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Evolution of tungsten isotopic compositions in the Mauna Kea volcanic system

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Ocean island basalts (OIB) sample multiple mantle components that reveal long-term chemical and isotopic heterogeneity in the mantle on a global scale [Zindler & Hart, 1986]. Discovery of negative ^{182}W anomalies in some OIB, as well as anti-correlations between μ^{182}W and ^{3}He/^{4}He among certain OIB systems, suggests that at least some mantle plumes may access relatively isolated and/or core-equilibrated reservoirs within Earth's interior [Mundl-Petermeier *et al.* 2020]. Correctly interpreting the causes of the isotopic systematics, for which multiple hypotheses have been tendered, may provide new insights into the dynamics of the deep Earth. Rather than attempting to assess the coupled isotopic heterogeneities through examination of a global dataset, here we focus on the evolution of μ^{182}W and ^{3}He/^{4}He in a single volcano, Mauna Kea, Hawaii. Samples are from the Hawaiian Scientific Drilling Project 2 core. Negative μ^{182}W values and elevated ^{3}He/^{4}He ratios are observed in the deepest portions of the stratigraphic section (~3 km depth with a model age of ~550 ka [Eisele *et al.*, 2003]). The anomalous compositions were present for at least 50 kyr. Greater temporal resolution will illuminate whether the magnitude of the negative μ^{182}W signal is reduced or intensified at intervals between 550 ka and 500 ka, and whether they continue to correlate with ^{3}He/^{4}He throughout the sequence. There is no resolvable μ^{182}W anomaly at 484 ka, which is the youngest sample yet characterized for μ^{182}W in the Mauna Kea stratigraphic section. Normal to moderately elevated ^{3}He/^{4}He is observed in the stratigraphic section above 484 Ka, so it will be diagnostic if these lavas also sample the anomalous μ^{182}W portion of the plume. As characterization of the evolution of μ^{182}W at Mauna Kea improves, we will integrate the ^{182}W and ^{3}He/^{4}He isotopic data with other radiogenic isotopic systems (e.g., Sr-Nd-Pb-Os), and major and trace element systematics. The presence or absence of correlations will allow us to deconvolve changes in componentry and/or melting dynamics of the mantle source over time. This information can ultimately be compared with, and applied to the global framework to inform on the origin and evolution of μ^{182}W and ^{3}He/^{4}He in global OIB.