

SVC007-08

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Uplift and subsidence of Shatsky Rise: inferred from volatiles in fresh volcanic glasses

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Shatsky Rise is a late Jurassic-early Cretaceous oceanic plateau located in the northwestern Pacific. It consists of three major massifs: Tamu, Ori and Shirshov Massifs from southwest to northeast. The Rise is 1000km x 200km, similar in size to Japan. Magnetic anomalies indicate that massifs are younger at northeast and formed along the trace of a triple junction of the mid oceanic ridge. IODP Expedition 324 drilled five sites on Shatsky Rise, two on Tamu Massif (Sites U1347 and U1348; east flank and north flank), two on Ori Massif (Sites U1349 and U1350; summit and east flank) and one on Shirshov Massif (Site U1346; summit). Drilling results show the following evidences for shallow marine (and/or possible subaerial) eruption of Shatsky Rise magma: (1) Basal sediments contain shallow-water bioclastic material at Sites U1346, U1347, U1348 and U1349, (2) Basal sediments contain benthic foraminifera characteristic of neritic and/or upper bathyal environments at Sites U1346, U1347 and U1348, (3) Some lava flows are highly vesicular up to 80% at Sites U1346, U1347 and U1349, (4) A possible paleosol is present and highly oxidized and possibly subaerial alteration is found at Site U1349. We examined the shallow marine eruption of Shatsky magma more quantitatively by volatiles in unaltered fresh volcanic glasses from Sites U1347, U1348 and U1350. CO₂ content of all volcanic glasses (~50 samples) are lower than 40 ppm and H₂O content are ranging from 0.2-0.6 wt%. The eruption (de-gassing) depths calculated by H₂O-CO₂ contents of volcanic glasses (Newman and Lowerstern, 2002) are all less than 1000m. The average eruption depths of U1347, U1348 and U1350 were 800 ± 200m (n=21), 390 ± 20m (n=2) and 710 ± 130m (n=21), respectively. Our data indicate initial uplift and post-eruption subsidence of Shatsky Rise and subsidence ratios agree well with normal oceanic lithosphere.

Keywords: eruption depth, volatile, volcanic glass, Shatsky Rise