SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

Press Release

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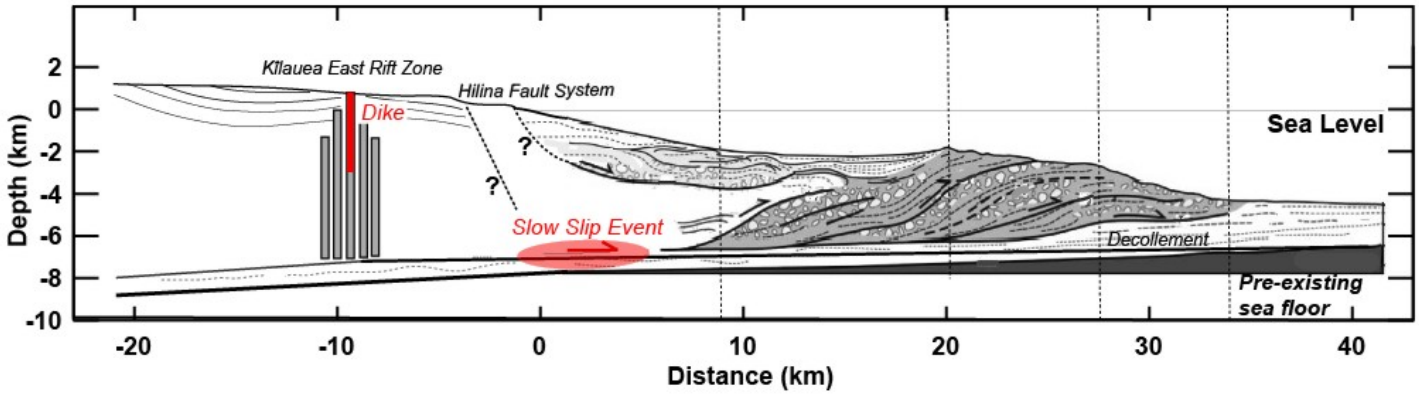
Magmatically Triggered Slow Earthquake Discovered at Kilauea Volcano, Hawaii

Honolulu, Hawaii– From June 17-19th 2007, Kilauea experienced a new dike intrusion, where magma rapidly moved from a storage reservoir beneath the summit into the east rift zone and extended the rift zone by as much as 1 meter. Researchers from the University of Hawaii at Manoa (UHM), Scripps Institution of Oceanography at UC San Diego, and the U.S. Geological Survey (USGS) Hawaiian Volcano Observatory have now discovered that the 2007 dike intrusion was not the only action going on: the dike also triggered a "slow earthquake" on Kilauea's south flank, demonstrating how magmatism and earthquake faulting at Kilauea can be tightly connected. The research findings will be published in the Friday, August 29th edition of the prestigious journal *Science*.

Slow earthquakes are a special type of earthquake where fault rupture occurs too slowly (over periods of days to months) to produce any felt shaking. Slow earthquakes of magnitude 5.5-5.7 have been previously found to periodically occur on the flanks of Kilauea, and have been identified by ground motion data on Global Positioning System (GPS) stations. A general understanding of slow earthquake initiation, however, is still unresolved.

This new study is the first observation of slow earthquake that was triggered by a dike intrusion. A team lead by Associate Researcher Ben Brooks of the School of Ocean and Earth Science and Technology (SOEST) at UHM used a combination of satellite and GPS data to demonstrate that the 2007 slow earthquake began about 15-20 hours after the start of the dike intrusion, and that the slow earthquake was accompanied by elevated rates of small magnitude microearthquakes, a pattern identical to what has been seen from past slow earthquakes. The authors also performed stress modeling to demonstrate how the processes associated with the volcanism at Kilauea contributes to the existence of the observed slow earthquakes. The results suggest that both extrinsic (intrusion-triggering on short time scales) and intrinsic (secular deformation on long time scales) processes produce slow earthquakes at Kilauea.



A schematic cross-section from north to south through Kilauea Volcano, showing the structure of the volcano and the mobile south flank. The June 17th dike intruded into the East Rift Zone and triggered the slow-slip event, that most likely occurred on the decollement fault between the volcano and the pre-existing sea floor, ~15 to 20 hours later. Image credit: James Foster, HIGP/SOEST

"Because of the large deformation signals from the dike intrusion, we needed to do some detailed detective work to prove the existence of this slow earthquake." says Brooks, an associate researcher in the Hawaii Institute for Geophysics and Planetology (HIGP) at UHM. "We used state-of-the-art InSAR satellite data to constrain the dike source and that allowed us to demonstrate the existence of the slow earthquake motions recorded by the GPS stations on Kilauea's flank."

To determine the presence of this slow earthquake, a multitude of measuring tools were required. “A dike intrusion could be seen with the seismic monitoring network, the tiltmeters and the GPS network, but these slow earthquakes can only be seen with the GPS network,” says James Foster, an assistant researcher with HIGP, and a co-author in the study.

“These slow earthquakes are an interesting phenomenon that has only been studied within the last decade and we’re still trying to figure out how they fall into the bigger picture of earthquakes, says Cecily Wolfe, also an associate professor in HIGP and another co-author. “They’re definitely a part of the earthquakes cycle, and trying to understand how they relate to other earthquakes and how they may be generated and triggered will give us greater insights into how predicable earthquakes are.”

Other researchers involved in the study are David Sandwell and David Myer of Scripps Institution of Oceanography at UC San Diego, and Paul Okubo and Michael Poland of the USGS Hawaiian Volcano Observatory.

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High resolution version of above image available, contact Tara Hicks Johnson at hickst@hawaii.edu or (808) 389-3561

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