITY & COUNTY HONOLULU	Hawaii- Government Agencies	-	Initial	10/1/2017	9/30/2018	Research
Charles Henry Fletcher	2018	UH Coastal Data Center - Updating the historical shoreline database for Oahu	CITY & COUNTY HONOLULU	Hawaii- Government Agencies	75,000	Initial	12/21/2017	9/30/2018	Research
Charles Henry Fletcher	2018	Updating the Hawaii Historical Shoreline Database: Modeling Past, Present, and Future Shoreline Change in Order to Empower Coastal Zone Management Agencies to Assess and Analyze Shoreline...	BUSINESS, ECON DEV & TOUR, DPT	Hawaii- Government Agencies	225,000	Initial	4/9/2018	2/28/2019	Research
Eric Willem Gertrudus Hellebrand	2018	Ocean Science for Rural Communities via Informal Science Education: Pop-Up/Drill Down Science	CONSORTIUM FOR OCEAN LEADERSHIP	Mainland- Non-Profit Organizations	11,966	Increment	7/1/2016	6/30/2018	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Gregory Moore	2018	U.S. Science Support Program Office Associated with the International Ocean Discovery Program (USSSP)	The Trustees of Columbia University in the City of New York	US Colleges and Universities	61,619	Supplement	2/1/2016	2/28/2018	Research
Gregory Moore	2018	U.S. Science Support Program Office Associated with the International Ocean Discovery Program (USSSP)	The Trustees of Columbia University in the City of New York	US Colleges and Universities	5,000	Supplement	2/1/2016	2/28/2019	Research
Julia Eve Hammer	2018	Exploring the time-temperature history of the lunar interior with advanced materials characterization of troctolite 76535	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	153,358	Increment	7/28/2016	7/27/2019	Research
Kenneth Rubin	2018	Fred M. Bullard Graduate Fellowship	UNIVERSITY HAWAII FOUNDATION	Hawaii- Non-Profit Organizations	48,416	Time & Cost Extension	1/1/2014	12/31/2019	Non-Research
Kenneth Rubin	2018	RAPID: Tracking magmatic and volcanic changes in the May 2018 Kilauea Eruption	NATIONAL SCIENCE FOUNDATION	National Science Foundation	119,821	Initial	6/1/2018	5/31/2019	Research
Michael Garcia	2018	Using Loihi Basaltic Rocks to Understand the Hawaiian Plume	NATIONAL SCIENCE FOUNDATION	National Science Foundation	209,938	Initial	8/15/2017	7/31/2019	Research
Paul Wessel	2018	Support for the Generic Mapping Tools	NATIONAL SCIENCE FOUNDATION	National Science Foundation	115,754	Supplement	6/1/2016	5/31/2019	Research
Paul Wessel	2018	REU Site: Earth Science on Volcanic Islands	NATIONAL SCIENCE FOUNDATION	National Science Foundation	154,523	Increment	10/1/2016	9/30/2019	Non-Research
Paul Wessel	2018	Collaborative Research: Improving the Generic Mapping Tools for Seismology, Geodesy, Geodynamics and Geology	NATIONAL SCIENCE FOUNDATION	National Science Foundation	24,448	Supplement	5/1/2014	4/30/2018	Research
Robert Dunn	2018	Collaborative Research: Seismic imaging of volcano construction, underplating and flexure along the Hawaii-Emperor Seamount Chain	NATIONAL SCIENCE FOUNDATION	National Science Foundation	178,255	Initial	4/1/2018	3/31/2021	Research

PI Name	Award Fiscal Year	Title	Award Sponsor	Sponsor Type	Award Amount	Award Type	Award Start Date	Award End Date	Research and Non-Research
Scott Rowland	2018	The 13th NASA Planetary Volcanology Field Workshop	NATIONAL AERONAUT & SPACE ADM	National Aeronautics and Space Administration	96,486	Initial	9/1/2018	8/31/2019	Non-Research
Thomas Shea	2018	Experimental Investigation of Chemical Zoning in Olivine: Applications to Hawaiian Basalt	NATIONAL SCIENCE FOUNDATION	National Science Foundation	123,000	Increment	7/1/2017	6/30/2020	Research
					16,280,677				

Fiscal year				
2013				3,081,862
2014				2,785,379
2015				1,833,840
2016				3,122,001
2017				2,891,391
2018				2,566,204
Total				**16,280,677**

GG END

Appendix – Publications in Earth Sciences

Henrietta Dulai

*postdoctoral advisee student advisee

1. McKenziex, T. and H. Dulai, 2017. Fukushima-derived radiocesium fallout in Hawaiian soils.*Journal of Environmental Radioactivity*. *180, 106-113*.
2. Richardsonx, C., H. Dulai. B. N. Popp, K. Ruttenberg, J. K. Fackrell, 2017. Submarine groundwater discharge drives biogeochemistry in two Hawaiian reefs. *Limnology and Oceanography*, 62(S1), S348-S363.
3. Bruno, B. C., J. Engels, G. Apuzen-Ito, J. Gillis-Davis, H. Dulai, G. Carter, C. Fletcher, D.Bottjer-Wilson, 2017. Two-stage exams a powerful tool for reducing the achievement gap inundergraduate oceanography and geology classes, *Oceanography*, 30(2), 198-208.
4. Shuler, C. A. El-Kadi, H. Dulai, C. Glenn, J. Fackrell, 2017. Source partitioning of anthropogenic groundwater nitrogen in a mixed-use landscape, Tutuila, American Samoa. *Hydrogeology Journal*, 25(8), 2419-2434.
5. Leta*, O.T., A, I. El-Kadi, H, Dulai, 2017. Implications of climate change on water budgets and reservoir water harvesting of Nuuanu area watersheds, Oahu, Hawaii. *Journal of Water Resources Planning and Management*, 143(11).
6. Azouzx, H. and H. Dulai, 2017. In the wake of Fukushima: Radiocesium inventories in selected North Pacific fish. *Pacific Science*. 71(2), 107-115.
7. Richardsonx, C.M, H. Dulai, R.B. Whittier, 2017. Sources and spatial variability of groundwater-delivered nutrients in Maunalua Bay, Oahu, Hawai'i. *Journal of Hydrology: Regional Studies* 11: 178-193. http://dx.doi.org/10.1016/j.ejrh.2015.11.006
8. Bishop, J.M, C.R. Glenn, D.W. Amato, H. Dulai, 2017. Effect of land use and groundwater flow path on submarine groundwater discharge nutrient flux. *Journal of Hydrology: Regional Studies*. doi:10.1016/j.ejrh.2015.10.008
9. Amato, D.W., J. M.Bishop, C.R.Glenn, H. Dulai, C. Smith, 2016. Impact of Submarine Groundwater Discharge on Marine Water Quality and Reef Biota of Maui. *PLOS ONE*, 11(11): e0165825. https://doi.org/10.1371/journal.pone.0165825
10. Fackrell, J.K., Glenn, C.R., Popp, B.N., Whittier, R.W., and Dulai, H., 2016. Wastewater injection, biogeochemical reactions, and resultant groundwater N flux to coastal waters: Kā'anapali, Maui, Hawai'i. *Marine Pollution Bulletin* 110, 281-292.
11. Leta*, O. T., A. El-Kadi, H. Dulai, K. Ghazal, 2016. Assessment of climate change impacts on water balance components of Heeia watershed in Hawaii. *Journal of Hydrology: Regional Studies* 8, 182-197.
12. Phillips, E.H, K.W.W. Sims, D.R.Sherrod, V.J.M. Salters, J. Blusztajn, H. Dulai, 2016. Isotopic constraints on the genesis and evolution of basanitic lavas at Haleakala, Island of Maui, Hawaii. *Geochimica et Cosmochimica Acta*, 195, 201-225.
13. Fröllje, H., K. Pahnke, B. Schnetger, H.-J. Brumsack, H. Dulai, J. N. Fitzsimmons, 2016. Hawaiian imprint on dissolved Nd and Ra isotopes and rare earth elements in the central North Pacific: local survey and seasonal variability. *Geochimica et Cosmochimica Acta*, 189, 110-131.
14. Dulai, H., A. Klevenx, K. Ruttenberg, R. Briggs, F.I. Thomas, 2016. Evaluation of Submarine Groundwater Discharge as Coastal Nutrient Source and Its Role in Coastal Groundwater Quality and Quantity. A. Fares (ed.), Emerging Issues in Groundwater Resources, Advances in Water Security, DOI 10.1007/978-3-319-32008-3_8
15. Dulai, H., J. Kamenik*, C.A.Watersx, J. Kennedy, J.Babinec, J.Jolly, M.Williamson, 2016. Autonomous long-term gamma-spectrometric monitoring of submarine groundwater discharge trends in Hawaii. *Journal of Radioanalytical and Nuclear Chemistry*. 307: 1865-1870. DOI 10.1007/s10967-015-4580-9

16. Swarzenski, P.W, H. Dulai, K.D. Kroeger, C.G. Smith, N. Dimova, C.D. Storlazzi, N.G. Prouty, S.B. Gingerich, C.R. Glenn, 2016. Observations of nearshore groundwater discharge: Kahekili Beach Park submarine springs, Maui, Hawaii. *Journal of Hydrology: Regional Studies*. 11:147-165. https://doi.org/10.1016/j.ejrh.2015.12.056

17. Nelson, C. N., M. J. Donahue, H. Dulaiova, S. J. Goldberg, F. F. La Valle, K. Lubarsky, J. Miyano, C.M. Richardsonx, N. J. Silbiger and F. I.M. Thomas, 2015. Fluorescent dissolved organic matter as a multivariate biogeochemical tracer of submarine groundwater discharge in coral reef ecosystems. *Marine Chemistry*. 177, 2 (20), 232-243.

18. Ganguli, P., P.W. Swarzenski, H. Dulaiova, C.R. Glenn, A.R. Flegal, 2014. Mercury dynamics in a coastal aquifer: Maunalua Bay, Oahu, Hawaii. *Estuarine, Coastal and Shelf Science*, 140, 52-65.

19. Dudley, B.D., R.A. MacKenzie , T.S. Sakihara, H. Dulaiova, C.A. Watersx, R.F. Hughes and R. Ostertag, 2014. Influences of native and non-native vegetation and invasive fish on water chemistry of Hawaiian anchialine ponds. *Pacific Science*, 68(4).

20. Kamenik*, J., H. Dulaiova, K. O. Buesseler, S. M. Pike, and K. Stastnax, 2013. Cesium-134 and 137 activities in the central North Pacific Ocean after the Fukushima Dai-ichi nuclear power plant accident, *Biogeosciences*, 10, 6045-6042.

21. Swarzenski, P., H. Dulaiova, M. L. Dailer, C. R. Glenn, C. G. Smith, C.D. Storlazzi, 2013. A Geochemical and Geophysical Assessment of Coastal Groundwater Discharge at select sites in Maui and O‘ahu, Hawai‘i, In: Groundwater in the Coastal Zones of Asia Pacific, Ed: C. Wetzelhuetter, Coastal Research Library, Vol. 7, 339.

22. Simms, K. W. W., Pichat, M. K. Reagan, P. R. Kyle, H. Dulaiova, N. Dunbar, J. Prytulak, G. Sawyer, G. Layne, J. Blichert-Toft, P.J.Gauthier, M.A. Charrette , T. R. Elliott, 2013. On the timescales of magma genesis, melt evolution, crystal growth rates and magma degassing in the Erebus volcano magmatic system using the 238U-, 235U- and 232Th-decay series, *Journal of Petrology*, 54(2), 235-271.

23. Dulaiova, H., K. W. W. Simms, J. Prytulak, M. A. Charette, 2013. New method for actinium separation in geological samples. *Journal of Radioanalytical and Nuclear Chemistry*, 296(1), 279-283.

24. Kamenik*, J., H. Dulaiova, F. Sebesta, and K. Stastnax, 2013. Fast concentration of dissolved forms of cesium radioisotopes from large seawater samples, *Journal of Radioanalytical and Nuclear Chemistry*, 296(2), 841-846.

25. Pike, S. M., K.O. Buesseler, C.F. Breier, H. Dulaiova, K. Stastnax, F. Sebesta, 2013. Extraction of cesium in seawater off Japan using AMP-PAN resin and quantification via gamma spectroscopy and inductively coupled mass spectrometry, *Journal of Radioanalytical and Nuclear Chemistry*, 296(1), 369-374.

26. Charette, M. A., H. Dulaiova, M.E. Gonneea, P.B. Henderson, W.S. Moore, J.C. Scholten, M.K. Pham, 2012. GEOTRACES radium isotopes interlaboratory comparison experiment, *Limnol. Oceanogr.: Methods* 10, 451-463.

27. Dimova, N. T., P.W. Swarzenski, H. Dulaiova, C. R. Glenn, 2012. Utilizing multichannel electrical resistivity methods to examine the dynamics of the fresh water–seawater interface in two Hawaiian groundwater systems, *Journal of Geophysical Research* 117 (C2), C02012.

R.A. Dunn

1. Dunn, RA, R Arai, DE Eason, JP Canales, RA Sohn, Three-dimensional seismic structure of the Mid-Atlantic Ridge: an investigation of tectonic, magmatic, and hydrothermal processes in the Rainbow area, *J. Geophys. Res.*, doi: 10.1002/2017JB015051, 2017. (soest no. 10284)

2. Canales, JP, RA Dunn, R Arai, RA Sohn, Seismic imaging of magma sills beneath an ultramafic-hosted hydrothermal system, *Geology*, doi:10.1130/G38795.1, 2017. (soest no. 9904)

3. Eason, DE, RA Dunn, JP Canales, RA Sohn, Segment-scale variations in seafloor volcanic and tectonic processes from multibeam sonar imaging, Mid-Atlantic Ridge Rainbow region (35˚45’-36˚35’N), *Geochem., Geophys., Geosys.*, 17, doi:10.1002/2016GC006433, 2016. (soest no. 9693)

4. Dunn, RA, Ocean acoustic reverberation tomography, *J. Acoust. Soc. Am.*, 138 (6), 3458-3469, 2015. (soest no. 9547)

5. Paulatto, M, JP Canales, RA Dunn, RA Sohn, Heterogeneous and asymmetric crustal accretion: new constraints from multi-beam bathymetry and potential field data from the Rainbow area of the Mid-Atlantic Ridge (35°50'N - 36°35'N), *Geochem. Geophys.Geosyst.*, 16, doi:10.1002/2015GC005743, 2015. (soest no. 9964)

6. Eason, DE and Dunn, RA, Petrogenesis and structure of oceanic crust in the Lau Back- Arc Basin, *Earth Planet. Sci. Lett.*, 429, 128-138, 2015. (soest no. 9480)

7. Ito, G, RA Dunn, A Li, The origin of shear wave splitting beneath Iceland, *Geophys. J.Int.,* 201, 1297-1312, 2015. (soest no. 9268)

8. Wei, SS, DA Wiens, Y Zha, T Plank, SC Webb, DK Blackman, RA Dunn, JA Conder, Seismic evidence of effects of water on mantle melt transport in the Lau back-arc mantle, *Nature*, doi:10.1038/nature14113, 2015. (soest no. 10204)

9. Dunn, RA, Crust and lithospheric structure – seismic structure of mid-ocean ridges. In (eds. B. Romanowicz and A. Dziewonski) *Treatise on Geophysics, vol. 1 – Seismology and Structure of the Earth 2nd Edition*, Elsevier Science, UK, 2015. (soest no. 9088)

10. Dunn, RA, Tracking stress and hydrothermal activity along the Eastern Lau Spreading Center using seismic anisotropy, *Earth Planet. Sci. Lett.*, 410,105-116, 2015. (soest no. 9220)

11. Brodie, D and RA Dunn, Low frequency baleen whale calls detected on an oceanbottom seismometer array in the Lau basin, South Pacific Ocean, *J. Acoust. Soc. Am.*, 137(1), 53-62. 2015. (soest no. 9040)

12. Zha, Y, SC Webb, SS Wei, DA Wiens, DK Blackman, W Menke, RA Dunn, JA Conder, Seismological imaging of ridge-arc interaction beneath the Eastern Lau Spreading Center from OBS ambient noise tomography, *Earth Planet. Sci. Lett.*, 408, 194-206, 2014. (soest no. 9935)

13. Arai, R and RA Dunn, Seismological study of Lau back arc crust: mantle water, magmatic differentiation, and a compositionally zoned basin, *Earth Planet. Sci. Lett.*, 390, 314-317, 2014. (soest no. 8998)

14. Ito G, RA Dunn, A Li, CJ Wolfe, A Gallego, Y Fu, Seismic anisotropy and shear-wave splitting associated with mantle plume-plate interaction, *J. Geophys. Res.*, 119, doi: 10.1002/2013JB010735, 2014. (soest no. 9095)

15. Canales, JP, RA Dunn, G Ito, RS Detrick, V Sallares, Effect of variations in magma supply on the crustal structure of mid-ocean ridges: insights from the western Galapagos Spreading Center. In (eds. KS Harpp, E Mittelstaedt, N d'Ozouville, DW Graham) The Galapagos: A Natural Laboratory for the Earth Sciences. Amer. Geophys. Union, 2014. (soest no. 8489)

16. Gallego, A, G Ito, RA Dunn, Investigating seismic anisotropy beneath the Reykjanes Ridge using models of mantle flow, crystallographic evolution, and surface wave propagation, *Geochem. Geophys. Geosyst.*, doi: 10.1002/ggge.20204, 2013. (soest no. 8950)

17. Dunn, RA, F Martinez, JA Conder, Crustal construction and magma chamber properties along the Eastern Lau Spreading Center, *Earth Planet. Sci. Lett.*, 371-372, 112-124, 2013. (soest no. 8915)

Deborah Eason

1. Dunn, R., R. Arai, D. Eason, J. Canales, R. Sohn (2017) Three-dimensional seismic structure of the Mid-Atlantic Ridge: An investigation of tectonic, magmatic, and hydrothermal processes in the Rainbow area. *J. Geophys. Res.*, 122, doi:10.1002/2017JB015051.

2. Sinton, J., D. Eason, and R. Duncan (2017) Volcanic evolution of Moloka'i, Hawai'i: Implications for the shield to postshield transition in Hawaiian volcanoes. *J. Volcanol. Geotherm. Res.*, 340: 30-51, doi:10.1016/j.volgeores.2017.04.011.

3. Purser, A., Y. Marcon, H.-J. Hoving, M. Vecchione, U. Piatkowski, D. Eason, H. Bluhm, A. Boetius (2016) Association of deep-sea incirrate octopods with manganese crusts and nodule fields in the Pacific Ocean. *Current Biology* 26(24), R1268-1269, doi:10.1016/j.cub.2016.10.052.

4. Eason, D., R. Dunn, J.P. Canales, R. Sohn (2016) Segment-scale variations in seafloor volcanic and tectonic processes in the Mid-Atlantic Ridge Rainbow region (35º45'N-36º35'N). *Geochem. Geophys. Geosyst.* 17,doi:10/1002/2016GC006433.

5. Hey, R., F. Martinez, Á. Höskuldsson, D. Eason, J. Sleeper, S. Thordarson, Á. Benediktsdóttir, S. Merkuryev (2016) Multibeam investigation of the active North Atlantic plate boundary reorganization tip. *Earth & Planet. Sci. Lett.* 435, doi:10.1016/j.epsl.2015.12.019.

6. Eason, D., and R. Dunn (2015) Petrogenesis and structure of oceanic crust in the Lau back-arc basin. *Earth & Planet. Sci. Lett. 429*: 128-138, doi:10.1016/j.epsl.2015.07.065.

7. Eason, D., J. Sinton, K. Grönvold and M. Kurz (2015) Effects of deglaciation on the petrology and eruptive history of the Western Volcanic Zone, Iceland. *Bull. Volc.* 77, doi:10.1007/s00445-015-0916-0.

8. Sinton, J., D. Eason, M. Tardona, D. Pyle, I. van der Zander, H. Guillou, D. Clague, J. Mahoney (2014) Ka'ena Volcano – a precursor volcano of the island of O'ahu, Hawai'i. *GSA Bull.* 126: 1219-1244, doi:10.1130/B30936.1.

9. Colman, A., J. Sinton, S. White, J.T. McClinton, J. Bowles, K. Rubin, M. Behn, B. Cushman, D. Eason, T. Gregg, K Grönvold, S. Hidalgo, J. Howell, O. Neill, C. Russo (2012) Effects of variable magma supply on mid-ocean ridge eruptions: Constraints from mapped lava flow fields along the Galápagos Spreading Center. *Geochem. Geophys. Geosyst.* 13, Q08014, doi:10.1029/2012GC004163.

Aly El-Kadi

(Student/researcher names are marked by asterisks)

1. *Leta, O.T., El-Kadi, A.I., Dulai, H. 2017. Implications of climate change on water budgets and reservoir water harvesting of Nuuanu area watersheds, Oahu, Hawaii, *Journal of Water Resources Planning and Management, ASCE,* (143(11):05017013-01-05017013-19.

2. *Shuler, C., El-Kadi, A.I., Dulai, H., Glenn, C., Fackrell*, J. 2017. Source partitioning of anthropogenic groundwater nitrogen in a mixed-use landscape, Tutuila, American Samoa. *Hydrogeology Journal*, 25(8), pp 2419–2434.

3. *Habel, S., C.H. Fletcher, K. Rotzoll, A.I. El-Kadi. 2017. Development of a model to simulate groundwater inundation induced by sea-level rise and high tides in Honolulu, Hawaii. *Water Res.* 114: 122-134.

4. *Leta, O.T., El-Kadi, A.I., Dulai, H., and Ghzal*, K.. 2016. Assessment of climate change impacts on water balance components of Heeia watershed in Hawaii. *Journal of Hydrology: Regional Studies*, 8: 182–197.

5. *Cutler, W.G., El-Kadi, A.I., Hue, N.V., Peard, J., Scheckel, K., and Ray, C. 2014. Iron Amendments to Reduce Bioaccessible Arsenic, *Journal of Hazardous Materials*, 279 (2014) 554–561.

6. Hagedorn, K.B., Mair, A., Tillery, S., El-Kadi, A.I., Ha, K., and Koh, G-W. 2014. Simple equations for temperature simulations on mid-latitude volcanic islands: A case study from Jeju (Republic of Korea), *Geosciences Journal*, DOI: 10.1007/s12303-014-0022-x.

7. El-Kadi, A.I., Tillery*, S., Whittier*, R.B., Hagedorn*, B., Mair*, A, Ha, K. and Koh, G.-W. 2014. Assessing sustainability of groundwater resources on Jeju Island, South Korea, under climate change, drought, and increased usage, *Journal of Hydrogeology*, 22: 625–642.

8. *Mair, A., Hagedorn*, B., Tillery*, S., El-Kadi, A.I., Westenbroek, S., Ha, K., and Koh, G.-W. 2013. Temporal and spatial variability of groundwater recharge on Jeju Island, Korea. *Journal of Hydrology*, 501: 213-226.

9. *Mair, A., and El-Kadi, A.I. 2013. Logistic regression modeling to assess groundwater vulnerability to contamination in Hawaii, USA. *Journal of Contaminant Hydrology*, 153:1–23.

10. Rotzoll, K., S.B. Gingerich, J. Jenson, and A.I. El-Kadi. 2013. Estimating hydraulic properties from tidal attenuation in the Northern Guam Lens Aquifer, Territory of Guam, USA. *Hydrogeology Journal*, 21(3), 643–654.

11. *Mair, A., A.I. El-Kadi, K. Ha, and G-W Koh. 2013. Temporal and spatial variability of rainfall and climate trend on Jeju Island, *Geosciences Journal,* 17(1):75-85. March.

12. *Cutler, W.G, R.C. Brewer , A.I. El-Kadi, N.V. Hue, P.G. Niemeyer, J. Peard, C. Ray. 2013. Bioaccessible arsenic in soils of former sugar cane plantations, Island of Hawaii, *Science of the Total Environment,* 442 (2013): 177–188.

Chip Fletcher

1. Keener, V., D. Helweg, S. Asam, S. Balwani, M. Burkett, C. Fletcher, T. Giambelluca, Z. Grecni, M. Nobrega-Olivera, J. Polovina, and G. Tribble, 2018: Hawai‘i and U.S.-Affiliated Pacific Islands. In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA. doi: 10.7930/NCA4.2018.CH27

2. Anderson, T.R. et al. (2018) Modeling multiple sea level rise stesses reveals up to twice the land at risk compared to strictly passive flooding methods. Scientific Reports (open access): https://www.nature.com/articles/s41598-018-32658-x

3. Summers, A. et al. (2018) Failure to protect beaches under slowly rising sea level. Climatic Change: https://link.springer.com/article/10.1007/s10584-018-2327-7; open access

4. Fletcher, C.H. (2018) Climate Change: What the science tells us, 2nd Ed., J. Wiley & Sons, NY, 265p.

5. Fletcher, C.H. (2017) Physical Geology: The Science of Earth, 3rd Ed., J. Wiley and Sons, NY, 678p.

6. Kane, H. H.*, Fletcher, C. H., Cochrane, E. E., Mitrovica, J. X., Habel, S.*, Barbee, M. 2017. Coastal plain stratigraphy records tectonic, environmental, and human habitability changes related to sea-level drawdown, 'Upolu, Sāmoa. Quaternary Research (2017), 87, 246–257 doi:10.1017/qua.2017.2

7. Habel, S., Fletcher, C.H., Rotzoll, K. and El-Kadi, A. 2017. Development of a model to simulate groundwater inundation induced by sea-level rise and high tides in Honolulu, Hawai‘i. Water Research. ISSN 0043-135.http://dx.doi.org/10.1016/j.watres.2017.02.035

8. Spirandelli, D.J., Anderson, T.R., Porro, R., and Fletcher, C.H. 2016. Improving Adaptation Planning for Future Sea-Level Rise: Understanding Uncertainty and Risks Using a Proabability-Based Shoreline Model. Journal of Planning and Research 1-14. DOI: 10.1177/0739456X16657160

9. Habel*, S., Fletcher, C. H., Barbee, M., Anderson*, T. R. 2016. The influence of seasonal patterns on a beach nourishment project in a complex reef environment. Coastal Engineering: Volume 116, Pages 67–76http://dx.doi.org/10.1016/j.coastaleng.2016.06.006

10. Romine*, B.M., Fletcher, C.H., Frazer, L.N., and Anderson*, T.R., 2016. Beach erosion under rising sea-level modulated by coastal geomorphology and sediment availability on carbonate reef-fringed island coasts. Sedimentology. DOI 10.1111/sed.12264

11. Fletcher C.H. (2016) Climate Change Booklets for the USAPI. Pacific Islands Climate Education Partnership. NSF Grant #1239733

12. Cochrane, E., Kane, H., Fletcher, C., Horrocks, M., Mills, J., Barbee, M. Morrison A., Matavai Tautunu, M., 2015. Lack of suitable coastal plains likely influenced Lapita (~2800 cal BP) settlement of Samoa: Evidence from SE Upolu. The Holocene, DOI: 10.1177/0959683615596841

13. Anderson, T.R., Fletcher, C.H., Barbee, M.M., Frazer, L.N., and Romine, B.M. 2015. Doubling of coastal erosion under rising sea level by mid-century in Hawai‘i. Natural Hazards. DOI 10.1007/s11069-015-1698-6

14. Kane H H, Fletcher C H, Frazer L N, Anderson T, Barbee, M. 2015. Modeling sea-level rise vulnerability of coastal environments using ranked management concerns. Climate Change. DOI 10.1007/s10584-015-1377-3

15. Anderson, T.R., Frazer, L.N., and Fletcher, C.H., 2015. Long-term shoreline change at Kailua, Hawai‘i, using regularized single transect.Journal of Coastal Research. West Palm Beach (Florida), ISSN 0749-0208. http://dx.doi.org/10.2112/JCOASTRES-D-13-00202.1

16. Kane H H, Fletcher C H, Frazer N, Barbee, M. (2015) Critical elevation levels for flooding due to sea-level rise. Regional Environmental Change. DOI 10.1007/s10113-014-0725-6

17. Sherman, C.E., Fletcher, C.H., Rubin, K.H., Simmons, K.R., and Adey, W.H., 2014. Sea-level and reef accretion history of Marine Oxygen Isotope Stage 7 and late Stage 5 based on age and facies of submerged late Pleistocene reefs, Oahu, Hawai‘i. Quaternary Research 81: 138-150

18. Anderson, T.R. and Frazer, L.N., 2013. Toward Parsimony in Shoreline Change Prediction (III): B-splines and noise handling, Journal of Coastal Research.

19. Romine, B.M., Fletcher, C.H., Barbee, M.M., Anderson, T.R., and Frazer, L.N., 2013. Are beach erosion rates and sea-level rise related in Hawai‘i?. Global and Planetary Change, 108: 149-157

20. Cooper, H.M., Chen, Q., Fletcher, C.H., and Barbee, M.M., 2013. Assessing vulnerability due to sea-level rise in Maui, Hawai'i using LiDAR remote sensing and GIS. Climate Change, 116:547-563, 16 p.

21. Cooper, H.M., Fletcher, C.H., Chen, Q. and Barbee, M.M., 2013. Sea-level rise vulnerability mapping for adaptation decisions using LiDAR DEMs. Progress in Physical Geography, 001-22, 22 p.

22. Rotzoll, K. and Fletcher, C., 2012, Assessment of groundwater inundation by sea level rise; Nature Climate Change, 3, 477-481,DOI:10.1038/NCLIMATE1725

23. Fletcher, C.H., Romine, B.M., Genz, A.S., Barbee, M.M., Dyer, M., Anderson, T.R., Lim, S.C., Vitousek, S., Bochicchio, C., and Richmond, B.M., 2012, National assessment of shoreline change: Historical shoreline change in the Hawai‘ian Islands: U.S. Geological Survey Open-File Report 2011–1051, 55 p.

24. Haunani H. Kane, Charles H. Fletcher, Bradley M. Romine, Tiffany R. Anderson, Neil L. Frazer, and Matthew M. Barbee (2012) Vulnerability Assessment of Hawai'i's Cultural Assets Attributable to Erosion Using Shoreline Trend Analysis Techniques. Journal of Coastal Research, West Palm Beach, (Florida). 28(3), 533-539. ISSN 0749-0208

25. Romine, B.M., Fletcher, C.H., Genz, A.S., Barbee, M.M., Dyer, Matthew, Anderson, T.R., Lim, S.C., Vitousek, Sean, Bochicchio, Christopher, and Richmond, B.M., 2012, National Assessment of Shoreline Change: A GIS compilation of vector shorelines and associated shoreline change data for the sandy shorelines of Kauai, Oahu, and Maui, Hawai‘i: U.S. Geological Survey Open-File Report 2011-1009.

26. Romine, B.M. and Fletcher, C.H., 2012. A summary of historical shoreline changes on beaches of Kauai, Oahu, and Maui; Hawai‘i. Journal of Coastal Research. West Palm Beach (Florida), ISSN 0749-0208.

27. Romine, B.M. and Fletcher, C.H. 2012, Armoring on Eroding Coasts Leads to Beach Narrowing and Loss on Oahu, Hawai‘i, in Pitfalls of Shoreline Stabilization: Selected Case Studies, J.A.G. Cooper, G. Andrew and O.H. Pilkey (eds.), Coastal Research Library 3, DOI 10.1007/978-94-007-4123-2_10, Springer Science and Business Media, Dordrecht, Netherlands.

Neil Frazer

1. Vitousek, S., Barnard, P.L., Fletcher, C.H., Frazer, N., Erikson, L., and Storlazzi, C. (2017) Doubling of coastal flooding frequency within decades due to sea level rise, *Nature Scientific Reports*, 7(1399), doi:10.1038/s41598-017-01362-7

2. Veazey*, L., Franklin, E.C., Kelley, C., Rooney, J. and Frazer, L.N., (2016) The implementation of rare events logistic regression to predict the distribution of mesophotic hard corals across the main Hawaiian Islands, *PeerJ*, DOI: 10.7717/peerj.2189.

3. Groner, M.L., Rogers, L.A., Bateman, A.W., Connors, B.M., Frazer, L.N., Godwin*, S.C., Krkošek, M., Lewis, M.A., Peacock*, S.J., Rees, E.E., Revie, C.W., and Schlägel, U.E. (2016) Review Article: Lessons from sea louse and salmon epidemiology, *Phil. Trans. Roy. Soc. B*, 371(1689), DOI: 10.1098/rstb.2015.0203.

4. Krkosek, M., Ashander, J., Frazer, L.N., and Lewis, M.A. (2013) Allee effect from parasite spill-back, *American Naturalist*, 182(5), 640–652.

5. Frazer, L.N., Krkosek, M. and Morton, A. (2012) Critical thresholds in sea lice epidemics: evidence, sensitivity and subcritical estimation, *Proceedings of the Royal Society, B.,* Published online Jan 4, 2012. DOI: 10.1098/rspb.2011.2210

6. Romine, B.M., Fletcher, C.H., Frazer, L.N., and Anderson, T.R. (2016) Beach erosion under rising sea level modulated by coastal geomorphology and sediment availability on carbonate reef-fringed coasts, *Sedimentology*, DOI: 10.1111/sed.12264.

7. Kane*, H.H., Fletcher, C.H., Romine*, B.M., Frazer, L.N., Anderson*, T.R., and Barbee, M.M. (2015) Modeling sea-level rise of vulnerability of coastal environments using ranked management concerns, *Climatic Change*, DOI: 10.1007/s10584-015-1377-3, published online March 19, 2015.

8. Anderson*, T.R., Fletcher, C.H., Barbee, M.M., Frazer, L.N., and Romine, B.M. (2015) Doubling of coastal erosion under rising sea level by mid-century in Hawaii. *Natural Hazards*, DOI 10.1007/s11069-015-1698-6, published online March 18, 2015.

9. Kane*, H.H., Fletcher, C.H., Frazer, L.N., and Barbee, M.M. (2015) Critical elevation levels for flooding due to sea level rise in Hawaii. *Regional Environmental Change,* 15(8), 1679–1687. DOI: 10.1007/s10113-014-0725-6.

10. Anderson*, T.R., Frazer, L.N. and Fletcher, C.H. (2014) Long-term shoreline change at Kailua, Hawaii using regularized single transect. *Journal of Coastal Research*, DOI: 10.2112/JCOASTRES-D-13-00202.1, published online October 16, 2014.

11. Anderson*, T.R. and Frazer, L.N. (2014) Toward parsimony in shoreline change prediction (III): B-splines and noise handling, *Journal of Coastal Research*, 30(4): 729–742.

12. Romine*, B.M., Fletcher, C.H., Barbee, M.M., Anderson*, T.R. and Frazer, L.N. (2013) Are beach erosion rates and sea level rise related in Hawaii? *Global and Planetary Change*, 108, 149–157.

13. Kane*, H.H., Fletcher, C.H., Romine*, B.M., Anderson*, T.R., Frazer, L.N., and Barbee, M.M. (2012) Vulnerability assessment of Hawai'i's cultural assets attributable to erosion using shoreline trend analysis techniques, *Journal of Coastal Research*, 28(3): 533–539.

14. Lautze, N., D. Thomas, N. Hinz, G. Ito, N. Frazer, D. Waller (2017). Play fairway analysis of geothermal resources across the state of Hawaii: 1. Geological, geophysical, and geochemical datasets, *Geothermics* 70, 376–392, https://doi.org/10.1016/j.geothermics.2017.02.001

15. Ito, G., N. Frazer, N. Lautze, D. Thomas, N. Hinz, D. Waller, R. Whittier, E. Wallin (2016), Play fairway analysis of geothermal resources across the state of Hawaii: 2. Resource probability mapping, *Geothermics*, doi:10.1016/j.geothermics.2016.11.004

16. Lautze, N., D. Thomas, N. Hinz, D. Waller, N. Frazer, G. Ito (2017). Play fairway analysis of geothermal resources across the state of Hawaii: 3. Use of development viability criterion to prioritize future exploration targets, *Geothermics*, 70, 406–413. https://doi.org/10.1016/j.geothermics.2017.07.005

17. Butler, R., Frazer, L.N. and Templeton, W. (2016) Bayesian probabilities for Mw 9.0 earthquake in the Aleutian Islands from a regionally scaled global rate, *Journal of Geophysical Research B Solid Earth*, doi:10.1002/2016JB012861.

18. Howell, S., Smith-Konter, Frazer, N., B. Tong, X., and Sandwell, D. (2016) The vertical fingerprint of earthquake cycle loading in southern California, *Nature Geoscience,* 9, 611-614. doi:10.1038/ngeo2741.

19. Klawonn*, M., C. J. Wolfe, L. N. Frazer, and B. F. Houghton (2014), Constraining particle size dependent plume sedimentation from the 17 June 1996 eruption of Ruapehu volcano, New Zealand using geophysical inversions, *J. Geophys. Res.* 119:1749–1763, doi:10.1002/2013JB010387.

20. Klawonn*, M., C. J. Wolfe, L. N. Frazer, and B. F. Houghton (2012), Novel inversion approach to constrain plume sedimentation from tephra deposit data: Application to the 17 June 1996 eruption of Ruapehu volcano, New Zealand, *J. Geophys. Res.*, 117, B05205, doi:10.1029/2011JB008767.

Eric Gaidos

1. Grunblatt, S. K., Huber, D., Gaidos, E., Lopez, D., Howard, A. W., Isaacson, H. T., Vanderburg, A., Nofi, L., Yu, J., North, T. S. H., Chaplin, W., Foreman-Mackey, D., Petigura, E., Ansdell, M., Weiss,

L. (2017) Seeing double with *K2*: Testing re-inflation with two remarkably similar planets around red giant branch stars, The Astronomical Journal 154, 254.

2. Kraus, A. L., Douglas, S. T., Mann, A. W., Agueros, M. A., Law, N. M., Covey, K. R., Feiden, G. A., Rizzuto, A. C., Howard, A., Isaacson, H., Gaidos, E., Torres, G., Bakos, G. (2017) The Factory and the Beehive III: PTFEB132.707+19.810, a low-mass eclipsing binary in Praesepe observed by PTF and KS, The Astrophysical Journal 845, 72.
3. Rodriguez, J. E., Ansdell, M., Oelkers, R. J., Cargile, P. A., Gaidos, E. et al. (2017) Identification of Young Stellar Variables with KELT for K2 I: Campaign 13 Taurus, The Astrophysical Journal 848, 97.
4. Gaidos, E. (2017) Transit Detection of a ``Starshade" at the Inner Lagrange Point of an Exoplanet, Monthly Notices of the Royal Astronomical Society, 469, 4455.
5. Gaidos, E. (2017) A minimum mass nebula for M dwarfs, Monthly Notices of the Royal Astronomical Society, 470, L1.
6. Gaidos, E., Kitzmann, D., Heng, K. (2017) Exoplanet characterization by multiobservatory photometry with *TESS* and *CHEOPS*, Monthly Notices of the Royal Astronomical Society, 468, 3418.
7. Fridlund, M., Gaidos, E., Barragan, O., Persson, C. M., Gandolfi, D., Cabrera, J., Hirano, Kuzahara, T. et al. (2017) K2-111b - A short period super-Earth orbiting a metal-poor, evolved old star, Astronomy & Astrophysics, 604, 16.
8. Rodriguez, J. E., Zhou, G., Cargile, P. A., Stevens, D. J., Osborn, H. P., Shappee, B. J., Reed, P. A., Lund, M. B., Relles, H. M., Latham, D. W., Eastman, Stassun, K. G., Bieryla, A., Esquerdo, G. A., Gaidos, E., and 21 co-authors (2017) The mysterious dimmings of the T Tauri star V1334 Tau, The Astrophysical Journal, 836, 209.
9. Schonhut-Stasik, J. S., Baranec, C., Huber, D., Ziegler, C., Atkinson, D., Gaidos, E., Law, N. M., Riddle, R., Hagelberg, J., van der Marel, N. (2017) Adaptive optics imaging of asteroseismic Kepler dwarf and subgiant stars, The Astrophysical Journal 847, 97.
10. Einarsson, B., Jóhannesson, T., Thorsteinsson, T., Gaidos, E., Zwinger, T. (2017) Subglacial flood path development during a rapidly rising jökulhlaup from the western Skaftá cauldron, Vatjnajökull, Iceland, Journal of Glaciology 63, 670-682.
11. Fichtinger, B., Gűdel, M., Mutel, R. M., Hallinan, G., Gaidos, E., Skinner, S. L, Lynch, C., Gayley, K. G. (2017) Radio emission and mass loss rate limits of four young solar-type stars, Astronomy & Astrophysics, 599, 127.
12. Mann, A. W., Gaidos, E., Vanderburg, A., Rizzuto, A. C., Ansdell, M., Medina, J., Mace, G. N., Kraus, A. L. (2017) Zodiacal Exoplanets in Time (ZEIT) IV. Seven Transiting Planets in the Praesepe Cluster., The Astronomical Journal, 153, 64.
13. Grunblatt, S. K., Huber, D., Gaidos, E., Lopez, E., Fulton, B., Fortney, J., Howard, A., Sinukoff, E., Mann, A., Isaacson, H. (2016) EPIC 211351816.01: A (Re-?) Inflated Planet Orbiting a Red Giant Star, The Astrophysical Journal, 152, 185.
14. Gaidos, E., Mann, A. W., Rizzuto, A. C., Nofi, L., Mace, G., Vanderburg, A., Feiden, G., Esposito, T. M., De Rosa, R. J., Graham, J. R., Ansdell, M., Kraus, A., Jaffe, D. (2016) Zodiacal Exoplanets in Time (ZEIT) II: A Close-In "Super-Earth" around an Enigmatic Young K Dwarf in the Pleiades Field, Monthly Notices of the Royal Astronomical Society, 464, 850.
15. Ansdell, M., Gaidos, E., Williams, J. P., Kennedy, G., Wyatt, M. C., LaCourse, D. M., Jacobs, T. L., Mann, A. W. (2016) Dipper disks not inclined toward edge-on orbits, Letters of the Monthly Notices of the Royal Astronomical Society, 146, L101.
16. Mann, A. W., Newton, E. R., Rizzuto, A. C., Irwin, J., Feiden, G. A., Gaidos, E., Mace, G. N., Kraus, A. L., James, D. J., Ansdell, M., Charbonneau, D., Covey, K. R., Ireland, M. R., Jaffe, D. T., Johnson, M. C., Kidder, B., Vanderburg, A. (2016) Zodiacal Exoplanets in Time (ZEIT) III: A short-period planet orbiting a pre-main-sequence star in the Upper Scorpius OB Association, The Astronomical Journal, 152, 61.

17. Kite, E., Fegley, B., Schaefer, L., Gaidos, E. (2016) Atmosphere-interior exchange on hot, rocky exoplanets", The Astrophysical Journal, 828, 80.

18. Mann, A. W., Gaidos, E., Mac, G., Johnson, M., Bowler, B., LaCourse, D., Jacobs, T., Vanderburg, A., Kraus, A., Kaplan, K., Jaffe, D. (2015) Zodiacal Exoplanets In Time (ZEIT)- I: A Neptune-sized planet orbiting an M4.5 dwarf in Hyades, The Astrophysical Journal, 818, 46.

19. Hirano, T., Fukui, A., Mann, A. W., Sanchis-Ojeda, R., Gaidos, E., Narita, N., Dai, F., Van Eylen, V., Lee, C.-H., Onozato, H., Ryu, T., Kusakabe, N., Ito, A., Kuzuhara, M., Onitsuka, M., Tatsuuma, M., Nowak, G., Palle, E., Ribas, I., Tamura, M., Yu, L. (2015) ESPRINT III: A close-in super-Earth around a metal-rich mid-M dwarf, The Astrophysical Journal, 820, 41.

20. Gaidos, E., Mann, A. W., Ansdell, M. (2015) The enigmatic and ephemeral M dwarf system KOI 6705: Cheshire cat or wild goose?, The Astrophysical Journal, 817, 50.

21. Ansdell, M., Gaidos, E., Rappaport, S. A., Jacobs, T. L., LaCourse, D. M., Jek, K. J., Mann, A. W., Wyatt, M. C., Kennedy, G., Williams, J. P., Boyajian, T. S. (2015): Young M dwarf "dipper" stars in Upper Sco and rho Oph observed by K2, The Astrophysical Journal, 816, 69.

22. Gaidos, E., Mann, A. W., Kraus, A. L., Ireland, M. (2016): They are small worlds after all: Revised properties of *Kepler* M dwarf stars and their planets, Monthly Notices of the Royal Astronomical Society, 457, 2877.

23. Sanchis-Ojeda, R., Rappaport, S., Palle, E., Delrez, L., DeVore, J., Gandolfi, D., Fukui A., Ribas, I., Stassun, K. G., Albrecht, S., Dai, F., Gaidos, E., Gillon, M., Hirano, T., Holman, M., Howard, A. W., Isaacson, H., Jehin, E., Kuzuhara, M., Mann, A. W., Marcy, G. W., Miles- Paez, P. A., Montanes-Rodriguez, P. A., Murgas, F., Narita, N., Nowak, G., Onitsuka, M., Paegert, M., Van Eylen, V., Winn, J. N., Yu, L. (2015): The K2-ESPRINT project I: Discovery of the disintegrating rocky planet with a cometary head and tail EPIC 201637175b, The Astrophysical Journal, 812, 112.

24. Gaidos, E. (2015) What are little worlds made of? Stellar abundances and the building blocks of planets. The Astrophysical Journal 804, 40-53.

25. Mann, A. W., Feiden, G. A., Gaidos, E., Boyajian, T., von Braun, K. (2015) How to constrain your M dwarf: measuring effective temperature, bolometric luminosity, mass and radius. The Astrophysical Journal 804, 64-101.

26. Muirhead, P. S., Mann, A. W., Vanderburg, A., Morton, T. D., Kraus, A., Ireland, M., Swift, J. J., Feiden, G. A., Gaidos, E., Gazak, J. Z. (2015) KOI-2704, KOI-2842, and the occurrence of compact multiples orbiting mid-M dwarf stars. The Astrophysical Journal 801, 18-32.

27. Silburt, A., Gaidos, E., Wu, Y. (2015) A statistical reconstruction of the planet population around *Kepler* solar-type stars. The Astrophysical Journal 799, 180-191.

28. Ansdell, M., Gaidos, E., Mann, A. W., Lepine, S., James, D., Buccino, A., Baranec, C., Law, N. M., Riddle, R., Mauas, P. (2015) The near-ultraviolet luminosity function of early Mtype dwarf stars. The Astrophysical Journal 798, 41-57.

29. Gaidos, E., Mann, A. W. (2014) M dwarf metallicities and giant planet occurrence: ironing out uncertainties and systematics. The Astrophysical Journal 791, 54-62.

30. Gaidos, E., Mann, A. W., Lepine, S., Buccino, A., James, D., Ansdell, M., Petrucci, R., Mauas, P., Hilton, E. J. (2014) Trumpeting M Dwarfs with CONCH-SHELL: a Catalog of Nearby Cool Host-Stars for Habitable ExopLanets and Life. Monthly Notices of the Royal Astronomical Society 443, 2561-2578.

31. Mann, A. W., Deacon, N. R., Gaidos, E., Ansdell, M., Brewer, J. M., Liu, M. C., Magnier, E. A., Aller, K. M. (2014) Prospecting in ultracool dwarfs: measuring the metallicities of late M dwarfs, The Astronomical Journal 147, 160-170.

32. Huber, D., Matthews, J. M., Pinsonneault, M. H., Aguirre, V. S., Gaidos, E., Garcia, R. A., Hekker, S., Mathur, S., Mosser, B., Benoit, T., Guillermo, B., Fabienne, A., Basu, S., Bedding, T. R., Chaplin, W. J., Demory, B.-O., Fleming, S. W., Guo, Z., Mann, A. W., Rowe, J. F., Serenelli, A. M., Smith, M. A., Stello, D. (2014) Revised stellar properties of *Kepler* targets for the Quarter 1-16 transit detection run. The Astrophysical Journal Supplement Series 211, 2-19.

33. Gaidos, E., Anderson, D. R., Lepine, S., Colon, K. D., Maravelias, G., Narita, N., Chang, E., Beyer, J., Fukui, A., Armstrong, J. D., Zezas, A., Fulton, B. J., Mann, A. W., West, R. G., Faedi, F. (2014) Prowling a sea of noise for transits: A Search for Exoplanets by Analysis of WASP Optical Lightcurves and Follow-up (SEAWOLF). Monthly Notices of the Royal Astronomical Society 437, 3133-3143.

34. Mann, A. W., Gaidos, E., Ansdell, M. (2013) Spectro-thermometry of M dwarfs and their candidate planets: too hot, too cool, or just right? The Astrophysical Journal 779, 188-202.

35. Colon, K. D., Gaidos, E. (2013) Narrow *K*-band observations of the GJ 1214 system. The Astrophysical Journal 776, 49-61.

36. Gaidos, E., Fischer, D. A., Mann, A. W., Howard, A. W. (2013) An understanding of the shoulder of giants: Jovian planets around late K dwarf stars and the trend with stellar mass. The Astrophysical Journal 771, 18-29.

37. Mann, A. W., Gaidos, E., Kraus, A., Hilton, E. J. (2013) Testing the metal of late-type Kepler planet hosts with iron-clad methods. The Astrophysical Journal 770, 43-50.

38. Sinukoff, E., Fulton, B., Scuderi, L., Gaidos, E. (2013) Below One Earth: Detection, formation, and properties of subterrestrial worlds. Space Science Reviews 180, 71-99.

39. Rusch, A., Gaidos, E. (2013) Nitrogen-cycling bacteria and archaea in the carbonate sediment of a coral reef. Geobiology 11, 472-484.

40. Gaidos, E. (2013) Candidate planets in the habitable zones of Kepler stars. The Astrophysical Journal 770, 90-101.

41. Van Summeren, J., Gaidos, E., Conrad, C. P. (2013) Magnetodynamo lifetimes for rocky, Earth-mass exoplanets with contrasting mantle convection regimes. Journal of Geophysical Research-Planets 118, 938-951.

42. Lepine, S., Hilton, E. J., Mann, A. W., Wilde, M., Rojas-Ayala, B., Cruz, K. L., Gaidos, E. (2013) A spectroscopic catalog of the brightest (J<9) M dwarfs in the northern sky. The Astronomical Journal 145, 102-130.

43. Mann, A. W., Brewer, J., Gaidos, E., Hilton, E. J., Lepine, S. (2013) Prospecting in latetype dwarfs: Techniques to determine metallicities of late-K to mid-M dwarfs using infrared and optical spectra. The Astronomical Journal 145, 52-66.

44. Gaidos, E., Mann, A. W. (2012) Objects in Kepler's mirror may be larger than they appear: bias and selection effects in transiting planet surveys. The Astrophysical Journal 761, 41-53.

45. Krot, A.N., Makide, K., Nagashima, K., Huss, G.R., Ogliore, R.C., Ciesla, F.J., Yang, L., Hellebrand, E., Gaidos, E. (2012) Heterogeneous distribution of Al-26 at the birth of the solar system: evidence from refractory grains and inclusions. Meteoritics and Planetary Science 47, 1948-1979.

46. Johnson, B. C., Lisse, C. M., Chen, C. H., Melosh, H. J., Wyatt, M. C., Thebault, P., Henning, W. G., Gaidos, E. J., Elkins-Tanton, L. T., Bridges, J. C., Morlok, A. (2012) A selfconsistent model of the circumstellar debris created by a giant hypervelocity impact in the HD172555 system. The Astrophysical Journal 761, 45-57. 62. Nittler, L., Gaidos, E. (2012) Galactic chemical evolution and the oxygen isotopic composition of the Solar System. Meteoritics & Planetary Science 47, 2031-2048.

47. Mann, A. W., Gaidos, E., Lepine, S., Hilton, E. (2012) They might be giants: luminosity class, planet occurrence, and planet-metallicity relation of the coolest Kepler target stars. The Astrophysical Journal 753, 90-103.

48. Marteinsson, V., Runarsson, A., Stefansson, A., Thorsteinsson, T., Johannesson, T., Magnusson, S., Reynisson, E., Einarsson, B., Wade, N., Morrison, H., Gaidos. E.* (2012) Microbial communities in the subglacial waters of the Vatnajokull ice cap, Iceland. The International Society for Microbial Ecology Journal 7, 427-437. Gaidos Peer-Reviewed Publications 2012-2017 p.5.

49. Gaidos, E., Fischer, D. A., Mann, A. W., Lepine, S. (2012) On the nature of small planets around the coolest Kepler stars. The Astrophysical Journal 746, 36-44.

J.E. Hammer

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1. Mollo, S. and Hammer, J.E., (2017) Dynamic Crystallization in Magmas, in: Mineral reaction kinetics: microstructures, textures, and chemical compositions, EMU Notes in Mineralogy, v. 16, Abart, R., and Heinrich, W., Eds. 373-418.
2. First. E., and Hammer, J. (2016) Igneous cooling history of olivine-phyric shergottite Yamato 980459 constrained by dynamic crystallization experiments. *Meteoritics. Planet. Sci.* 1-23, doi: 10.1111/maps.12659.
3. *Welsch, B.*, Hammer, J., Baronnet, A., Jacob, S., Hellebrand, E., and Sinton, J. (2016) Clinopyroxene in postshield Haleakala ankaramite: 2. Texture, compositional zoning and supersaturation in the magma. *Contrib. Mineral. Petrol.* 171:6, DOI 10.1007/s00410-015-1213-9
4. Hammer, J., Jacob, S., *Welsch, B.*, Hellebrand, E., and Sinton, J. (2016) Clinopyroxene in postshield Haleakala ankaramite: 1. Efficacy of thermobarometry. *Contrib. Mineral. Petrol.* 171:7, DOI 10.1007/s00410-015-1212-x.
5. Shea, T., Costa, F., Krimer, D., Hammer, JE. (2015) Accuracy of timescales retrieved from diffusion modeling in olivine: A 3D perspective. *Am. Mineral.* 100, 2026-2042.
6. Brachfeld, S., Shah, D., First, E., Hammer, JE, and Bowles, J. (2015) Influence of redox conditions on the intensity of Mars crustal magnetic anomalies. *Meteoritics and Planet. Sci.* 50, 1703-1717.
7. Brugger, CR, Hammer, JE. (2015) Prevalence of growth twins among anhedral plagioclase microlites. *Am. Mineral.* 100, 385-395.
8. Brachfeld, S, Cuomo, D, Tatsumi-Petrochilos, L, Bowles, J, Shah, D, and Hammer, J. (2014) Contribution of Multidomain Titanomagentite to the Intensity and Stability of Mars Crustal Magnetic Anomalies. *Geophys. Res. Lett.*, 41, 7997–8005, doi:10.1002/ 2014GL062032.
9. *Welsch, BT*, Hammer, JE and Hellebrand, E (2014) Phosphorus zoning reveals dendritic architecture of olivine. *Geology* doi: 10.1130/G35691.1
10. Shea, T, Hammer, J, First, E. (2013) Magma balloons or bombs? *Nature Geoscience*. 6, 802-803.
11. *Shea, T.* and Hammer, J.E. (2013) Kinetics of cooling- and decompression-induced crystallization in hydrous mafic-intermediate magmas. *J. Volcanol. Geotherm. Res.* http://dx.doi.org/10.1016/j.jvolgeores.2013.04.018
12. *Shea, T.* and Hammer, J.E. (2013) Oxidation in CSPV experiments involving H_2O-bearing mafic magmas: Quantification and mitigation. *Am. Mineral.* 98, 1285-1296.
13. *Bowles, J.A.*, Tatsumi-Petrochilos, L., Hammer, J.E., Brachfeld, S.A. (2012) Multi-component cubic oxide exsolution in synthetic basalts: Temperature dependence and implications for magnetic properties. *J. Geophysical Res.–Solid Earth.* doi:10.1029/2011JB008867
14. Stovall, WK, Houghton, BF, Hammer, JE, Fagents, SA, Swanson, DA (2012) Vesiculation of high fountaining Hawaiian eruptions: episodes 15 and 16 of 1959 Kilauea Iki. *Bull. Volcanol.* 74, 441-455.

Eric Hellebrand

1. Teehera K.B., Jungbluth S.P., Onac B.P., Acosta-Maeda T., Hellebrand E., Misra A., Plitsch A., Rappe M.S., Smith S.M., Telus M. and Schorghofer N. (2017) Cryogenic minerals in Hawaiian lava tubes: A geochemical and microbiological exploration. *Geomicrobiology Journal*. DOI: 10.1080/01490451.2017.1362079
2. Hammer J., Jacob S., Welsch B., Hellebrand E. and Sinton J. (2016) Clinopyroxene in postshield Haleakala ankaramite: 1. Efficacy of thermobarometry. *Contributions to Mineralogy and Petrology* 171, DOI:10.1007/s00410-015-1212-x
3. Welsch B., Hammer J., Jacob S., Hellebrand E. and Sinton J. (2016) Clinopyroxene in postshield Haleakala ankaramite: 2. Texture, compositional zoning and supersaturation in the magma. *Contributions to Mineralogy and Petrology* 171, DOI:10.1007/s00410-015-1213-9

4. Welsch B., Hammer J. & Hellebrand E. (2014) Phosphorus zoning reveals dendritic architecture of olivine. *Geology*, DOI: 10.1130/G35691.1

5. Lassiter J.C., Byerlee B.L., Snow J.E. & Hellebrand E. (2014) Constraints from Os-isotope variations on the origin of Lena Trough abyssal peridotites and implications for the composition and evolution of the depleted upper mantle. *Earth and Planetary Science Letters,* 403, 178-187.

6. Davidson J., Krot A.N., Nagashima K., Hellebrand E. & Lauretta D. (2014) Oxygen isotope and chemical compositions of magnetite and olivine in the anomalous CK3 Watson 002 andungrouped Asuka---881595 carbonaceous chondrites: Effects of parent body metamorphism.

   Meteoritics & Planetary Science, DOI: 10.1111/maps.12341.

7. De Hoog J.C.M., Lissenberg C.J., Brooker R.A., Hinton R., Trail D. & Hellebrand E. (2014) Hydrogen incorporation and charge balance in natural zircon. *Geochimica et Cosmochimica Acta,* DOI: 10.1016/j.gca.2014.06.033

8. Schrader D.L., Nagashima K., Krot A.N., Ogliore R.C. & Hellebrand E. (2014) Variations in the O-isotope composition of gas during the formation of chondrules from the CR chondrites. *Geochimica et Cosmochimica Acta,* DOI: 10.1016/j.gca.2014.01.034.

9. Laukert G., von der Handt A., Hellebrand E., Snow J.E. & Hoppe P. (2014) Abyssal pyroxenites from the ultraslow spreading Lena Trough – Reactive melt stagnation at high pressures. *Journal of Petrology*, 55, 427-458.

10. Shea T., Hellebrand E., Gurioli L. and Tuffen H. (2014) Conduit- to localized-scale degassing during Plinian eruptions:insights from major element and volatile (Cl and H2O) analysis within Vesuvius AD79 pumice. *Journal of Petrology*, 55, 315-344.

11. Zinin P., Burgess K., Prakapenka V. & Hellebrand E. (2014) Elastic characterization of platinum/rhodium alloy at high temperature by combined laser heating and laser ultrasonic techniques. *Ultrasonics,* 54, 963-966.

12. Jung S., Brandt S., Nebel O., Hellebrand E., Seth B. and Jung C (2013) The P-T-t paths of highgrade gneisses, Kaoko Belt, Namibia: Constraints from mineral data, U-Pb allanite and monazite and Sm-Nd/Lu-Hf garnet ages and garnet ionprobe data. *Gondwana Research*. . DOI: 10.1016/j.gr.2013.05.017

13. Odake S., Zinin P.V., Hellebrand E., Prakapenka V., Liu Y., Hong S., Burgess K. & Ming L.C. (2013) Formation of the high pressure graphite and BC8 phases in a cold compression experiment by Raman scattering. *Journal of Raman Spectroscopy*. DOI: 10.1002/jrs.4372

14. Makide K., Nagashima K., Krot A.N., Huss G.R., Hutcheon I.D., Hellebrand E. & Petaev M.I. (2013) Heterogeneous distribution of 26Al at the birth of the Solar System: Evidence from corundum-bearing refractory inclusions in carbonaceous chondrites. *Geochimica et Cosmochimica Acta*. DOI: 10.1016/j.gca.2013.01.028.

15. Krot A.N., Makide K., Nagashima K., Huss G.R., Ogliore R.C., Ciesla F.J., Yang L., Hellebrand E. & Gaidos E. (2012) Heterogeneous distribution of 26Al at the birth of the solar system: Evidence from refractory grains and inclusions. *Meteoritics & Planetary Science*, 47, 1948-1974, doi: 10.1111/maps.12008.

16. Rioux M., Lissenberg C.J. McLean N.M., Bowring S.A., MacLeod C.J., Hellebrand E. & Shimizu N. (2012) Protracted timescales of lower crustal growth at the fast-spreading East Pacific Rise. *Nature Geoscience*, doi: 10.1038/NGEO1378.

17. Schipper C.I., White J.D.L., Nichols A.R.L., Hellebrand E., Burgisser A. & Murtagh R. (2012) Incipient melt segregation as preserved in subaqueous pyroclasts. *Geology*, doi: 10.1130/G32582.1

18. Smyth J.R., Miyajima N., Huss G.R., Hellebrand E., Rubie D.C. & Frost D.J. (2012) Olivinewadsleyite- pyroxene topotaxy: Evidence for coherent nucleation and diffusion-controlled growth at the 410-km discontinuity. *Physics of the Earth and Planetary Interiors*, 200, 85-91.

19. Zinin P.V., Ming L.C., Ishii H.A., Jia R., Acosta T., & Hellebrand E. (2012): Phase transition in BCx system under high-pressure and high-temperature: Synthesis of cubic dense BC3 nanostructured phase. *Journal of Applied Physics* 111, DOI: 10.1063/1.4723275.

Bruce Houghton

1. Gudnason, J.; Thordarson, T.; Houghton, B.F.; Larsen, G. 2017. The 1845 Hekla eruption: Grain-size characteristics of a tephra layer. *Journal of Volcanology and Geothermal Research, 350*: 33–46. doi:10.1016/j.jvolgeores.2017.11.025
2. Gonnermann, H.M.; Giachetti, T.; Fliedner, C.; Nguyen, C.T.; Houghton, B.F.; Crozier, J. A.; Carey, R.J. 2017. Permeability during magma expansion and compaction. *Journal of Geophysical Research: 122*: 1–24. doi:10.1002/2017JB014783
3. Jones, T.J.; Llewellin, E.W.; Houghton, B.F.; Brown, R.J.; Vye-Brown, C. 2017. Proximal lava drainage controls on basaltic fissure eruption dynamics. *Bulletin of Volcanology, 79:* 81. doi:10.1007/s00445-017-1164-2
4. *Turner, N.*; Houghton, B.F.; Taddeucci, J.; von der Lieth, J.; Kueppers, U.; Gaudin, D.; Ricci, T.; Kim, K.; Scarlato, P. 2017. Drone peers into open volcanic vents, *Eos 98*. doi:10.1029/2017EO082751
5. *Isgett, S.J.*; Houghton, B.F.; Fagents, S.A.; *Biass, S.*; Burgisser, A.; Arbaret, L. 2017. Eruptive and shallow conduit dynamics during Vulcanian explosions: Insights from the Episode IV block field of the 1912 eruption of Novarupta, Alaska. *Bulletin of Volcanology, 79:* 58. doi:10.1007/s00445-017-1138-4
6. Houghton, B.F.; Swanson, D.A.; *Biass, S.*; Fagents, S.A.; Orr, T.R. 2017. Partitioning of pyroclasts between ballistic transport and a convective plume: Kīlauea volcano, 19 March 2008. *Journal of Geophysical Research, Solid Earth, 122:* 3379–3391. doi:10.1002/2017JB014040
7. *Gudnason, J.*; Thordarson, T.; Houghton, B.F.; Larsen, G. 2017. The opening subplinian phase of the Hekla 1991 eruption: Properties of the tephra fall deposit. *Bulletin of Volcanology, 79:* 34. doi:10.1007/s00445-017-1118-8
8. Gaudin, D.; J. Taddeucci, J.; Scarlato, P.; Del Bello, E.; Ricci, T.; Orr, T.R.; Houghton, B.F.; Harris, A.; Rao, A.; Bucco, A. 2017. Integrating puffing and explosions in a general scheme for Strombolian-style activity. *Journal of Geophysical Research, 122:*1860-1875. doi:10.1002/2016JB013707
9. Gaudin, D.; J. Taddeucci, J.; Houghton, B.F.; Orr, T. R.; Andronico, D.; Del Bello, E.; Kueppers, U.; Ricci, T.; Scarlato, P. 2016. 3-D high-speed imaging of volcanic bomb trajectory in basaltic explosive eruptions. *Geochemistry, Geophysics, Geosystems 17,* 4268-4275. doi:10.1002/2016GC006560
10. *Janebo, M.H.*; Houghton, B.F.; Thordarson, T.; Larsen, G. 2016. Shallow conduit processes during the AD 1158 explosive eruption of Hekla volcano, Iceland. *Bulletin of Volcanology, 78*: 74. doi:10.1007/s00445-016-1070-z
11. *Janebo, M.H.;* Thordarson, T.; Houghton, B.F.; Bonadonna, C.; Larsen, G.; Carey, R.J. 2016. Dispersal of key subplinian-Plinian tephras from Hekla volcano, Iceland: Implications for eruption source parameters. *Bulletin of Volcanology, 78:* 66. doi:10.1007/s00445-016-1059-7
12. Ferguson, D.J.; Gonnermann, H.M.; Ruprecht, P.; Plank, T.; Hauri, E.H.; Houghton, B.F.; Swanson, D.A. 2016. Magma decompression rates during explosive eruptions of Kīlauea volcano, Hawaii, recorded by melt embayments. *Bulletin of Volcanology, 78:*71. doi:10.1007/s00445-016-1064-x
13. Rae, A.S.P.; Edmonds, M.; Maclennan, J.; Morgan, D.; Houghton, B.F.; Hartley, M.E.; Sides, I. 2016. Timescales of magma transport and mixing at Kilauea Volcano, Hawaii. *Geology, 44*: 463-466. doi:10.1130/G37800.1
14. Houghton, B.F.; Taddeucci, J.; Andronico, D.; Gonnermann, H.M.; Pistolesi, M.; Patrick, M.R.; Orr, T.R.; Swanson, D.A.; Edmonds, M.; Gaudin, D.; Carey, R.J.; Scarlato, P. 2016. Stronger or longer: Discriminating between Hawaiian and Strombolian eruption styles. *Geology, 44*: 163-166. doi:10.1130/G37423.1
15. *Volentik, A.*; Houghton, B.F. 2015. Tephra fallout hazards at Quito International Airport (Ecuador). *Bulletin of Volcanology*, 77: 50. doi:10.1007/s00445-015-0923-1
16. Taddeucci, J.; Edmonds, M.; Houghton, B.F.; James, M.R.; Vergniolle, S. 2015. Hawaiian and Strombolian Eruptions. In: Sigurdsson, H.; Houghton, B.F.; McNutt, S.; Rhymer, H.; Stix, J. (eds) *Encyclopaedia of Volcanoes,* 485-504 pp. Academic Press, San Diego.

17. Edmonds, M.; Sides, I.; Maclennan, J.; Houghton, B.F.; Swanson, D.A. 2015. Insights into mixing, fractionation and degassing of primitive melts at Kīlauea Volcano, Hawai`i. In: *Hawaiian volcanoes, from source to surface*. Eds: Carey, R.; Cayol, V.; Poland, M.; Weis, D. In: Hawaiian Volcanoes, From Source to Surface. *AGU Monograph Series*.

18. Houghton, B.F.; White, J.D.L.; Van Eaton, A.M. Phreatomagmatic and related eruption styles. 2015. In: Sigurdsson, H.; Houghton, B.F.; McNutt, S.; Rhymer, H.; Stix, J. (eds) *Encyclopaedia of Volcanoes,* 537-552 pp. Academic Press, San Diego.

19. Gregg, C. E.; Houghton, B, F.; Ewert, J. W. 2015. Volcanic warning systems. In: Sigurdsson, H.; Houghton, B.F.; McNutt, S.; Rhymer, H.; Stix, J. (eds) *Encyclopaedia of Volcanoes,* 1173-1186 pp. Academic Press, San Diego.

20. Houghton, B.F.; Carey, R.J. 2015. Pyroclastic fall deposits. In: Sigurdsson, H.; Houghton, B.F.; McNutt, S.; Rhymer, H.; Stix, J. (eds) *Encyclopaedia of Volcanoes,* 599-616 pp. Academic Press, San Diego.

21. Barclay, J., Haynes, K., Houghton, B.F.; Johnston, D.M. 2015. Social pathways to reduce volcanic risk. In: Sigurdsson, H.; Houghton, B.F.; McNutt, S.; Rhymer, H.; Stix, J. (eds) *Encyclopaedia of Volcanoes,* 1202-1214 pp. Academic Press, San Diego.

22. Carey, R.J.; Swanson, D.A.; Houghton, B.F.; Orr, T.R.; Sutton, A.J. 2015. Onset of a basaltic explosive eruption from Kīlauea's summit in 2008. In: *Hawaiian volcanoes, from source to surface*. Eds: Carey, R.; Cayol, V.; Poland, M.; Weis, D. In: Hawaiian Volcanoes, From Source to Surface. *AGU Monograph Series* 421-438 pp.

23. May, M.D.; Carey, R.J.; Swanson, D.A.; Houghton, B.F. 2015. Reticulite-producing fountains from ring fractures in Kīlauea Caldera ca. 1500 CE. In: *Hawaiian volcanoes, from source to surface*. Eds: Carey, R.; Cayol, V.; Poland, M.; Weis, D. In: Hawaiian Volcanoes, From Source to Surface. *AGU Monograph Series* 351-368 pp.

24. *Parcheta, C.E.*; Fagents, S.A.; Swanson, D.A.; Houghton, B.F.; Ericksen, T. 2015. Hawaiian fissure fountains: Quantifying vent and shallow conduit geometry, Episode 1 of the 1969–1974 Mauna Ulu eruption. In: *Hawaiian volcanoes, from source to surface*. Eds: Carey, R.; Cayol, V.; Poland, M.; Weis, D. In: Hawaiian Volcanoes, From Source to Surface. *AGU Monograph Series* 369-392 pp.

25. *Eychenne, J.*; Houghton, B.F.; Swanson, D.A.; Carey, R.J.; Swavely, L. 2015. Dynamics of an open basaltic magma system: the 2008 activity of the Halema'uma'u Overlook vent, Kīlauea Caldera. *Earth & Planetary Science Letters, 409*: 49-60. doi:10.1016/j.epsl.2014.10.045

26. Rotella, M.D.; Wilson, C.J.N.; Barker, S.J.; Cashman, K.V.; Houghton, B.F.; Wright, I.C. 2014. Bubble development in explosive silicic eruptions: insights from pyroclast vesicularity textures from Raoul volcano (Kermadec arc). *Bulletin of Volcanology*, *76*: 826-850. doi:10.1007/s00445-014-0826-6

27. Swanson, D.A.; Weaver, S.J.; Houghton, B.F. 2014. Reconstructing the deadly eruptive events of CE at Kīlauea Volcano, Hawai'i. *Geological Society of America Bulletin, 127;* 503-515, April 2014. doi:10.1130/B31116.1

28. Nguyen, C.T.; Gonnermann, H.M.; Houghton, B.F. 2014. Explosive to effusive transition during the largest volcanic eruption of the 20th century (Novarupta 1912, Alaska). *Geology, 42:* 703-706. doi:10.1130/G35593.1

29. *Klawonn, M.*; Houghton, B.F.; Swanson, D.A.; Fagents, S.A.; Wessel, P.; Wolfe, C.J. 2014. From field data to volumes: Constraining uncertainties in pyroclastic eruption parameters. *Bulletin of Volcanology, 76*: 839. doi:10.1007/s00445-014-0839-1

30. Sides, I.R.; Edmonds, M.; Maclennan, J.; Houghton, B.F.; Swanson, D.A.; Steele-MacInnis, M.J. 2014. Magma mixing and high fountaining during the 1959 Kīlauea Iki eruption, Hawai`i. *Earth & Planetary Science Letters, 400*: 102-112. doi:10.1016/j.epsl.2014.05.024

31. *Klawonn, M.*; Frazer, L.N.; Wolfe, C.J.; Houghton, B.F., Rosenberg, M.D. 2014. Constraining particle size-dependent plume sedimentation from the 17 June 1996 eruption of Ruapehu volcano, New Zealand, using geophysical inversions. *Journal of Geophysical Research. 119:*1749-1763. doi:10.1002/2013JB010387

32. Sides, I.R.; Edmonds, M.; Maclennan, J.; Swanson, D.A.; Houghton, B.F. 2014. Eruption style at Kīlauea Volcano in Hawaii linked to primary melt composition. *Nature Geoscience, 7*: 464-469. doi:10.1038/NGEO2140

33. Houghton, B.F.; Carey, R.J.; Rosenberg, M.D. 2014. The 1800a Taupo eruption: 'Ill wind' blows the ultraplinian type event down to Plinian. *Geology, 42*: 459-461. doi:10.1130/G35400.1

34. *Klawonn, M.*; Houghton, B.F.; Swanson, D.A.; Fagents, S.A.; Wessel, P.; Wolfe, C.J. 2014. Constraining explosive volcanism: Subjective choices during estimates of eruption magnitude. *Bulletin of Volcanology, 76*: 793-798. doi:10.1007/s00445-013-0793-3

35. James, M.R.; Lane, S.J.; Houghton, B.F. 2013. Unsteady explosive eruptions: Strombolian activity. In Fagents, S.A.; Gregg, T.K.P.; Lopes, R.M.C. (eds) Modeling Volcanic Processes: The Physics and Mathematics of Volcanism. Cambridge University Press. Cambridge. 431 pp.

36. Lautze, N.; Taddeucci, J.; Andronico, D.; Houghton, B.F.; Niemeijer, D.; Scarlato, P. 2013. Insights into explosion dynamics and the production of ash at Stromboli from samples collected in real-time, October 2009. *Geological Society of America Special Paper, 498:* 125-139. doi:10.1130/2013.2498(08)

37. *Parcheta, C.E.;* Houghton, B.F.; Swanson, D.A. 2013. Contrasting patterns of vesiculation in low, intermediate and high Hawaiian fountains: A case study of the 1969 Mauna Ulu eruption. *Journal of Volcanology and Geothermal Research, 255*: 79-89. doi:10.1016/j.jvolgeores.2013.01.016

38. Houghton, B.F.; Swanson, D.A.; Rauch, J.; Carey, R.J.; Fagents, S.A.; Orr, T.R. 2013. Pushing the Volcano Explosivity Index to its limit and beyond: Constraints from exceptionally weak explosive eruptions at Kīlauea in 2008. *Geology, 41*: 627-630. doi:10.1130/G34146.1

39. Carey, R.J.; Manga, M.; Degruyter, W.; Gonnermann, H.; Swanson, D.; Houghton, B.F.; Orr, T.; Patrick, M. 2013. Convection in a volcanic conduit recorded by bubbles. *Geology, 41:* 395-398. doi:10.1130/G33805.1

40. *Moitra, P.*; Gonnermann, H.M.; Houghton, B.F.; Giachetti, T. 2013. Relating vesicle shape in pyroclasts to eruption styles. *Bulletin of Volcanology, 75:* 691-70. doi:10.1007/s00445-013-0691-8

41. Leonard, G.; Houghton, B.F. 2013. New Zealand's volcanoes: changing risk & constant hazard. *Natural Hazards in New Zealand*, Eds H.J. Campbell, G. Hicks, Te Papa Museum of New Zealand, Wellington.

42. *Cannata, C.B.;* De Rosa, R.; Houghton, B.F.; Donato, P.; Nudo, A. 2012. Pele's Hair: Case Studies from Kilauea Volcano and Vulcanello (Aeolian islands). *Acta Vulcanologica*, *24*: 27-34.

43. Carey, R.J.; Manga, M.; Swanson, D.; Houghton, B.F.; Orr, T.; Patrick, M. 2012. Externally triggered renewed bubble nucleation in basaltic magma: The October 12 2008 eruption at Halema'uma'u Overlook vent, Kīlauea, Hawai'i, USA. *Journal of Geophysical Research, 117*: 2156-2202. doi:10.1029/2012JB009496

44. Shea, T.; Gurioli, L.; Houghton, B.F. 2012. Transitions between fall phases and pyroclastic density currents during the AD 79 eruption at Vesuvius: building a transient conduit model from the textural and volatile record. *Bulletin of Volcanology, 74:* 2363-2381. doi:10.1007/s00445-012-0668-z

45. Gonnermann, H.M.; Houghton, B.F. 2012. Magma degassing during the Plinian eruption of Novarupta, Alaska, 1912. *Geochemistry, Geophysics, Geosystems, 13*, doi:10.1029/2012GC004273

46. *Klawonn, M.*; Wolfe, C.J.; Frazer, N.; Houghton, B.F. 2012. Novel inversion approach to constrain plume sedimentation from tephra deposit data: Application to the 17 June 1996 eruption of Ruapehu volcano, New Zealand. *Journal of Geophysical Research, 117:* B05205. doi:10.1029/2011JB008767

47. *Parcheta, C.E.;* Houghton, B. F.; Swanson D.A. 2012. Hawaiian Fissure Fountains 1: Decoding Deposits - Episode 1 of the 1969-1974 Mauna Ulu Eruption. *Bulletin of Volcanology, 74*: 1729-1743. doi:10.1007/s00445-012-0621-1

48. *Rottas, K.M.;* Houghton, B.F. 2012. Structure, stratigraphy, and eruption dynamics of a young tuff ring: Hanauma Bay, Oahu, Hawai'i. *Bulletin of Volcanology, 74*: 1683-1697. doi:10.1007/s00445-012-0624-y

49. Lautze, N.; Taddeucci, J.; Andronico, D.; Cannata, C.; Tornetta, L.; Scarlato, P.; Houghton, B.F. 2012. SEM-based methods for the analysis of basaltic ash from weak explosive activity at Etna in 2006 and the 2007 eruptive crisis at Stromboli. *Physics and Chemistry of the Earth, 46*: 113-127. doi:10.1016/j.pce.2011.02.001

Garrett Ito

1. Bruno, B. C., J. Engels, G. Ito, J. Gillis-Davis, H. Dulai, G. Carter, C. Fletcher, D. Botjer-Wilson (2017) Two-stage exams: a powerful tool for reducing the achievement gap in undergraduate oceanography and geology classes, *Oceanography*, 30(2), https://doi.org/10.5670/oceanog.2017.241.
2. Lautze, N., D. Thomas, N. Hinz, D. Waller, N. Frazer, G. Ito (2017), Play fairway analysis of geothermal resources across the state of Hawaii: 3. Use of development viability criterion to prioritize future exploration targets, *Geothermics*, https://doi.org/10.1016/j.geothermics.2017.07.005. (PDF)
3. Lautze, N., D. Thomas, N. Hinz, G. Ito, N. Frazer, D. Waller (2017), Play fairway analysis of geothermal resources across the state of Hawaii: 1. Geological, geophysical, and geochemical datasets, *Geothermics*, https://doi.org/10.1016/j.geothermics.2017.02.001. (PDF)
4. Ito, G., N. Frazer, N. Lautze, D. Thomas, N. Hinz, D. Waller, R. Whittier, E. Wallin (2017), Play fairway analysis of geothermal resources across the state of Hawaii: 2. Resource probability mapping, *Geothermics*, 70, 393-405, doi:10.1016/j.geothermics.2016.11.004 (PDF).
5. Ballmer, M. D., L. Schumacher, V. Lekic, C. Thomas, G. Ito (2016), Compositional layering within the large low shear-wave velocity provinces in the lower mantle, *Geochem. Geophys. Geosys.*, doi: 10.1002/2016GC006605 (URL)
6. *Howell, S. M., G. Ito, M. D. Behn, F. Martinez, J.-A. Olive, J. Escartín (2016), Magmatic and tectonic extension at the Chile Ridge: Evidence for mantle controls on ridge segmentation, *Geochem. Geophys. Geosys.*, *17*, doi: 10.1002/2016GC006380 (PDF, URL)
7. Olive, J.-A., M. D. Behn, E. Mittelstaedt, G. Ito, B. Z. Klein (2016) The role of elasticity in simulating long-term tectonic extension, *Geophys. J. Int.,* 205, 728-743 (PDF).
8. Olive, J.-A., M. D. Behn, G. Ito, W. R. Buck, J. Escartín (2016) Response to Comment on "Sensitivity of seafloor bathymetry to climate-driven fluctuations in mid-ocean ridge magma supply", *Science, 352* (6292), 1405, doi:10.1126/science.aaf2021. (URL and URL to comment by Huybers et al. 2016).
9. Olive, J.-A., Behn, M.D., Ito, G., Buck, W.R., Escartin, J., and S. Howell (2015), Sensitivity of seafloor bathymetry to climate-driven fluctuations in mid-ocean ridge magma supply, *Science*, 350(6258). (Link to reprint). Media coverage: Science, LDEO / Columbia University, and Ars Technica.
10. Garcia, M. O., D. Weis, L. Swinnard, G. Ito, A. Pietruszka (2015) Petrology and Geochemistry of Volcanic Rocks from the South Kaua`i Swell Volcano, Hawai`i: Implications for the Lithology and Composition of the Hawaiian Mantle Plume, J. Petrol. 56, 6, 1173-1197, doi: 10.1093/petrology/egv033 (PDF, URL).
11. Kelly, C., J. R. Smith, J. Miller, J. Tree, B. Boston, M. Garcia, G. Ito, J. Taylor, F. Lichowski, D. Wagner, J. Leonard, B. Dechnik, D. Leurs (2015), New insights from Seafloor mapping of Hawaiian Marine Monument, *Eos, 96,* doi:10.1029/2015EO030235, 28 May 2015, (PDF, URL).
12. †Ballmer, M. D., P. E. van Keken, G. Ito (2015), Hotspots, Large Igneous Provinces, and Melting Anomalies, in: Treatise of Geophysics, 2nd edition, (editor G. Schubert), volume 7 "Mantle Dynamics", (editor D. Bercovici), 393-459, Elsevier, Amsterdam.
13. G. Ito, R. Dunn, A. Li (2015), The origin of shear-wave splitting beneath Iceland, *Geophys. J. Int*, *201*, 1297-1312, doi:10.1093/gji/gvv078. (PDF and URL)
14. †Ballmer, M. D., G. Ito, C. Cheng (2015), Asymmetric dynamical behavior of thermochemical plumes and implications for Hawaiian lava composition, in *Hawaiian volcanoes: From Source to Surface*, eds. R. Carey, V. Cayol, M. Poland, D. Weis, Chapter 3, *Geophys. Monogr 208*, Amer. Geophys. Union, John Wiley & Sons, Inc, Washington D.C., 10.1002/9781118872079.ch3, (PDF of preprint, URL)

15. Ito, G., and T. Bianco (2014), Patterns in Galápagos magmatism arising from the upper mantle dynamics of plume-ridge interaction, in *The Galápagos as a Laboratory for the Earth Sciences*, edited by K. S. Harpp, et al., Chapter 13, Geophys. Monogr., 204, Amer. Geophys. Union, Washington D. C., 245-261. (PDF)

16. Canales, J. P., R. A. Dunn, G. Ito, R. S. Detrick, V. Sallarès (in press) Effect of variation sin magma supply on the cristal structure of mid-ocean ridges, insights from the Western Galápagos Spreading Center, in *The Galápagos as a Laboratory for the Earth Sciences*, edited by K. S. Harpp, et al., Chapter 17, Geophys. Monogr., 204, Amer. Geophys. Union, Washington D. C. (PDF)

17. Ito, G., R. Dunn, A. Li, C. J. Wolfe, A. Gallego, Y. Fu (2014), Seismic anisotropy and shear wave splitting associated with mantle plume-plate interaction, *J. Geophy. Res.*, 119, doi:10.1002/2013JB010735 (PDF, URL)

18. Martel, S. J., G. M. Stock, G. Ito (2014), Mechanics of relative and absolute displacements across normal faults, and implications for uplift and subsidence along the eastern escarpment of the Sierra Nevada, California, Origin and Evolution of the Sierra Nevada and Walker Lane Theme Issue, Geosphere, 10(2), 243-263, doi:10.1130/GES00968.1. (URL)

19. *Howell, S. M., G. Ito, A. J. Breivik, A. Rai, R. Mjelde, B. Hanan, K. Sayit, and P. Vogt (2014), The origin of the asymmetry in the Iceland hotspot along the Mid-Atlantic Ridge from continental breakup to present-day, *Earth Planet. Sci. Lett.*, *392*, 143-153 (PDF).

20. †Gallego, A., G. Ito, R. A. Dunn (2013) Investigating seismic anisotropy beneath the Reykjanes Ridge using models of mantle flow, crystallographic evolution, and surface wave propagation, *Geochem. Geophys. Geosys.*, doi:10.10002/ggge.20204. (PDF, URL) (Supplement)

21. †Ballmer, M. D., G. Ito, C. J. Wolfe, S. C. Solomon (2013), Double layering of a thermochemical plume in the upper mantle beneath Hawaii, *Earth Planet. Sci. Lett., 376*, 155-164 (PDF, URL).

22. Ito, G., M. O. Garcia, J. R. Smith, B. Taylor, A. Flinders, B. Jicha, S. Yamasaki, D. Weis, L. Swinnard, C. Blay (2013), A low-relief shield volcano origin for the South Kaua'i Swell, *Geochem. Geophys. Geosys.,* doi: 10.1002/ggge.20159 (PDF, URL) (Supplement)

23. Flinders, A. F., G. Ito, M. O. Garcia, J. M. Sinton, J. Kauahikaua, B. Taylor (2013), Intrusive dike complexes, cumulate cores, and the extrusive growth of Hawaiian volcanoes, 40 (13), 3367-3373, doi:10.1002/grl.50633. (PDF, URL)

24. *Bianco, T. A., G. Ito, J. van Hunen, J. J. Mahoney, M. D. Ballmer (2013) Geochemical variations at ridge-centered hotspots caused by variable melting of a veined mantle plume, *Earth Planet. Sci. Lett.*, 371-372, 171-201 (URL)

25. Garcia, M. O., D. Hanano, A. Flinders, D. Weis, G. Ito, M. D. Kurz (2012) Age, geology, geophysics, and geochemistry of Mahukona Volcano, Hawai`i, Bull. Volcanol. doi:10.1007/s00445-012-0602-4 (PDF)

26. Fu, Y. V., A. Li, G. Ito, S.-H. Hung (2012) Waveform modeling of shear wave splitting from anisotropic models of Iceland, *Geochem. Geophys. Geosys.*, 12, 6, Q12001, doi:10.1029/2012GC004369 (PDF)

Kevin Johnson

1. Janin, M., C. Hémond, M. Maia, P. Nonnotte, E. Ponzevera, K. T. M. Johnson,The Amsterdam-St. Paul Plateau: a Complex Hotspot/DUPAL-Flavored MORB Interaction, *Geochem. Geophys. Geosyst., 13,* doi:10.1029/2012GC004165, 2012

2. Maia, M, I Pessanha, E Courrèges, M Patriat, P Gente, C Hémond, M Janin, KTM Johnson, W Roest, J-Y Royer, and J Vatteville, Building of the Amsterdam-Saint Paul plateau: A 10 Myr history of a ridge-hot spot interaction and variations in the strength of the hot spot source, *J. Geophys. Res., 116,* B09104, doi:10.1029/2010JB007768, 2012

Jasper Konter

Note names in *italics** are Konter's students

1. *Finlayson*,* V.A., Konter, J.G., Ma, L., 2015. The importance of a Ni correction with ion counter in the double spike analysis of Fe isotope compositions using a 57Fe/ 58Fe double spike. Geochem. Geophys. Geosyst. doi:10.1002/2015GC006012
2. Hu, Y., Harrington, M.D., Sun, Y., Yang, Z., Konter, J., Teng, F.-Z., 2016. Magnesium isotopic homogeneity of San Carlos olivine: a potential standard for Mg isotopic analysis by multi-collector inductively coupled plasma mass spectrometry. Rapid Commun. Mass Spectrom. 30, 2123–2132. doi:10.1002/rcm.7700
3. Jackson, M.G., Hart, S.R., Konter, J.G., Kurz, M.D., Blusztajn, J., Farley, K.A., 2014. Helium and lead isotopes reveal the geochemical geometry of the Samoan plume. Nature 514, 355–358. doi:10.1038/nature13794
4. Jackson, M.G., Koga, K.T., Price, A., Konter, J.G., Koppers, A.A.P., *Finlayson** V.A., Konrad, K., Hauri, E.H., Kylander-Clark, A., Kelley, K.A., Kendrick, M.A., 2015. Deeply dredged submarine HIMU glasses from the Tuvalu Islands, Polynesia: Implications for volatile budgets of recycled oceanic crust. Geochem. Geophys. Geosyst. doi:10.1002/2015GC005966
5. Jackson, M.G., Konter, J.G., Becker, T.W., 2017. Primordial helium entrained by the hottest mantle plumes. Nature 542, 340–343. doi:10.1038/nature21023
6. Kelley, C., Konter, J.G., Kennedy, B.R.C., 2017. New Frontiers in Ocean Exploration: The E/V Nautilus, NOAA Ship Okeanos Explorer, and R/V Falkor 2016 Field Season. Bell, K., Flanders, J., Bowman, A., Raineault, N., editors. Oceanography. doi:10.5670/oceanog.2017.supplement.01
7. Konter, J.G., Becker, T.W., 2012. Shallow lithospheric contribution to mantle plumes revealed by integrating seismic and geochemical data. Geochem. Geophys. Geosyst 13, n/a–n/a. doi:10.1029/2011GC003923
8. Konter, J.G., Jackson, M.G., 2012. Large volumes of rejuvenated volcanism in Samoa: Evidence supporting a tectonic influence on late-stage volcanism. Geochem. Geophys. Geosyst 13, 1–23. doi:10.1029/2011GC003974
9. Konter, J.G., Pietruszka, A.J., Hanan, B.B., Finlayson, V.A., Craddock, P.R., Jackson, M.G., Dauphas, N., 2016. Unusual δ56Fe values in Samoan rejuvenated lavas generated in the mantle. Earth Planet. Sci. Lett. 450, 221–232. doi:10.1016/j.epsl.2016.06.029
10. Konter, J.G., *Storm**, L.P., 2014. High precision 87Sr/86Sr measurements by MC-ICPMS, simultaneously solving for Kr interferences and mass-based fractionation. Chem. Geol. 385, 26–34. doi:10.1016/j.chemgeo.2014.07.009
11. Ma, L., Konter, J., Herndon, E., Jin, L., Steinhoefel, G., Sanchez, D., Brantley, S., 2014. Quantifying an early signature of the industrial revolution from lead concentrations and isotopes in soils of Pennsylvania, USA. Anthropocene 7, 16–29. doi:10.1016/j.ancene.2014.12.003
12. Price, A.A., Jackson, M.G., Blichert-Toft, J., Blusztajn, J., Conatser, C.S., Konter, J.G., Koppers, A.A.P., Kurz, M.D., 2016. Geochemical evidence in the northeast Lau Basin for subduction of the Cook-Austral volcanic chain in the Tonga Trench. Geochem. Geophys. Geosyst 17, 1694–1724. doi:10.1002/2015GC006237

Steve Martel

1. Moon, S., Perron, J.T., Martel, S., Holbrook, W.S., and St. Clair, J, 2017, A model of three-dimensional topographic stresses with implications for bedrock fractures, surface processes and landscape evolution: Journal of Geophysical Research, doi: 10.1002/2016JF004155
2. Martel, S.J., 2017. Progress in understanding sheeting joints over the past two centuries. Journal of Structural Geology, v. 94, p. 68-86, http://dx.doi.org/10.1016/j.jsg.2016.11.003
3. Martel, S.J., 2016. Effects of small-amplitude periodic topography on combined stresses due to gravity and tectonics. International Journal of Rock Mechanics and Mining Sciences, v. 89, p. 1-13. doi:10.1016/j.ijrmms.2016.07.026
4. St. Clair, J., Moon, S., Holbrook, W.S., Perron, J.T., Riebe, C.S., Martel, S., Carr, B., Harman, C., Singha, K., and Richter, D.deB., 2015, Geophysical imaging reveals topographic stress control of bedrock weathering: Science, v. 350, p. 534-538.

5. Tabrizi, A.M., Pan, E., Martel, S.J., Xia, K., Griffith, W.A., and Sangghaleh, A., 2014, Stress fields induced by a non-uniform displacement discontinuity in an elastic half plane: Engineering Fracture Mechanics, v. 132, p. 177-188.

6. Slim, M., Perron, J., Martel, S.J., and Singha, K., 2014, Topographic stress and rock fracture: A two dimensional numerical model for arbitrary topography and preliminary comparison with borehole observations: Earth Surface Processes and Landforms, doi: 10.1002/esp.3646.

7. Martel, S.J., Stock, G.M., and Ito, G., 2014, Mechanics of relative and absolute displacements across normal faults, and implications for uplift and subsidence along the eastern escarpment of the Sierra Nevada, California: Geosphere, v. 10, p. 243-263, doi: 10.1130/GES00968.1.

8. Goodfellow, B.W., Skelton, A., Martel, S.J., Stroeven, A.P., Jansson, K.N., and Hättestrand, C., 2014, Controls of tor formation, Cairngorm Mountains, Scotland: Journal of Geophysical Research, v. 119, doi:10.1002/2013JF002862.

9. Stock, G.M., Martel, S.J., Collins, B.D., and Harp, E.L., 2012, Progressive failure of sheeted rock slopes: The 2009-2010 Rhombus Wall rock falls in Yosemite Valley, California, USA: Earth Surface Processes and Landforms (Rock Slope Erosion Special Edition), v. 37, p. 546-561, doi:Â 10.1002/esp.3192.

Gregory F. Moore

* = student first author

1. Yamashita, M., Miura, S., Moore, G.F., Nakanish,i A., Kodaira., S, Kaneda., Y., 2017, Bathymetric imaging of protothrust zone along the Nankai Trough: *Island Arc*, e12233, doi:10.1111/iar.12233.

2. *Taladay, K., Boston, Moore, G.F., 2017, Gas-in-place estimate for potential gas hydrate concentrated zone in the Kumano Basin, Nankai Trough forearc, Japan: *Energies*, v. 10, #1552, doi:10.3390/en10101552.

3. *Boston, B., Moore, G.F., Nakamura, Y., and Kodaira, S., 2017, Forearc Slope Deformation above the Japan Trench Megathrust: Implications for Subduction Erosion: *Earth Planet. Sci. Lett.*, v. 462, p. 26-34.

4. Laberg, J.S., Strasser, M., Alves, T.M., Gao, S., Kawamura, K., Kopf, A., and Moore, G.F., 2016, Internal deformation of a muddy gravity flow and its interaction with the seafloor (Site C0018 of IODP Expedition 333, Nankai Trough, SE Japan): *Landslides*, v. 14, p. 849-860, doi: 10.1007/s10346-016-0766-7.

5. *Boston, B., Moore, G.F., Jurado, M.J., and Sone, H., 2016, Deformation of the Nankai Trough inner accretionary prism: The role of inherited structures: *Geochem. Geophys. Geosyst.,* v. 17, p. 485-500, doi: 10.1002/2015GC006185.

6. Moore, G.F. and Strasser, M., 2015, Large mass transport deposits in Kumano Basin, Nankai Trough, Japan: Submarine Mass Movements and Their Consequences, G. Lamarche et al., eds., Springer, New York, p. 371-379.

7. Moore, G.F., Boston, B.B., Strasser, M., Underwood, M.B., and Ratliff, R.A., 2015, Evolution of tectono-sedimentary systems in the Kumano Basin, Nankai Trough forearc: Mar. Petrol. Geology, v. 67, p. 604-616.

8. Van Tuyl, J., Alves, T. M., and Moore G. F., 2015, Strain decoupling reveals variable seismogenic risk in SE Japan (Nankai Trough): *Geochem. Geophys. Geosyst.*, 16, 2025–2037, doi:10.1002/2015GC005778.

9. Hino, R., Tsuji, T., Bangs, N., Sanada, Y., Park, J-O, von Huene, R., Moore, G.F., Araki, E. and Kinoshita, M., 2015, Qp structure of the accretionary wedge in the Kumano Basin, Nankai Trough, Japan, revealed by long-offset walk-away VSP: Earth Planets Space, v. 67, doi:10.1186/s40623-014-0175-x.

10. *Boston, B., Moore, G.F., Nakamura, Y., and Kodaira, S., 2014, Outer-rise normal fault development and influence on near-trench décollement propagation along the Japan Trench, off Tohoku: Earth, Planets, Space, v. 66, # 135, p. 1-17, doi:10.1186/1880-5981-66-135.

11. Alves, T.M., Strasser, M., and Moore, G.F., 2014, Erosional features as indicators of thrust fault activity (Nankai Trough, Japan): Marine Geology, v. 356, p.5-18, doi:10.1016/j.margeo.2013.07.011.

12. Moore, G.F., Kanagawa, K., Strasser, M., Dugan, B., Maeda, L., Toczko, S., and IODP Exp 338 Sci. Party, 2014, IODP Expedition 338: NanTroSEIZE State 3: NanTroSEIZE plate boundary deep riser 2: Sci. Dill., v. 17, p. 1-12, doi: 10.5194/sd-17-1-2014.

13. Bale, S., Alves, T.M., and Moore, G.F., 2014, Distribution of gas hydrates on continental margins by means of a mathematical envelope: A method applied to the interpretation of 3D seismic data: *Geochem. Geophys. Geosyst.,* v. 15, p. 52-68, doi:10.1002/2013GC004938.

14. Alves, T.M., Kurtev, K., Moore, G., and Strasser, M., 2014, Assessing the internal character, reservoir potential and seal competence of Mass-Transport Deposits using seismic texture: a geophysical and petrophysical approach: AAPG Bull., v.98, p. 793-824.

15. Pickering, K.T., Underwood, M.B., Saito, S., Naruse, H., Kutterolf, S., Scudder, R., Park, J-O., Moore, G.F., and Slagle, A., 2013, Depositional architecture, provenance, and tectonic/eustatic modulation of Miocene submarine fans in the Shikoku Basin: Results from NanTroSEIZE: *Geochem. Geophys. Geosyst.,* v. 14, doi:10.1002/ggge.20107.

16. Moore, G.F., Boston, B.B., Sacks, A.F. and Saffer, D.M., 2013, Analysis of normal fault populations in the Kumano forearc basin, Nankai Trough, Japan: 1. Multiple orientations and generations of Faults from 3-D coherency mapping: *Geochem. Geophys. Geosyst.,* v. 14, doi:10.1002/ggge.20119

17. Underwood, M.B., and Moore, G.F., 2012, Evolution of sedimentary environments in the subduction zone of southwest Japan: recent results from the NantroSEIZE Kumano transect: in: Busby, C. and Perez, A. (eds.), *Tectonics of Sedimentary - Basins Recent Advances*: Wiley-Blackwell, p.310-326.

18. Strasser, M., Henry, P., Kanamatsu, T., Thu, M.K., Moore, G.F., and IODP Exp. 333 scientists, 2012, Scientific drilling of mass-transport deposits in the Nankai accretionary wedge: First results from IODP Exp. 333: *in* Y. Yamada et al. (eds.), *Submarine Mass Movements and Their Consequences*, Advances in Natural and Technological Hazards, v. 31, Springer Book Series, p. 671-681.

Brian Popp

1. Tolar B.B., Wallsgrove N.J. Popp B.N., and Hollibaugh J.T. (2017) Oxidation of urea-derived nitrogen by thaumarchaeota-dominated marine nitrifying communities. *Environmental Microbiology* 19:4838-4850 doi: 10.1111/1462-2920.13457.

2. Gerringer M.E., Andrews A.H., Huss G.R., Nagashima K., Popp B.N., Gallo N.D., Clark M.R. Linley T.D., Jamieson A.J., and Drazen J.C. (2017) Life history of abyssal and hadal fishes from otolith growth zones and oxygen isotopic compositions. *Deep-Sea Research Part I* 132:37-50 https://doi.org/10.1016/j.dsr.2017.12.002.

3. Fehren-Schmitz L., Jarman C.L., Harkins K.M., Kayser M., Popp B.N. and Skoglund P. (2017) Genetic ancestry of Rapanui before and after European contact. *Current Biology* 27:1-7 http://dx.doi.org/10.1016/j.cub.2017.09.029.

4. Peavey L.E., Popp B.N., Pitman R.L., Gaines S.D., Arthur K.E., Kelez S., and Seminoff J.A. (2017) Opportunism on the high seas: foraging ecology of olive ridley turtles in the eastern Pacific Ocean. *Frontiers in Marine Science* 4:348 doi: 10.3389/fmars.2017.00348.

5. Ohkouchi N., Chikaraishi Y., Close H., Fry B., Larsen T., Madigan D.J., McCarthy M.D., McMahon K.W., Nagata T., Naito Y.I., Ogawa N.O., Popp B.N., Steffan S., Takano Y., Tayasu I., Wyatt A.S.J., Yamaguchi Y.T. and Yokoyama Y. (2017) Advances in the application of amino acid nitrogen isotopic analysis in ecological and biogeochemical studies. *Organic Geochemistry* 113:150-174. http://dx.doi.org/10.1016/j.orggeochem.2017.07.009.

6. Richardson C.M, Dulai H., Popp B.N., Ruttenberg K. and Fackrell J.K. (2017) Submarine groundwater discharge drives biogeochemistry in two Hawaiian reefs. *Limnology and Oceanography* 62:S348-S363, doi: 10.1002/lno.10654.

7. Rowe J.A., Litton C.M., Lepczyk C.A., and Popp B.N. (2017) Impacts of endangered seabirds on nutrient cycling in montane forest ecosystems of Hawaii. *Pacific Science* 71:495-509, doi:10.2984/71.4.7.

8. Wongkiew S., Popp B.N., Kim H-J. and Khanal S.K. (2017) Fate of nitrogen in floating-raft aquaponic systems using natural abundance nitrogen isotopic compositions. *International Journal of Biodeterioration and Biodegradation* 125:24-32, https://doi.org/10.1016/j.ibiod.2017.08.006.

9. Jarman C.L., Larsen T., Hunt T., Lipo C., Solsvik R., Wallsgrove N.J., Ka'apu-Lyons C., Close H.G. and Popp B.N. (2017) Diet of the prehistoric population of Rapa Nui (Easter Island, Chile) shows environmental adaptation and resilience. *American Journal of Physical Anthropology* 164:343-361, https://doi.org/10.1002/ajpa.23273.

10. Gerringer M.E., Popp B.N., Linley T.D., Jamieson A.J. and Drazen J.C. (2017) Comparative feeding ecology of abyssal and hadal fishes through stomach content and amino acid isotope analysis. *Deep-Sea Research Part I* 121:110-120, doi: 10.1016/j.dsr.2017.01.003.

11. Hetherington E.D., Olson R.J., Drazen J.C., Lennert-Cody C.E., Balance L.T., Kaufmann R.S. and Popp B.N. (2017) Spatial variability in food web structure in the eastern tropical Pacific using compound-specific nitrogen isotope analysis of amino acids. *Limnology and Oceanography* 62:541-560, doi: 10.1002/lno.10443.

12. Tolar B.B., Powers L.C., Miller W.L. Wallsgrove N.J., Popp B.N. and Hollibaugh J.T. (2016) Ammonia oxidation in the ocean can be inhibited by nanomolar concentrations of hydrogen peroxide. *Frontiers in Marine Science* 3:1-16, Article 237, doi: 10.3389/fmars.2016.00237.

13. Hebert C.E., Popp B.N., Fernie K.J., Ka'apu-Lyons C., Rattner B.A. and Wallsgrove N. (2016) Amino acid-specific stable nitrogen isotope values in avian tissues: Insights from captive American kestrels and wild herring gulls. *Environmental Science & Technology* 50:12928-12937, doi: 10.1021/acs.est.6b04407.

14. Fackrell J.K., Glenn C.R., Popp B.N., Whittier R.B. and Dulai H. (2016) Wastewater injection, aquifer biogeochemical reactions, and resultant groundwater N fluxes to coastal waters: Ka'anapali, Maui, Hawai'i. *Marine Pollution Bulletin* 110:218-292, http://dx.doi.org/10.1016/j.marpolbul.2016.06.050

15. Pyle R.L., Boland R., Bolick H., Bowen B., Bradley C. J., Kane C., Kosaki R. K., Langston R., Longenecker K., Montgomery A. D., Parrish F. A., Popp B. N., Rooney J. Smith C. M., Wagner D. and Spalding H. L. (2016) A comprehensive investigation of mesophotic coral ecosystems in the Hawaiian Archipelago. *PeerJ* 4:e2475; DOI 10.7717/peerj.2475.

16. Bradley C.J., Longenecker K., Pyle R.L. and Popp B.N. (2016) Compound specific isotopic analysis of amino acids reveals dietary changes in mesophotic coral-reef fish. *Marine Ecology Progress Series* 558:65-79, doi: 10.3354/meps11872.

17. Madigan D.J., Chiang W-C., Wallsgrove N.J., Popp B.N., Kitagawa T., Choy C.A., Tallmon J., Ahmed N., Fisher N.S. and Sun C. (2016) Intrinsic tracers reveal recent foraging ecology of giant Pacific bluefin tuna at their primary spawning grounds. *Marine Ecology Progress Series* 553:253-266, doi: 10.3354/meps11782.

18. Tolar B. B., Ross M. J. Wallsgrove N. J., Liu Q., Aluwihare L. I., Popp B. N. and Hollibaugh J. T. (2016) Contribution of ammonia oxidation to chemoautotrophy in Antarctic coastal waters. *The ISME Journal* doi: 10.1038/ismej.2016.61.

19. Kwon S.Y., Blum J.D., Madigan D. Block B., and Popp B.N. (2016) Quantifying mercury isotope dynamics in captive Pacific bluefin tuna (*Thunnus orientalis*). *Elementa: Science of the Anthropocene* 4:000088 doi: 10.12952/journal.elementa.000088.

20. Puigcorbé V., Benitez-Nelson C. R., Masqué P., Verdeny E., White A. E., Popp B. N., Prahl F. G. and Lam P. J. (2015) Small phytoplankton drive high summertime carbon and nutrient export in the Gulf of California and Eastern Tropical North Pacific. *Global Biogeochemical Cycles* 29:1309-1332, doi: 10.1002/2015GB005134.

21. Bradley C. J., Wallsgrove N. J., Choy C. A., Drazen J. C., Hoen D. K., Hetherington E. D., and Popp B. N. (2015) Trophic position estimates of teleosts using amino acid compound specific isotopic analysis. *Limnology and Oceanography - Methods* 13:476-493 doi: 10.1002/lom3.10041.

22. Sackett D., Drazen J. C., Choy C. A., Popp B. N. and Pitz G. (2015) Mercury sources and trophic ecology for Hawaiian bottomfish. *Environmental Science and Technology* 49: 6909-6918, doi: 10.1021/acs.est.5b01009.

23. Choy C. A., Popp B. N., Hannides C. C. S. and Drazen J. C. (2015) Trophic structure and food resources of epipelagic and mesopelagic fishes in the North Pacific Subtropical Gyre ecosystem inferred from nitrogen isotopic compositions. *Limnology and Oceanography* 60:1156-1171, doi:10.1002/lno.10085.

24. Hussey N. E., MacNeil M. A., Siple M. C., Popp B. N. Dudley S. F. J. and Fisk A. T. (2015) Expanded trophic complexity among sharks. *Food Webs* 4:1-7, doi: 10.1016/j.fooweb.2015.04.002.

25. Nielsen J. M., Popp B. N. and Winder M. (2015) Metaanalysis of $\delta^{15}N$ amino acid values for estimating trophic position in marine organisms. *Oecologia* 178:631-642, doi 10.1007/s00442-015-3305-7.

26. Papastamatiou Y. P., Meyer C. G., Kosaki R. K., Wallsgrove N. J. and Popp B. N. (2015) Movements and foraging of predators associated with mesophotic coral reefs and their potential for linking ecological habitats. *Marine Ecology Progress Series* 521:155-170 doi: 10.3354/meps11110.

27. Hannides C. C. S., Drazen J. C. and Popp B. N. (2015) Mesopelagic zooplankton metabolic demand in the North Pacific Subtropical Gyre. *Limnology and Oceanography* 60:419-428, doi: 10.1002/lno.10032.

28. Lorrain A., Graham B. S., Popp B. N., Allain V., Olson R. J., Hunt B. P. V., Potier M., Fry B., Galvan-Magana F., Menkes C., Kaehler S. and Menard F. (2015) Nitrogen isotopic baselines and implications for estimating foraging habitat and trophic position of yellowfin tuna in the Indian and Pacific Oceans. *Deep-Sea Research II* 113:188-198, doi: 10.1016/j.dsr2.2014.02.003.

29. Downs E. E., Popp B. N. and Holl C. M. (2014) Nitrogen isotope fractionation and amino acid turnover rates in the Pacific white shrimp, *Litopenaeus vannamei*. *Marine Ecology Progress Series* 516:239-250, doi: 10.3354/meps11030.

30. Gutiérrez-Rodríguez A., Décima M., Popp B. N., and Landry M. R. (2014) Invisible trophic links in marine food webs. *Limnology and Oceanography* 59:1590-1598, doi:10.4319/lo.2014.59.5.1590.

31. Penton C. R., Deenik J. L., Popp B. N., Bruland G. L., Engstrom P., Mueller J., Worden A., and Tiedje J. M. (2014) Assessing nitrogen transformations in a flooded agroecosystem using the isotope pairing technique and nitrogen functional gene abundances. *Soil Science* 179: 2-10, doi: 10.1097/SS.0000000000000038.

32. Hoen D. K., Kim S. L., Hussey N. E., Wallsgrove N. J., Drazen J. C. and Popp B. N. (2014) Amino acid ^{15}N trophic enrichment factors of four large carnivorous fishes. *Journal of Experimental Marine Biology and Ecology* 453:76-83.

33. Arthur K. E., Kelez S. S., Larsen T., Choy C. A. and Popp B. N. (2014) Tracing the biosynthetic source of essential amino acids in marine turtles using $\delta^{13}C$ fingerprints. *Ecology* 95:1285-1293 http://dx.doi.org/10.1890/13-0263.1.

34. Madigan D. J., Baumann Z., Carlisle A. B., Hoen D. K., Popp B. N., Dewar H., Snodgrass O. E., Block B. A. and Fisher N. S. (2014) Reconstructing transoceanic migration patterns of Pacific bluefin tuna using a chemical toolbox. *Ecology* http://dx.doi.org/10.1890/13-1467.1.

35. Wolhowe M. D., Prahl F. G., White A. E., Popp B. N. and Navarro A. R. (2014) A biomarker perspective on coccolithophorid growth and export in a stratified sea. *Progress in Oceanography* 122:65-76, http://dx.doi.org/10.1016/j.pocean.2013.12.001.

36. Bradley C. J., Madigan D. J., Block B. A. and Popp B. N. (2014) Amino acid isotope incorporation and enrichment factors in Pacific bluefin tuna, *Thunnus orientalis*. *PLoS ONE* 9(1): e85818. doi:10.1371/journal.pone.0085818.

37. Hannides C. C. S., Popp B. N., Choy C. A. and Drazen J. C. (2013) Midwater zooplankton and suspended particle dynamics in the North Pacific subtropical gyre: a stable isotope perspective. *Limnology and Oceanography* 58:1931-1946, doi:10.4319/lo.2013.58.6.1931.

38. *Blum J. D., Popp B. N., Drazen J. C., Choy A. C. and Johnson M. W. (2013) Methylmercury production below the mixed layer in the North Pacific Ocean. *Nature Geoscience* 6:879-884, doi:10.1038/ngeo1918.

39. Cox T. E., Foster M. S., Popp B. N., Smith C. M. and Abbott I. A. (2013) Can stormwater be detected by algae in an urban reef in Hawai'i? *Marine Pollution Bulletin* 71:92-100, doi: 10.1016/j.marpolbul.2013.03.030.

40. Beman J. M., Shih J. L. and Popp B. N. (2013) Nitrite oxidation in the upper water column and oxygen minimum zone of the eastern tropical North Pacific Ocean. *The ISME Journal* 7:2192-2205, doi:10.1038/ismej.2013.96.

41. Decima M., Landry M. R. and Popp B. N. (2013) Environmental perturbation effects on baseline $\delta^{15}N$ values and zooplankton trophic flexibility in the southern California Current Ecosystem. *Limnology and Oceanography* 58:624-634, doi:10.4319/lo.2013.58.2.0624.

42. Vander Zanden H. B., Arthur K. E., Bolten A. B., Popp B. N. Lagueux C. J., Harrison E., Campbell C. L. and Bjorndal K. A. (2013) Trophic ecology of a green turtle breeding population. *Marine Ecology Progress Serie*s 476:237-249, doi: 10.3354/meps10185.

43. White A. E., Foster R. A., Benitez-Nelson C. R., Masque P. Verdeny E., Popp B. N., Arthur K. E. and Prahl F. G. (2013) Nitrogen fixation in the Gulf of California and the eastern tropical North Pacific. *Progress in Oceanography* 109:1-17, http://dx.doi.org/10.1016/j.pocean.2012.09.002.

44. Penton C. R., Deenik J. L., Popp B. N., Bruland G., Engstrom P. Mueller J., Worden A. and Tiedje J. (2012) Importance of sub-surface rhizosphere-mediated coupled nitrification-denitrification in a flooded agroecosystem in Hawaii. *Soil Biology and Biochemistry* 57:362-373, http://dx.doi.org/10.1016/j.soilbio.2012.10.018.

45. Madigan D. J., Litvin S. Y., Popp B. N., Carlisle A. B., Farwell C. J. and Block B. A. (2012) Tissue turnover rates and isotopic trophic discrimination factors in the endothermic teleost, Pacific Bluefin tuna (*Thunnus orientalis*). *PLoS ONE* 7(11): e49220. doi:10.1371/journal.pone.0049220.

46. Choy C. A., Davison P. C., Drazen J. C., Flynn A., Gier E. J., Hoffman C, McClain-Counts J. P., Miller T. W., Popp B. N., Ross S. W. and Sutton T. T. (2012) Global trophic position comparison of two dominant mesopelagic fish families (Myctophidae, Stomiidae) using amino acid nitrogen isotopic analyses. *PLoS ONE* 7(11): e50133. doi:10.1371/journal.pone.0050133.

47. Seminoff J., Benson S. R., Arthur K. E., Tomoharu E., Dutton P. H., Tapilatu R. F. and Popp B. N. (2012) Stable isotope tracking of endangered sea turtles: Validation with satellite telemetry and $\delta^{15}N$ analysis of amino acids. *PLoS ONE* 7: e37403. doi:10.1371/journal.pone.0037403.

48. Beman J. M., Popp B. N. and Alford S. E. (2012) Quantification of ammonia oxidation rates and ammonia-oxidizing archaea and bacteria at high resolution in the Gulf of California and eastern tropical North Pacific. *Limnology and Oceanography* 57:711-726.

**Web of Science Highly Cited in Field*. Highly cited papers receive enough citations as of January/February 2018 to place them in the top 1% of their academic fields based on a highly cited threshold for the field and publication year.

Scott Rowland

1. Malin MC (and 28 others; 2017) The Mars Science Laboratory (MSL) Mast cameras and Descent imager: I. Investigation and instrument descriptions. Earth and Space Science, doi: 10.1002/2016EA000252

2. Harris AJL, Rowland SK, Villeneuve N, Thordarson T (2017) Pāhoehoe, ‘a‘ā, and block lava: an illustrated history of the nomenclature. B Volcanol 79.7, doi: 10.1007/s00445-016-1075-7

3. Harris AJL, Rowland SK (2015) Lava flows and rheology. *In* Sigurdsson H, Houghton B, McNutt SR, Rymer H, Styx J, eds. Encyclopedia of Volcanoes, 2nd Edition

4. Mangold N, and 49 others (2015) Chemical variations in Yellowknife Bay formation sedimentary rocks analyzed by ChemCam on board the Curiosity rover on Mars. J. Geophys. Res. Planets, 120:452–482, doi:10.1002/2014JE004681

5. Blaney DL and 31 others (2014) Chemistry and texture of the rocks at Rocknest, Gale Crater: Evidence for sedimentary origin and diagenetic alteration. J Geophys Res Planets, 119:2109-2131, doi:10.1002/2013JE004590

6. Kurz MD, Rowland SK, Curtice J, Saal AE, Naumann T (2014) Eruption rates for Fernandina Volcano: A new chronology at the Galápagos hotspot center. *In* Harpp KS, Mittlestaedt E, d'Ozouville N, Graham DW, eds. The Galapagos: A Natural Laboratory for the Earth Sciences, Am Geophys Union Geophysical Monograph 204
7. Grotzinger JP and 71 others (2013) A habitable fluvio-lacustrine environment at Yellowknife Bay, Gale Crater, Mars. Science 343, 10.1126/science.1242777
8. Stolper EM, Baker MB, Newcombe ME, Schmidt ME, Treiman AH, Cousin A, Dyar MD, Fisk MR, Gellert R, King PL, Seshin L, Maurice S, McLennan SM, Minitti ME, Perrett G, Rowland S, Sautter V, Wiens RC, MSL Science Team (2013) The petrochemistry of Jake_M: A Martian mugearite. Science 341: DOI: 10.1126/science.1239463
9. Harris AJL, Rowland SK (2015) FLOWGO 2012: An updated framework for thermorheological simulations of Channel-Contained lava. In Carey R, Cayol V, Poland M, and Weis D, eds., Hawaiian Volcanoes: From Source to Surface, Am Geophys Union Geophysical Monograph 208
10. Edgett KS, Yingst RA, Ravine MA, Caplinger MA, Maki JN, Ghaemi FT, Schaffner JA, Bell JF, Edwards LJ, Herkenhoff KE, Heydari E, Kah LC, Lemmon MT, Minitti ME, Olson TS, Parker TJ, Rowland SK, Schieber J, Sullivan RJ, Sumer DY, Thomas PC, Jensen EH, Simmonds JJ, Sengstaken AJ, Willson RG, Goetz W (2012) Curiosity's Mars Hand Lens Imager (MAHLI) Investigation. Space Science Reviews DOI 10.1007/s11214-012-9910-4.

Ken Rubin

1. Butler, Rhett, Burney, David A., Rubin, Kenneth H., and David Walsh (2017) The Orphan Sanriku Tsunami of 1586: New Evidence from Coral Dating on Kaua'i, Natural Hazards, DOI: 10.1007/s11069-017-2902-7.
2. Dutton, A., Rubin, K.H., McLean, N, Bowring, Bard, J. E., Edwards, R.L., Henderson, G.M., Reid, M.R., Richards, D.A., Sims, K.W.W., Walker, J.D., Yokoyama Y. (2017) Data reporting standards for publication of U-series data for geochronology and timescale assessment in the earth sciences, Quaternary Geochronology 39, 42-149, DOI: 10.1016/j.quageo.2017.03.001
3. Shorttle, Oliver, Rudge, John F, Maclennan, John, Rubin, Ken H (2016) A Statistical description of concurrent mixing and crystallisation during MORB differentiation: Implications for trace element enrichment, J. Petrology, 57 (11-12): 2127-2162. doi: 10.1093/petrology/egw056
4. Colman, Alice, Sinton, John, Rubin, Ken (2016) Magmatic Processes at Variable Magma Supply Along the Galápagos Spreading Center: Constraints from Individual Eruptive Units, Journal of Petrology, 57(5), 981-1018, doi: 10.1093/petrology/egw032.
5. Zellmer, GF, K. H. Rubin, CA Miller, JG Shellnutt, A Belousov, M Belousova (2015) Resolving discordant U-Th-Ra ages: constraints on petrogenetic processes of recent effusive eruptions at Tatun Volcano Group, northern Taiwan, In: Caricchi, L. & Blundy, J. D. (eds) Chemical, Physical and Temporal Evolution of Magmatic Systems. Geological Society, London, Special Publications, 422, DOI: 10.1144/SP422.3
6. Lupton, John, Rubin, Ken H., Arculus, Richard, Lilley, Marvin, Butterfield, David, Resing, Joseph, Baker, Edward, Embley R., (2015). Helium Isotope, C/3He, and Ba-Nb-Ti Signatures in the Northern Lau Basin: Distinguishing Arc, Back-arc, and Hotspot Affinities, Geochem. Geophys. Geosys., 16, 1133–1155, DOI: 10.1002/2014GC005625.
7. Rubin K. H. (2014) Mid-Ocean Ridge Magmatism and Volcanism. In: Harff J., Meschede M., Petersen S., Thiede J. (Ed.) Encyclopedia of Marine Geosciences. Springer, Dordrecht. pp 21 https://doi.org/10.1007/978-94-007-6238-1_28
8. Embley, R.W., S.G. Merle, E.T. Baker, K. H. Rubin, J.E. Lupton, JA Resing, R.P. Dziak, M.D. Lilley, W.W. Chadwick Jr., T. Shank, R. Greene, S.L. Walker, J. Haxel, E. Olson and T. Baumberger (2014), Eruptive modes and hiatus of volcanism at West Mata seamount, NE Lau basin: 1996-2012, Geochemistry, Geophysics, Geosystems. 15, 4093-4115, DOI: 10.1002/2014GC005387
9. T. McClinton, S. M. White, A. Colman, K. H. Rubin, J. M. Sinton (2014) The role of crystallinity and viscosity in the formation of submarine lava flow morphology. Bull. Volc. 76, 854, pp13. DOI: 10.1007/s00445-014-0854-2.

10. Bowles, J. A., A. Colman, J. T. McClinton, J. M. Sinton, S. M. White, and K. H. Rubin (2014), Eruptive timing and 200 year episodicity at 92°W on the hot spot-influenced Galapagos Spreading Center derived from geomagnetic paleointensity, Geochem. Geophys. Geosyst., 15, 2211–2224, doi:10.1002/2014GC005315.

11. Sherman, C.E., Fletcher, C.H., Rubin, K. H., Simmons, K.R. and H. Adey, W.H. (2014) Sea-level and reef accretion history of marine isotope stage 7 and late stage 5 based on age and facies of submerged late Pleistocene reefs, Oahu, Hawaii, *Quaternary Research,* 81,138-150. DOI: 10.1016/j/yqres.2013.11.001.

12. Rubin, K. H., S. A., Soule, W. W., Chadwick, D. J. Fornari, D. S., Clague, R.W. Embley, E. T. Baker, M. R. Perfit, D. W. Caress R. P. Dziak. (2012) Volcanic Eruptions in the Deep Sea, *Oceanography* 25,142–157, http://dx.doi.org/10.5670/oceanog.2012.12.

13. E.T. Baker, W. W. Chadwick, J.P. Cowen, R. P. Dziak, Rubin, K. H., D. J. Fornari (2012) Hydrothermal discharge during submarine eruptions: The importance of detection, response, and new technology, *Oceanography*, 25, 128–141, http://dx.doi.org/10.5670/oceanog.2012.11.

14. Colman, A, Sinton, J.M., White, S. M., McClinton, J.T., Bowles, JA, Rubin, K. H., Behn, M.D., Cushman, B., Eason, D.E., Gregg, TKP, Grönvold, K., Hidalgo, S., Howell, J., Neill, O., Russo, C. (2012) Effects of variable magma supply on mid-ocean ridge eruptions: Constraints from mapped lava flow fields along the Galápagos Spreading Center *Geochem. Geophys. Geosyst*., 13, Q08014, http://dx.doi.org/10.1029/2012GC004163

15. D.J. Fornari, K.L. Von Damm, J.G. Bryce, J.P. Cowen, V. Ferrini, A. Fundis, M.D. Lilley, G.W. Luther III, L. Mullineaux, M.R. Perfit, M.F. Meana-Prado, Rubin, K. H., W.E. Seyfried Jr., T.M. Shank, A. Soule, M. Tolstoy, S.M. White (2012) The East Pacific Rise Between 9° and 10°N: Twenty-Five Years of Integrated, Multidisciplinary Oceanic Spreading Center Studies. *Oceanography*, 2,18–43, http://dx.doi.org/10.5670/oceanog.2012.02.

Tom Shea

1. Lynn KJ, Garcia MO, Shea T, Costa F, Swanson DA (2017) Timescales of mixing and storage for Keanakako'i Tephra magmas (1500-1820 C.E.), Kilauea Volcano, Hawai'i, Contributions to Mineralogy and Petrology. 172:76.

2. Shea T (2017) Bubble nucleation in magmas: a dominantly heterogeneous process? Journal of Volcanology and Geothermal Research. 343:155-170.

3. Shea T, Leonhardi T, Giachetti T, Larsen J, Lindoo A, Sinton, J, Parson E, (2017) Dynamics of an unusual cone-building trachyte eruption at Pu‘u Wa‘awa‘a, Hualālai, Hawaii, Bulletin of Volcanology. 79:2.

4. Colombier M, Gurioli L, Druitt TH, Shea T, Boivin P, Miallier D, (2017) Textural evolution of magma during the 9.4 ka trachytic explosive eruption at Kilian Volcano, Chaîne des Puys, France, 2015, Bulletin of Volcanology. 79:17.

5. Lynn KJ, Shea T, Garcia MO, (2017) Nickel variability in Hawaiian olivine: Evaluating the relative contributions from mantle and crustal processes, online first, American Mineralogist. DOI 10.2138/am-2017-5763.

6. Graham DW, Michael PJ, Shea T, (2016) Extreme Incompatibility of Helium During Mantle Melting: Evidence from Undegassed Mid-Ocean Ridge Basalts. Earth and Planetary Science Letters. 454:192-202.

7. Shea T, Owen J., (2016) Discovery of a trachyte ignimbrite sequence at Hualalaī, Hawaii, Bulletin of Volcanology. 78, 34.

8. Shea T, Lynn, K.J., Garcia, M.O., (2015) Cracking the olivine zoning code: Distinguishing between crystal growth and diffusion, Geology, 43:935-938.

9. Shea T, Costa, F., Krimer D., Hammer J.E, (2015) Accuracy and precision of timescales retrieved from diffusion modeling in olivine: a 3D perspective, American Mineralogist, 100:2026-2042.

10. Giachetti T, Gonnermann H, Gardner, J, Shea T, Gouldstone A (2015) Discriminating secondary from magmatic water in rhyolitic matrix-glass of volcanic pyroclasts using thermogravimetric analysis. Geochimica and Cosmochimica Acta, 148:457-476.
11. Shea T, Gurioli L, Hellebrand E, Tuffen, H (2014) Conduit to localized scale degassing during Plinian eruptions: insights from major element and volatile (Cl and H2O) analyses within AD79 Vesuvius pumice. Journal of Petrology, 55:315-344.
12. Shea T, Hammer JE, First E (2013) Pumice balloons or bombs? Nature Geoscience (Corresp.), 6:802-803.
13. Shea T, Hammer JE (2013) Rates of oxidation in CSPV experiments involving H2O-bearing mafic magmas. American Mineralogist, 98:1285-1296.
14. Shea T, Hammer JE (2013) Kinetics of cooling- and decompression-induced crystallization in hydrous mafic-intermediate magma. Journal of Volcanology and Geothermal Research, 260:127-145.
15. Shea T, Gurioli L, Houghton, BF (2012) Transitions between fall phases and pyroclastic density currents during the AD 79 eruption at Vesuvius: building a transient conduit model from the textural and volatile record. Bulletin of Volcanology, 74:2363-2381.

Bridget Smith-Konter

1. Luttrell, K. and B. Smith-Konter (2017), Limits on crustal differential stress in southern California from topography and earthquake focal mechanisms, Geophys. J. Int., doi: 10.1093/gji/ggx301.
2. Howell, S., B. Smith-Konter, N. Frazer, X. Tong, and D.T. Sandwell (2016), The vertical fingerprint of earthquake-cycle loading in Southern California, Nature Geosciences, doi: 10.1093/2015-03-04591.
3. Carrick, T., K. Miller, E. Hagedorn, B. Smith-Konter, and A. Velasco (2016), Pathways to the Geosciences Summer High School Program: A ten year evaluation, Journal of Geoscience Education, 64, 87-97, doi: 10.5408/15-088.1.
4. Schleicher, D.G., A.N. Bair, S. Sackey, L.A. Alciatore, R.M. Eby, and B. Smith-Konter (2015), The evolving photometric lightcurve of Comet 1P/Halley's coma during the 1985/86 apparition, The Astronomical Journal, 150:79, doi:10.1088/0004-6256/150/3/79.
5. Tong, X., D.T. Sandwell, and B. Smith-Konter (2015), An integral method to estimate the moment accumulation rate on the Creeping Section of the San Andreas Fault, Geophysical Journal International, doi: 10.1093/gji/gjis140783.
6. Smith-Konter, B., G.M. Thornton, and D.T. Sandwell (2014), Vertical crustal displacement due to interseismic deformation along the San Andreas fault: Constraints from tide gauges, Geophysical Research Letters, doi:10.1029/2014GL060091.
7. Tong, X., B. Smith-Konter, and D.T. Sandwell (2014), Is there a discrepancy between geological and geodetic slip rates along the San Andreas Fault System?, Journal of Geophysical Research, doi:10.1029/2013JB010765.
8. Tong, X., D.T. Sandwell, and B. Smith-Konter (2013), High-resolution interseismic velocity data along the San Andreas Fault System, Journal of Geophysical Research, 118, doi:10.1029/2012JB009442.
9. Del Pardo, C., B. Smith-Konter, C. Kreemer, G. Blewitt, W. Hammond, and L. Serpa (2012), Interseismic deformation and stress evolution of the Death Valley Fault Zone, Journal of Geophysical Research, 117, B060404, doi:10.1029/2011JB008552.

S.M. Stanley

1. Stanley, S.M., 2014, Evolutionary radiation of shallow-water Lucinidae (Bivalvia with endosymbionts) as a result of the Late Cretaceous rise of seagrasses and mangroves. *Geology* 42:803-806.
2. Blättler, C.L., Stanley, S. M., Henderson, G. M., and Jenkyns, H. C., 2114, Identifying vital effects in *Halimeda* algae with Ca isotopes. *Biogeosciences* 11:7207-7217.
3. Stanley, S. M., 2015, Functional shell morphology of non-cementing Bivalvia. *Treatise on Invertebrate Paleontology*. Part N. Volume 1, Bivalvia (revised, electronic version), Ch.5. 46pp.

4. Stanley, S. M., 2015, Evolutionary ecology of the Bivalvia. *Treatise on Invertebrate Paleontology*. Part N. Volume 1, Bivalvia (revised, electronic version), Ch.19. 48pp.

5. Stanley, S.M. 2016. New estimates of the magnitudes of major marine mass extinctions in earth history. *Proceedings of the National Academy of Sciences*. www.pnas.org/lookup/suppl/doi:10.1073/pnas.1613094113/-/DCSupplemental

Paul Wessel

*indicates first author was my student [% is my contribution for multi-authored papers]

1. Conrad, C. P., Selway, K., Hirschmann, M. M., Ballmer, M. D., and Wessel, P., 2017, Constraints on Volumes and Patterns of Asthenospheric Melt from the Space-Time Distribution of Seamounts, *Geophys. Res. Lett., 44*, doi:10.1002/2017GL074098 [5%].

2. Wessel, P., and Luis, J., 2017, The GMT/MATLAB Toolbox, *Geochem. Geophys. Geosyst.*, 18, 811–823, doi:10.1002/2016GC006723 [65%].

3. Xiong, L., G. Wang, and P. Wessel, 2017, Anti-aliasing Filtering for Deriving High- Accuracy DEMs from TLS Data: Case Study at Freeport, Texas, *Computers & Geosciences, 100*, 125–134, doi:10.1016/j.cageo.2016.11.006 [15%]. 2016 [4]

4. Sandwell, D. T. and P. Wessel, 2016, Interpolation of 2-D Vector Data Using Constraints from Elasticity, *Geophys. Res. Lett.*, *43*, 10,703–10,709, doi:10.1002/2016GL070340 [40%].

5. Wessel, P., and R.D. Müller, 2016, Ridge-Spotting: A new test for Pacific absolute plate motion models, *Geochem. Geophys. Geosystems*, *17(6),* 2408–2420, doi:10.1002/2016GC006404 [90%].

6. *Kim, S.-S. and Wessel, P., 2016, New analytical solutions for modeling of vertical gravity gradient data, *Geochem. Geophys. Geosyst., 17*, doi:10.1002/ 2016GC006263 [50%].

7. Wessel, P., 2016, Regional-residual separation of bathymetry and revised estimates of Hawaii plume flux, *Geophys. J. Int.*, *204(2)*, 932–947, doi:10.1093/gji/ggv472. 2015 [5]

8. Wessel, P., Matthews, K.J., Müller, R.D., Mazzoni, A., Whittaker, J. M., R. Myhill, and Chandler, M.T., 2015, Semi-Automatic Fracture Zone Tracking, *Geochem. Geophys. Geosyst., 16 (7)*, 2462–2472, doi:10.1002/2015GC005853 [80%].

9. Wessel, P., and D. Müller, 2015, Plate Tectonics, in G. Schubert (ed.), *Treatise of Geophysic*s, 2nd edition, *6*, 49–98, doi:10.1016/B978-044452748-6.00101-2, Elsevier, Oxford [65%].

10. Whittaker, J. M, Alfonso, J., Masterton, S., Müller, R. D., Wessel, P., Williams, S. and Seton, M., 2015, Long-term interaction between mid-ocean ridge spreading systems and mantle plumes, *Nat. Geosc.*, 8, 479–483, doi:10.1038/NGEO2437 [10%].

11. *Maher, S. M., Wessel, P., Müller, R. D., Williams, S., and Y. Harada, 2015, Changes in the Absolute Plate Motion of Africa Around Hawaii-Emperor Bend Time, *Geophys. J. Int.*, 201, 1743–1764, doi:10.1093/gji/ggv104 [40%].

12. *Chandler, M. T., P. Wessel, and B. Taylor, 2015, Tectonic reconstructions in magnetic quiet zones: Insights from the greater Ongong Java Plateau, in *The Origin, Evolution, and Environmental Impact of Oceanic Large Igneous Provinces: Geological Society of America Special Paper 511*, edited by C. R. Neal, W. W. Sager, T. Sano and E. Erba, 185–193, Geol. Soc. Am., doi:10.1130/2015.2511(10). [30%] 2014 [3]

13. Klawonn, M., B.F. Houghton, D.A. Swanson, S.A. Fagents, P. Wessel, and C.J. Wolfe, 2014,From field data to volumes: constraining uncertainty for pyroclastic eruptions, *Bull. Volcanol., 76 (7)*, 1–16, doi:10.1007/s00445-014-0839-1. [10%]

14. Klawonn, M., B.F. Houghton, P. Wessel, C.J. Wolfe, D.A. Swanson, S.A. Fagents, 2014, Constraining explosive volcanism: Subjective choices in quantifying pyroclastic products, Wessel 2 *Bull. Volcanol., 76 (2)*, doi:10.1007/s00445-013-0793-3. [10%]

15. Seton, M., Whittaker, J. M., Wessel, P., et al. (2014), Community infrastructure and repository for marine magnetic identifications, *Geochem. Geophys. Geosyst.*, *5*(4), 1629– 1641, doi:10.1002/2013GC005176. [40%]2013 [3]

16. Wessel, P., Smith, W. H. F., Scharroo, R., Luis, J. F., and Wobbe, F., 2013, GMT 5: A major new release of the Generic Mapping Tools: *Eos Trans. AGU*, *94*(45), 409–410, doi:10.1002/2013EO450001. [75%]

17. Sandwell, D. T., Garcia, E. S., Soofi, K., Wessel, P., Chandler, M. T., and Smith, W. H. F., 2013, Toward 1-mGal accuracy in global marine gravity from CryoSat-2, Envisat, and Jason- 1: *The Leading Edge, v. 32* (8), p. 892–899. [15%]

8. *Chandler, M. T., Wessel, P., and Sager, W. W., 2013, Analysis of Ontong Java Plateau paleolatitudes: Evidence for large-scale rotation since 123 Ma?, *Geophys. J. Int.*, doi: 10.1093/gji/ggt075. [40%]2012 [3]

19. *Chandler, M. T., and P. Wessel, 2012, Errata-based correction of marine geophysical trackline data, *G3*, *13*(Q10004), doi:10.1029/2012GC004294 [40%]

20. Ray, J., Mahoney, J. J., Duncan, R. A., Ray, J., Wessel, P., Naar, D. F., 2012, Chronology and geochemistry of lavas from the Nazca Ridge and Easter Seamount Chain: A ~30 Myr hotspot record, *J. Petrology, 53(7)*, 1417–1448, doi:10.1093/petrology/egs021. [10%]

21. *Chandler, M. T., Wessel, P., Taylor, B., Seton, M., Kim, S.-S., Huang, K., 2012, Reconstructing Ontong Java Nui: Implications for Pacific absolute plate motion, hotspot drift and true polar wander, *Earth Planet. Sci. Lett., 331-332*, 140–151. [40%]

BOOKS

1. Wessel, P., 2015, *Introduction to Statistics and Data Analysis*, 187 pp., Self-published, Honolulu, HI, https://paul-wessel.selz.com.

Michael O. Garcia

Peer-reviewed Scientific Papers and Books

(student and post-doc co-authors are listed *in italics)*

2017

1. Garcia, M.O., Jicha, B.R., Marske, J.P. and Pietruszka, A.J., How old is Kīlauea Volcano? Insights from $^{40}Ar/^{39}Ar$ dating of the 1.7-km-deep SOH-1 core. Geology, 45, 79-82, doi:10.1130/G38419.1.

2. Garcia, M.O., Watson, B., Editors, 2017, Olivine, Special Collection of 11 Papers for American Mineralogist, 102.

3. Harrison, L., Weis., D., Garcia, M.O., The link between Hawaiian mantle plume composition, magmatic flux, and deep mantle geodynamics. Earth and Planetary Science Letters, 463, 298-309, 10.1016/j.epsl.2017.01.027.

4. *Lynn, K.J.*, Shea, T., and Garcia, M.O., Nickel variability in Hawaiian olivine: Evaluating the relative contributions from mantle and crustal processes. American Mineralogist, 102, 507–518, doi.org/10.2138/am-2017-5763.

5. *Lynn, K.J.*, Garcia, M.O., Shea, T., Costa, F., and Swanson, D. A., Timescales of mixing and storage for Keanakāko‘i Tephra magmas (1500-1823 C.E.), Kīlauea Volcano, Hawai‘i. Contributions to Mineralogy and Petrology, 172, 76-95, doi. 10.1007/s00410-017-1395-4.

2016

6. Garcia, M.O., Rhodes, J.M., Huang, S., Hickey-Vargas, R., Magmas and their sources: A special issue honoring Frederick A. Frey. Geochimica et Cosmochimica Acta, Fred Frey Special Issue, 185, 1-8, 10.1016/j.gca.2016.05.018.

7. Garcia, M.O., Weis, D., Jicha, B.R., Ito, G., Hanano, D., Petrology and geochronology of lavas from Ka‘ula Volcano: Implications for rejuvenated volcanism of the Hawaiian Mantle Plume. Geochimica et Cosmochimica Acta, Fred Frey Special Issue, 185, 278–301, doi.org/10.1016/j.gca.2016.03.025.

8. Kelley, C., France, S., Parrish, F., Wagner, D,. Gerringer, M., Garcia, M.O., CAPSTONE’s First Year - 2015 Hohonu Moana: Exploring deep waters off Hawaii. Oceanography, 29, 68-73.

9. Clague, D.A., Frey, F.A., Garcia, M.O., Huang, S., McWilliams, M., Beeson, M.H., Compositional heterogeneity of the sugarloaf melilite nephelinite flow, Honolulu Volcanics, Hawaii. Geochimica et Cosmochimica Acta, Fred Frey Special Issue, 185, 251-277, doi.org/10.1016/j.gca.2016.01.034.

2015

10. Garcia, M.O., How and why Hawaiian volcanism has become pivotal to our understanding of volcanoes. In Hawaiian Volcanoes: Source to Surface, Editors R. J. Carey, M. P. Poland, V. Cayol, and D. Weis. American Geophysical Union Monograph, 208, 1-18.

11. Garcia, M.O., Smith, J.R., *Tree, J.P.*, Weis, D., Harrison, L., Jicha, B.R., Petrology, geochemistry and ages of lavas from Northwest Hawaiian Ridge volcanoes. Geological Society of America Special Paper 511, The Origin, Evolution, and Environmental Impact of Oceanic Large Igneous Provinces, Editors Clive R. Neal, William Sager, Takashi Sano, Elisabetta Erba, 1-26.

12. Garcia, M.O., Weis, D., *Swinnard, L.*, Ito, G. and Pietruszka, A.J., Petrology and geochemistry of volcanics from the South Kauai Swell, Hawaii: Implications for the lithology and composition of the Hawaiian mantle plume. Journal of Petrology, 56, 1173–1197, doi: 10.1093/petrology/egv033.

13. Kelley, C. Smith, J.R., *Tree, J.*, Miller, J., Boston, B., Garcia, M.O., Ito, G. Taylor, J. Lichowski, F., Wagner, D., Leonard, J., Dechnik, B., Luers, D., New seafloor mapping surveys are rewriting the geologic history of the Hawaiian archipelago. American Geophysical Union EOS, 96, doi:10.1029/2015EO030235.

14. Pietruszka, A.J., Heaton, D.E., *Marske, J.P.*, and Garcia, M.O., Two small magma bodies beneath the summit of Kīlauea Volcano unveiled by isotopically distinct melt deliveries from the mantle. Earth and Planetary Science Letters, 413, 90–100, doi.org/10.1016/j.epsl.2014.12.040.

15. Shea, T., Lynn, K. and Garcia, M.O., Cracking the olivine zoning code: Distinguishing between crystal growth and diffusion. Geology, 43, 935–938, 10.1130/G37082.1.

2014

16. Swanson, D., Rose, T., *Mucek, A.,* Garcia, M.O., Fiske, R., Mastin, L., Cycles of explosive and effusive eruptions at Kilauea Volcano, Hawaii. Geology, 42, 631–634, doi:10.1130/G35701.1

2013

17. Bizimis, M., Salters, V., Garcia, M.O, Norman, M.D., The composition and distribution of the rejuvenated component across the Hawaiian plume: Hf-Nd-Sr-Pb isotope systematics of Kaula lavas and pyroxenite xenoliths. Geochemistry, Geophysics, Geosystems, 14(10): 4458-4478. doi:10.1002/ggge.20250.

18. *Flinders, A.F.*, Ito, G., Garcia, M.O, Sinton, J., Kauahikaua, J., Taylor, B., Intrusive dike-complexes, cumulate cores, and the exogenous growth of Hawaiian volcanoes. Geophysical Research Letters, v. 40, 3367–3373, doi:10.1002/grl.50633.

19. *Greene, A.*, Garcia, M.O., Pietruszka, A., Weis, D., Marske, J., Maerschalk, C., Vollinger, M.J., Eiler, J., Temporal geochemical variations in lavas from Kīlauea's Pu'u 'Ō'ō eruption (1983-2010): Cyclic variations of Pb isotope ratios from the melting of vertical source heterogeneities. Geochemistry, Geophysics, Geosystems, 14, 11, doi: 10.1002/2013GC004719.

20. Ito, G, Garcia, M.O., Smith, J.R., Taylor, B., Flinders, A., Jicha, B.R., Yamasaki, S. Weis, D., Swinnard, L., Blay, C., A low-relief shield volcano origin for the South Kaua'i Swell. Geochemistry, Geophysics, Geosystems, 14, 7 doi: 10.1002/ggge.20159.

21. Pietruszka, A.J., Norman, M.D., Garcia, M.O., *Marske, J.*, Burns, D.H., Chemical heterogeneity in the Hawaiian mantle plume from the alteration and dehydration of recycled oceanic crust. Earth and Planetary Science Letters, 361, 298-309.

2012

22. Garcia, M.O., Weis, D., Hanano, D., Apuzen-Ito, G., *Flinders, A.*, Kurz, M., Age, geology, geophysics and geochemistry of Mahukona volcano, Hawaii. Bulletin of Volcanology, 74, 1445-1463.

23. Jicha, B.R., Rhodes, J.M., Singer, B.S., Garcia, M.O., The $^{40}Ar/^{39}Ar$ geochronology of submarine Mauna Loa volcano, Hawaii. Journal of Geophysical Research, 117, B09204 doi:10.1029/2012JB009373.

Gregory Ravizza

1. Peucker-Ehrenbrink, B., Ravizza, G. and Winckler G. (2016) Geochemical tracers of extraterrestrial matter in sediments. Elements 12.3: 191-196.
2. Paquay*, F. S., Ravizza, G. and Coccione, R. (2014) The influence of extraterrestrial material on the late Eocene marine Os isotope record." Geochimica et Cosmochimica Acta 144: 238-257.
3. Schmitz, B., Huss, G.R., Meier, M.M.M., Peucker-Ehrenbrink, B., Cronholm, A., Davies, M.B., Heck, P.R., Johansen, A., Keil, K., Kristiansson, P., Ravizza, G., Tassinari, M., and Terfelt, F. (2014) A fossil winonaite-like meteorite in Ordovician limestone: A piece of the impactor that broke up the L-chondrite parent body? Earth and Planetary Science Letters. 400, 145-152.
4. Zaiss*, J., Ravizza, G., Goderis, S., Sauvage, J., Claeys, P. and Johnson, K. (2014). "A complete Os excursion across a terrestrial Cretaceous–Paleogene boundary at the West Bijou Site, Colorado, with evidence for recent open system behavior." Chemical Geology 385: 7-16.
5. Goderis, S., Wittmann, A., Zaiss*, J., Elburg, M., Ravizza, G, Vanhaecke, F., Deutsch, A. and Claeys, P. (2013) Testing the ureilite projectile hypothesis for the El'gygytgyn impact: Determination of siderophile element abundances and Os isotope ratios in ICDP drill core samples and melt rocks. Meteoritics & Planetary Science. 48, 1296-1324.
6. Wieczorek, R., Fantle, M. S., Kump L. R. and Ravizza G. (2013). Geochemical evidence for volcanic activity prior to and enhanced terrestrial weathering during the Paleocene Eocene Thermal Maximum. Geochimica et Cosmochimica Acta 119: 391-410.
7. Ravizza G. and Vonderhaar, D. (2012) A geochemical clock in earliest Paleogene pelagic carbonates based on the impact-induced Os istope excursion at the Cretaceous-Paleogene Boundary. Paleoceanography. 27 15pp PA3219 doi:10.1029/2012PA002301.
8. Paquay* F. S. and Ravizza G. (2012) Heterogeneous seawater $^{187}Os/^{188}Os$ during late Pleistocene Glaciations. Earth and Planetary Science Letters. 349/350, 126-138.
9. Tejada, M. Ravizza G., Suzuki, K. and Paquay F., (2012) An extraterrestrial trigger for the Early Cretaceous massive volcanism? Evidence from the paleo-Tethys Ocean Scientific Reports, Volume: 2 Article Number: 268 DOI: 10.1038/srep00268.
10. Nozaki T.; Suzuki, K.; Ravizza, G. Kimura, J-I; Chang, Q. (2012) A Method for Rapid Determination of Re and Os Isotope Compositions Using ID-MC-ICP-MS Combined with the Sparging Method. Geostandards And Geoanalytical Research 36, 131-148.