

Final Report: Effects of magma supply on normal fault evolution and eruption dynamics along the Galápagos Spreading center

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In March-April 2010 I participated in the Galápagos Ridge Undersea Volcanic Eruptions Expedition (GRUVEE) aboard the R/V Atlantis to study eruption dynamics at an intermediate spreading ridge. During the cruise we conducted 27 ALVIN dives to create detailed geologic maps of two ~20 km x 5 km regions of the ridge axis that varied in magma supply, axial morphology, fault size and spacing, depth to the axial magma chamber, and eruptive style. In addition, we collected high-resolution bathymetry data using the AUV SENTRY and images of the seafloor using WHOI's TOWCAM system. These data provide one of the highest resolution datasets currently available for studying volcanic processes at a mid-ocean ridge. Specifically, we were able to map individual lava flows and determine their eruptive volume and chemistry. Based on these data, I am now working with Julia Howell (a Ph.D. student from the University of South Carolina who also participated in the GRUVEE cruise) to use the data collected from this study to constrain 3D models for the stress field during volcanic eruptions. Julia spent the 2011 spring semester as a guest student at WHOI developing these models and taking course 12.521 (Computational Geophysical Modeling, co-taught by Jian Lin, Olivier Marchal, and myself). Julia will present these results at the upcoming AGU meeting in San Francisco, in December.