MEETINGS

Exploring Hawaiian Volcanism

AGU Chapman Conference: Hawaiian Volcanoes, From Source to Surface; Waikoloa, Hawai'i, 20–24 August 2012

PAGE 72

In 1912 the Hawaiian Volcano Observatory (HVO) was established by Massachusetts Institute of Technology professor Thomas A. Jaggar Jr. on the island of Hawaii. Driven by the devastation he observed while investigating the volcanic disasters of 1902 at Montagne Pelée in the Caribbean, Jaggar conducted a worldwide search and decided that Hawai'i provided an excellent natural laboratory for systematic study of earthquake and volcano processes toward better understanding of seismic and volcanic hazards. In the 100 years since HVO's founding, surveillance and investigation of Hawaiian volcanoes have spurred advances in volcano and seismic monitoring techniques, extended scientists' understanding of eruptive activity and processes, and contributed to development of global theories about hot spots and mantle plumes.

The Chapman Conference "Hawaiian Volcanoes, From Source to Surface" was convened on the occasion of HVO's centennial. Conference goals included reviewing current understanding of Hawaiian volcanism developed over the past century, identifying critical problems needing future research, and exploring how Hawai'i informs research elsewhere on the Earth and other planets.

Approximately 180 scientists from 12 countries attended the meeting, including about 40 students. Financial support was provided by the U.S. Geological Survey (USGS), the U.S. National Science Foundation (NSF), and the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI). The conference program was structured to trace the route of ascending magma from its source within Earth's mantle to eruption at the surface. Each day consisted of a morning of invited talks summarizing current understanding of key concepts and phenomena, followed in the afternoon by short contributed talks, breakout discussions, and poster presentations. A field trip day offered participants a chance to visit one of the five shield volcanoes that make up the island.

Hawaiian volcanoes are among the best studied in the world, but surprisingly, a number of fundamental questions remain unanswered. It is generally thought that a mantle plume feeds the Hawaiian hot spot. What is the depth and source of melting, and what is the mechanism of melt transport to the surface? Over the last 5 million years, Hawaiian volcanoes have formed two geochemically and geographically distinct chains—the "Loa" and "Kea" trends. What are the origins of these trends, and how far back in time can they be distinguished? The volumes and structures of individual overlapping volcanoes that make up the island of Hawai'i are poorly known. Is Kīlauea a small volcano sitting on the shoulder of Mauna Loa, or does it deeply indent Mauna Loa's flank? A wide range of models have been proposed for the size and shape of magma reservoirs and conduits beneath the surface, but agreement, especially between geophysicists and geochemists, has been elusive. What do subvolcanic magma storage areas and transport pathways look like? Both Kīlauea and Mauna Loa are characterized by explosive deposits in their summit regions. What controls the transition between explosive and effusive volcanism at Hawaiian volcanoes? What geophysical, geochemical, and geological tools will help us to better forecast future volcanic activity?

Consensus emerged that such critical questions would benefit most from interdisciplinary approaches leading to more complete physical and chemical models integrating a variety of observations. The Hawaii Scientific Drilling Project (HDSP) on Mauna Kea, which resulted in more than 3 kilometers of continuous core from the flank of a Kea trend volcano (spanning from about 240,000 to >650,000 years before present), is a potential example of this approach. On the less expensive end of the spectrum, more rigorous integration of existing and new geodetic, seismic, and geochemical data in Hawai'i is needed to better constrain, for example, the sizes and shapes of magma reservoirs. Ultimately, conference participants felt that an ocean island research initiative, akin to the Ridge Interdisciplinary Global Experiments (RIDGE) and Geodynamic Processes at Rifting and Subducting Margins (GeoPRISMS) programs sponsored by NSF, might best coordinate discussion and activity among the numerous but currently independent research groups that focus on Hawai'i and other hot spot volcanoes around the world.

Conference presenters agreed to share their overviews and investigations of aspects of Hawaiian volcanism with the larger community via the 2012 Hawai'i Chapman Conference Web site (http://hilo.hawaii.edu/~kenhon/HawaiiChapman). A technical summary that will highlight major research questions discussed at the conference is forthcoming. Hopefully, this Chapman Conference has stimulated the community that studies Hawaiian volcanism, helped frame critical research targets, outlined future areas of interest, and inspired the next generation of research scientists.

—Michael P. Poland and Paul G. Okubo, Hawaiian Volcano Observatory, U.S. Geological Survey, Hawai'i National Park, Hawai'i; Email: mpoland@usgs.gov; and Ken Hon, University of Hawai'i at Hilo