2008 Fall Meeting
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HR: 0800h
AN: **DI21A-1725**
TI: S-wave tomographic imaging of the mantle beneath the Hawaiian Islands from the PLUME deployments of ocean-bottom and land seismometers
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AB: The Hawaiian PLUME (Plume-Lithosphere Undersea Melt Experiment) project is a multidisciplinary program to study the deep mantle structure of the Hawaiian hotspot and address the debate over whether one end of the island chain is underlain by a classical plume from the deep mantle and how mantle upwelling interacts with the overlying lithosphere beneath the Hawaiian Swell. PLUME involved two consecutive ocean-bottom seismometer (OBS) deployments and a

concurrent deployment of 10 land seismometers along the islands. The first deployment of 35 broadband OBSs in 2005-2006 was centered on the island of Hawaii with stations spaced about 75 km apart. A second deployment of 38 OBSs, in a pattern with a larger aperture and a station spacing of about 250 km, was carried out in 2006-2007, although the number of seafloor stations on the second deployment that yielded useful data was reduced by instrument malfunction or loss. We present S-wave tomographic images of the regional mantle structure beneath the Hawaiian Islands using the combined data from the PLUME experiment. The OBS horizontal components were oriented from particle motions of teleseismic P waves. High-quality relative arrival times of S waves were measured with the multi- channel cross-correlation method of VanDecar and Crosson. In the ~0.05-0.1 Hz frequency band, we obtained 1191 arrivals during the first deployment and 955 arrivals during the second deployment. Because of the high noise levels on the horizontal components of seafloor instruments at Hawaii, most measurements are from $M_w \geq 6.0$ earthquakes, which are moderately well distributed in azimuth. The relative arrival time dataset has been inverted for S-wave velocity models beneath Hawaii using both ray theoretical and finite-frequency methods; results from both approaches display general similarity. The S-wave arrival time data from the second OBS deployment are useful in broadening the region of consideration and extending downward the depth resolution of imaging into the transition zone. Although resolution below the transition zone is limited, the arrival times of SKS phases recorded by the PLUME deployments display azimuthally varying patterns that may be compatible with a broad low velocity volume near ~1,000-1,500 km depth in the lower mantle beneath Hawaii.

DE: 7208 Mantle (1212, 1213, 8124)
DE: 7270 Tomography (6982, 8180)
DE: 8137 Hotspots, large igneous provinces, and flood basalt volcanism
SC: Study of the Earth's Deep Interior [DI]
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