Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.36339

Re-evaluating the W stable isotopes of MORBs: a case study of the Pacific-Antarctic Ridge

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Stable W isotopes have recently emerged as a promising tracer of high-temperature geochemical processes, including mantle-crust geochemical cycles [1], slab dehydration and the onset of cold subduction zones [2]. In addition, heavy $\delta^{186}W$ values compared to mid-ocean ridge basalts (MORB) reported in arc lavas suggest retention of light isotopes in the slab during dehydration [1]. However, a major limitation is the sparse characterization of stable W isotope compositions of the upper mantle. Existing constraints for MORB suggest a homogenous mantle in terms of W isotopes, but these derive from a small set of samples (n = 8) from a single locality in the Mid-Atlantic Ridge [1]. This calls for a more extensive study of the upper mantle's W stable isotope composition. Here, we present stable W isotope data (reported as $\delta^{186/184}W$ relative to NIST 3163) and W concentrations for MORB glasses from the Pacific-Antarctic ridge, south of the Chile Triple Junction. These samples are dredges collected from locations between latitudes 53°S and 41°S, during the PACANTARCTIC2 cruise in 2004-2005, and correspond with pristine glass chips from inner pillow basalts. Tungsten concentrations of the samples studied vary from 6.8 to 220 ng/g. These W concentrations are coupled with other immobile and incompatible elements (Nb and Th) and have W/Th ratios within the range of fresh MORB, implying W is derived from their mantle source(s). Full analytical completion of W stable isotope is underway. Our dataset expands global MORB W-isotope coverage by providing the first stable W isotope measurements from the Pacific ridge system, enabling direct comparison between the slow-spreading Atlantic and fast-spreading Pacific and capturing a broader range of mantle melting rates.

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