Geochemical anomalies beneath the Rodrigues Triple Junction, Indian Ocean

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The Rodriguez Triple Junction (25.6°S; RTJ) is located at the intersection of the Central Indian Ridge (CIR), the Southeast Indian Ridge (SEIR) and the Southwest Indian Ridge (SWIR). Near the RTJ, these intermediate to ultra slow-spreading ridges are experiencing complex petrogenetic processes in response to the eastward propagation of the RTJ, leading occasionnally to exhumation of deep oceanic lithosphere. In this region, active hydrothermal systems are mainly found off-axis. We present new major, trace element and Sr-Nd-Hf-Pb isotope data for mafic and ultramafic rocks from on-axis RTJ and off-axis of the CIR and SEIR, recovered during a number of INDEX (Indian Ocean Exploration For Seafloor Massive Sulfide) cruises.

All samples have DUPAL-like Pb isotope ratios, characterized by high Δ8/4 (>35). At the RTJ, the lavas form two distinct geochemical groups in terms of major-trace element and Hf-Pb isotope systematics. The first group, having low $^{206}Pb/^{204}Pb$ and high $^{207}Pb/^{204}Pb$, $^{176}Hf/^{177}Hf$ and $^{143}Nd/^{144}Nd$ isotope ratios, differs from other lavas from the RTJ and those sampled away by the three ridge branches. However, basalts and gabbros from the Kairei hydrothermal vent field (25.3°S; CIR) sampled in the vicinity of the RTJ to the North broadly share the same geochemical characteristics. The second group appears to share some isotopic affinities with both the depleted end of the CIR and easternmost SWIR lavas. It has higher TiO_2, Na_2O and K_2O, as well as lower Al_2O_3 at lower MgO relative to the first group, but it strongly differs from lavas of the easternmost SWIR in terms of major and trace element systematics.

Our new data reveal that the RTJ mantle is strongly heterogeneous at a small-scale. They also indicate that the change in morphotectonic segmentation between the RTJ and the eastermost SWIR likely coincides with an isotopic and thermal boundary, with lavas from the RTJ being produced by higher extents of melting at higher pressures.