

General Overview of IODP Expedition 324: Testing Plume and Plate Models of Ocean Plateau Formation at Shatsky Rise

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IODP Expedition 324 cored Shatsky Rise, a Mesozoic oceanic plateau in the Pacific Ocean. Shatsky Rise, located ~1500 km east of Japan, is a large oceanic plateau (about the area of Japan) and represents a huge emplacement of basaltic magma. This plateau is unique in several respects. Prior geophysical work has been able to outline a plausible tectonic history, including postulated flood basalt eruptions (e.g., Sager et al., 1999, JGR 104, 7557-7576). In addition, the plateau seems to be made up of three large volcanic edifices (they are called Tamu, Ori and Shirshov Massifs from southwest to northeast). Shatsky Rise is representative of oceanic plateaus in general, which are poorly understood because they are very sparsely sampled. In contrast to other and larger oceanic plateaus that have been drilled before (Kerguelen and Ontong Java Plateaus), Shatsky Rise was formed during a time of frequent magnetic reversals and therefore its tectonic setting can be much better constraint.

Our preliminary data, which are descriptions of cores and shipboard analyses of core samples, give several important results (Expedition 324 Scientists, 2010, http://publications.iodp.org/preliminary_report/324/). Core lithologies show that the initial eruptions (Tamu Massif) were characterized by massive sheet flows and that sites farther northeast on the plateau (younger, smaller Ori and Shirshov Massifs) show progressively lesser contribution from massive flows. This is consistent with the hypotheses of a massive, initial volcanic event and waning magmatic output with time. Our results also show that the higher points on the volcanic edifices were in shallow water or were subaerial, indicating that the volcanic summits formed islands and implying dynamic uplift. Further, the cores show extensive alteration at volcano summit sites, in contrast to light alteration at flank sites, indicating that the summit structures have promoted or focused thermal fluid flow. The drilling results also show that volcanoclastic sediments, previously not known from Shatsky Rise, make up a significant contribution to volcano summit structures. Finally, geochemical data indicate that the sampled lava flows are made up of variably evolved tholeiitic basalts with mid-ocean ridge basalt character (from normal to enriched MORB), extending the results from the single previous recovery of Shatsky Rise volcanics at Site 1213 during ODP Leg 198 (Mahoney et al., 2005, *Geology* 33, 185-188) to the entire plateau.

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