Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23432

Evolution of tungsten isotopic compositions across the Hawaiian archipelago

LORI N WILLHITE[1], VALERIE FINLAYSON[1], NICOLE M.B. WILLIAMSON[2], DR. DOMINIQUE WEIS, PHD[2] AND RICHARD J. WALKER[1]

[1]University of Maryland
[2]University of British Columbia
Presenting Author: lorinwillhite@gmail.com

Investigating the spatio-temporal isotopic evolution among Hawaiian volcanoes has allowed a greater understanding of Hawaiian plume structure and dynamics. For example, the evolution of $\mu^{182}W$ in samples from the Hawaiian Scientific Drilling Project drill core (HSDP-2) demonstrates that negative anomalies were most significant when the Mauna Kea volcanic center was proximal to the plume center, where mantle potential temperatures are highest. The magnitude of the negative anomalies appears to correlate with excesses in Ti and Nb. These correlations may link $\mu^{182}W$ deficits to early (*i.e.,* within the first 60 Myr of Earth's history), deep, magma ocean processes. Alternatively, if $\mu^{182}W$ deficits result from isotopic equilibration between the core and lowermost mantle, then the reactive lithology at the core-mantle boundary may consist of recycled eclogitic crust characterized by enrichments in Ti and Nb. Volcanoes along the archipelago comprise two parallel geographic and geochemical trends, the Loa and Kea trends. Available $\mu^{182}W$ data from Hawai‘i do not show a systematic difference between the two trends, although data is limited to n = 19 samples from the Mauna Loa, Mauna Kea, Kīlauea, Kohala, and Kama‘ehuakanaloa (formerly known as Lō’ihi) volcanoes. Furthermore, the isotopic composition of both the Loa and Kea trends are heterogeneous over time such that six geochemical subgroups have been identified along the Hawaiian archipelago: Kea, transitional Kea, Kohala, and Loa, enriched Loa, and Lō’ihi (Weis et al., 2020). These subgroups may reflect the mixing of different proportions of the ambient mantle, well-preserved primitive material, recycled components, etc. To test whether the $\mu^{182}W$ compositions of the six subgroups vary systematically, we expand the Hawaiian $\mu^{182}W$ dataset to include greater geographic and temporal sampling of the Hawaiian Islands. Here, we provide the first $\mu^{182}W$ data from Kaua‘i, which hosts both Loa and Kea trend volcanics, and additional $\mu^{182}W$ data from each of the previously identified geochemical subgroups in Hawai‘i.

[1] Weis et al. (2020) *Geochemistry, Geophysics, Geosystems*, 21, e2020GC009292.