V082-003 Room: C310 Time: May 29 9:30-9:45

Underwater Kilauea and Mauna Loa: Recent JAMSTEC results

Michelle Coombs[1], Peter Lipman[1], Thomas SISSON[2], Jun-Ichi Kimura[3]

[1] USGS, [2] Volcano Hazards Team, USGS, [3] Dept. Geosci., Shimane Univ.

The Hilina slump, on the southeast flank of Kilauea (Hawaii Island), is currently the most actively deforming flank of any oceanic island worldwide, moving seaward at rates up to 10 cm/yr at shoreline. Recent study, as part of the JAMSTEC Hawaii project, has focused on the underwater slopes of this active region of volcano spreading. Submersible observations and samples from the 1998-1999 and 2001 JAMSTEC cruises show that the mid-slope bench and lower slope of the Hilina slump system consist entirely of compositionally diverse volcaniclastic rocks. Submarine-erupted (greater than 750 ppm S) breccia clasts and sandstone grains have strongly variable alkalic and transitional basalt compositions (to 38% silica, 10.8% alkalis), contrasting with present-day Kilauea tholeiites. The volcaniclastic rocks provide a unique record of ancestral submarine alkalic growth of an archetypal hotspot volcano. In contrast, a dive in 2001 (K-208) sampled in-place alkalic pillow basalts above the mid-slope bench, at depths of 2080-2570 mbsl, providing a critical link between deep alkalic volcaniclastics and shallow tholeiitic to transitional composition lavas. The alkalic pillow basalts on the upper slope, document that the ancestral alkalic edifice of Kilauea was large and projected into shallow water. In addition, dive K-207 to the west and at similar depths (ca. 2100-2700 mbsl) traversed a series of volcaniclastic breccias; all but the shallowest clasts are alkalic. Dissolved carbon dioxide and water concentrations (90-120 ppm and 0.75-1.00 wt%, respectively) in clast glasses are consistent with eruption depths being similar to sampling depths. This suggests a short transport history for clasts in the breccia, and that the alkalic/tholeiitic transition could be reached by an additional dive above the K-208 site (greater than 2000 m). With these new dives, almost all of Kilaueas alkalic-to-tholeiitic compositional evolution has been sampled, providing a framework against which other hotspot volcanoes can be evaluated as we learn more about their early histories.

A third south-flank dive resolved controversies concerning the origin of Papau Seamount, about 900 m high elongate submarine mound that marks the west end of the Hilina mid-slope bench. JAMSTEC dive K-209 on the west side of Papau revealed poorly consolidated massive breccias. Glassy rinds from breccia clasts are degassed (lower than 130 ppm S), many clasts are highly vesicular, and glass and whole-rock compositions are all Mauna Loa-like (higher than 51.9% in silica). Thus, Papau is debris from subaerial Mauna Loa, not Kilauea, and volcaniclastic deposits on the Hilina bench wrap depositionally around its east side. This discovery indicates that Mauna Loa extends much farther under the west flank of Kilauea than previously realized and that Kilauea must have grown on the deep-water south flank of the larger volcano, probably initially at the base of a large landslide fault scarp.