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TITLE: Combined Sr, Nd, Pb and Hf isotopic constraints on the origin of Shatsky Rise (NW Pacific)

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ABSTRACT BODY: The submarine Shatsky Rise plateau in the northwest Pacific Ocean (ca. 1500 km east of Japan) formed during the Jurassic to Early Cretaceous. Based on magnetic reversals combined with bathymetric data, the three main volcanic massifs are proposed to have successively formed by massive volcanism along a southwest-northeast moving spreading center. We investigate a proposed interaction of a possible mantle plume head with the spreading system, Shatsky Rise volcano, in 2009 (Expedition 324 Scientists, 2010). Based on major and trace element compositions, the origin of the lavas can be explained by derivation from a normal mid-ocean ridge basalt (MORB)-like source, although a distinct depletion in Nb and Ta implies that melting started at greater depth (Sano et al. in press). A small fraction of samples (all from Ori massifs) show highly over moderately incompatible trace element ratios indicating an enriched (plume?) source.

We present compiled Sr, Nd, Pb and Hf isotope ratios from all three volcanic edifices of Shatsky Rise and a detailed trace element study. Most isotope data overlap with Pacific MORB composition although regional variations exist. Data from drill sites on the oldest edifice, Tamu massif, yield fairly uniform compositions, a wider spread is found for lavas from the Ori and Shirshov, suggesting that the source has become more heterogeneous with time (also consistent with the data reflecting a decreasing degree of melting (and therefore less homogenization of inherent plume heterogeneities) during the interaction of the spreading center with a waning plume head. Interestingly, lavas from the Ori and Shirshov show elevated ¹⁴³Nd/¹⁴⁴Nd and ²⁰⁶Pb/²⁰⁴Pb ratios, placing them closer to a composition recently proposed for a non-choyudo source which is supposed to be preferentially sampled by large igneous province volcanism (Jackson and Carlson, 2011).

Expedition 324 Scientists, IODP Prel. Rept. 324, 2010

Jackson, M.G. and Carlson, R.W., Nature, vol. 476, 2011

Sano T., Shimizu K., Ishikawa A., Senda R., Chang Q., Kimura J.-I., Widdowson M., Sager W.W. Geochemistry, 2011

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Additional Details

Previously Presented Material: Some preliminary data (30%) were presented at last years AGU fall meeting

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