Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35675

Controls on the iron isotope composition of near-ridge magmatism determined from highly heterogeneous 8°20’ N seamount lavas

MOLLY K ANDERSON, STEPHEN M ELARDO, GEORGE KAMENOV AND ELIZABETH PESAR

University of Florida

Global iron isotope estimates for mid-ocean ridge basalt (MORB) indicate that ridges are sampling a homogeneous upper mantle. A limited number of studies have found heterogeneous and heavy (relative to chondrites) iron isotope compositions among near-ridge seamounts (e.g., δ^{56}Fe from 0.03 to 0.36‰). The near-EPR 8°20’ N seamount chain has some of the largest trace element and radiogenic isotope variability found along the EPR system, which has been attributed to variably melting a highly heterogeneous sub-ridge mantle. Measuring iron isotopes from this chain therefore enables a more complete assessment of the mantle source and magmatic differentiation controls on iron isotopes in the near-ridge mantle. Here we report iron isotope measurements from 22 highly heterogeneous, well-characterized lavas from the 8°20’ N seamount chain. The δ^{56}Fe range (-0.054 ± 0.029‰ to 0.319 ± 0.010‰) among this single seamount chain far exceeds ranges observed in global on-axis MORB, largely consistent with other near-ridge seamount lavas. The incompatible element enriched lavas (EMORB, with the highest K/Ti and $[La/Sm]_N$) consistently have the highest δ^{56}Fe (≤ 0.319 ± 0.015‰). By contrast, the ultra-depleted lavas (DMORB) have the lowest δ^{56}Fe (≥ -0.054 ± 0.029‰) found so far among global MORB and near-ridge seamounts, rivaling some of the lightest iron isotopes of global peridotites. To assess source versus process controls on iron isotope variability, we combine the new iron isotope results with existing major and trace elements, radiogenic isotopes, and stable N isotopes. Preliminary results indicate that controls on iron isotope variability systematically differ between EMORB and DMORB lavas, and that a combination of source variability and magmatic processes can explain the highly heterogeneous nature of off-axis seamount iron isotopes.