Anciently depleted mantle at Knipovich Ridge?

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Earth's mantle is highly heterogeneous. The way this heterogeneity is manifest in magmas depends on melt extraction and mixing, processes that tend to bias the compositional complexity of the source towards more enriched (or less depleted) isotopic compositions. Indeed, abyssal peridotites indicate that the mantle has Nd and Hf isotopic ratios exceeding by far those of the erupted melts [e.g., 1]. This isotopically depleted material has an important, yet underestimated, contribution on MORB chemistry, testified by parallel correlations in the Nd-Hf isotopic space [2]. The basalts from Knipovich ridge, a ~550-km long oblique supersegment in the Artic region, are characterized by the highest Hf isotope compositions amongst MORB worldwide [3], pointing to a larger than average contribution of an anciently depleted source. Linear anomalies in the magnetic field oriented at high angle (~45º) from the present ridge direction, and the occurrence of sediments Paleogene in age subsided into the rift valley suggest that the present-day ridge dissected previously existing oceanic lithosphere [5]. Here, we propose that this ridge jump results in the present-day Knipovich lithosphere to be processed for a second time, and this time the contribution from an old, refractory asthenosphere has become noticeable as the more fertile components were removed earlier. This mechanism is able to explain the anomalously radiogenic Hf isotope ratios of the Knipovich basalts, suggesting that old, refractory mantle is ubiquitous at MOR but its contribution in basalt chemistry becomes noticable where the oceanic lithosphere is re-melted due to adjustments in ridge axis.

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