Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

BPT013-11 Room: 301B Time: May 26 11:45-12:00

Preliminary results of igneous petrology of the volcanic products from Shatsky Rise, IODP Expedition 324

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IODP Expedition 324 cored five sites (Sites U1346 to U1350) at Shatsky Rise, a large oceanic plateau in the northwest Pacific Ocean. We described the lavas and volcaniclastics from three main massifs (Shirshov, Ori, and Tamu Massifs) of Shatsky Rise to clarify the volcanic succession and petrographic characteristics of volcanic products.
Site U1346 was drilled on Shirshov Massif and consists of 53 m of highly vesicular (30 to 50 % vesicles) pillow lavas (and/or larger pillow-like inflation units) consisting of aphyric micro- to cryptocrystalline basalt. These are interpreted as part of a single pillow lava eruption stack. The nature of the sedimentary intercalations within the succession indicates that the environment deepened progressively from nearshore to offshore marine conditions throughout the eruptive time period.
Site U1347 was drilled on the southeastern flank of Tamu Massif. The 160 m thick basement succession consists of massive basalt flows and pillow inflation units intercalated with volcaniclastic sedimentary successions. These include (1) an upper series of four massive lava flows (8 to 19 m thick); (2) a 75 m lava stack with more massive (3 to 6 m thick) basaltic flows passing upward in larger pillow-like inflation units (1 to 2 m thick) and pillow basalts (<1 m thick), which likely represent successive eruptive pulses during which lava effusion rates diminished; and (3) two massive internally homogeneous basaltic lava flows consisting of a very thick (23 m) upper tabular flow overlying a second (partially drilled) flow. The frequent recovery of thick (often fresh) glassy rinds within the pillow unit stack indicates that alteration was essentially buffered in these rocks.
Site U1348 was drilled on a basement high on the north flank of Tamu Massif and is unusual in that it provided 120 m of volcaniclastic sediments, including 90 m of highly altered hyaloclastite. This initially proved difficult to interpret because of the pervasive alteration, which masks both the original texture and structure of this lithology. However, the predominance of altered glass shards material is indicative of substantial submarine volcanism nearby.
Site U1349 was drilled near the top of Ori Massif. The upper thin altered lavas have extremely vesicular flow tops, many of which are deeply reddened, possibly as a result of subaerial weathering. Increasingly thicker lava inflation units occur toward the bottom of the lower lava section before passing into an underlying submarine succession of lava flow breccias, hyaloclastite fragments, and more massive lava pods. Accordingly, this volcanic succession appears to have developed in progressively shallower to emergent conditions, followed by submergence after volcanism ceased. The basalt is petrographically distinguishable because it is the most primitive, with more olivine and Cr-spinel.
Site U1350 was drilled on the eastern flank of Ori Massif, where the seafloor is 800 m deeper. Drilling yielded (1) a series of massive basalt flows passing downhole into (2) a transitional zone, (3) aphyric to sparsely plagioclase-phyric pillow lavas, (4) a thin layer of hyaloclastite, and (5) a

succession of well-preserved plagioclase-phyric pillow lavas set in a matrix of, at time of eruption, unconsolidated or fluidized micritic limestone. The inflation units above the hyaloclastite are complex, containing a mixture of massive flow and larger pillow-like units sparsely interspersed with thin sedimentary horizons. Beneath the hyaloclastite, the high core recovery preserved in great detail an intricate stack of small pillow lavas (0.1 to 0.5 m) and numerous pillow/sediment baked contacts.

Keywords: IODP, Expedition 324, Shatsky Rise, Igneous petrology, Oceanic plateau basalt