

ERTH607 - Submarine Volcanoes

Fall 2022

Instructor: Ken Rubin Day, Time: Tu-Th 0900-1015 AM, POST 613
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Course Content: Various aspects of active volcanism in the deep and shallow ocean and its effect on the surrounding environment, focusing on recent eruptions, remote detection, eruption monitoring and observation, volcanic deposits and landforms, ecosystem impacts, hydrothermal activity, and submersible and robotic field tools. I will draw heavily from my own research and field expeditions to active submarine volcano sites around the Pacific, supplemented by current literature.

Course Format: This is a seminar course where participants read and discuss papers and talk about the latest research. The plan is to meet once per week to discuss relevant background and once per week to discuss one or two papers. Initially the instructor will lead the paper discussions but by mid-semester course enrollees will also lead discussions. The format will be conversational and as informal as possible to encourage participation and lots of questions during class.

Grading: Grading will be based on class participation and student-led discussions.

Topics: We will discuss all of the following (not necessarily in this exact order):

I. Volcanic products.

- Volcano types, magma types, relationship to tectonic settings
- Deep sea volcanic products, eruption, and lava and pyroclast emplacement mechanisms
- Reconstructing eruptions from sea floor lava morphology, deposit mapping, morphology and geology
- Magma reservoirs and magma chemistry, and magma chamber processes
- Compositional variations within individual eruption deposits

II. Eruptions Impacts

- Submarine effusive and pyroclastic volcanism
- Eruption detection and response including seismic detection of eruptions
- Eruption chronologies
- Hydrothermal Processes and response to eruptions, including event plumes
- Eruption effects on sea floor ecology & microbial communities

III Tectonic settings.

- Ocean ridge volcanism.
- Submarine Hāwai'ian Volcanism
- Submarine Arc Volcanoes
- Special topics with discussions led by Students

IV. Some Specific eruptions (plus others time permitting)

- Hunga Tonga Hunga Ha'apia, 2022
- West Mata 2008 - 2017
- Loihi 1997
- NW Rota-1 2004 -2010
- Axial Smt 1998, 2011 and 2015
- NELSC 2008-2017
- Havre 2012
- N East Pacific Rise 1991-1992 and 2005-2006

GG Student Learning Objectives (SLOs):

GG department has provisionally defined 4 and 5 learning objectives, respectively, for the MS

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and PhD graduate degree programs, relating to Technical knowledge, the conduct of science, Oral and written skills, and Professional skills. This course directly incorporates content relevant some of these:

M.S.

1. **Technical knowledge.** M.S. 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 fields of geology and geophysics.

3. **Communicate geological knowledge** M.S. graduate 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 Geology through seminar or conference presentations.

Ph.D.

1. **Technical knowledge.** Ph.D. 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 fields of geology and geophysics.

2. **Expertise in a sub-discipline.** Ph.D. graduates are able to comprehensively synthesize, evaluate, and interpret relevant fundamental knowledge in her or his sub-discipline.

4. **Communicate geological knowledge** Ph.D. 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 Geology through seminar or conference presentations.

Title IX:

- The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:
- **As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator.** Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.
- If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the **confidential resources available here:**
<http://www.manoa.hawaii.edu/titleix/resources.html#confidential>
- If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.