^{182}W deficits in modern ocean island basalts: vestiges of Earth's accretion?

G.J. ARCHER[1*], A. STRACKE[2], AND T. KLEINE[1]

[1]Institut für Planetologie, University of Münster, 48149 Münster, Germany (*archer@uni-muenster.de)
[2]Institut für Mineralogie, University of Münster, 48149 Münster, Germany

Prior studies have reported deficits in ^{182}W (^{182}Hf → ^{182}W + 2β^-; $t_{1/2}$ = 8.9 Ma) for some modern ocean island basalts (OIBs) that appear to be negatively correlated with ^{3}He/^{4}He [e.g., 1,2,3]. Proposed explanations for these anomalies have so far included very early differentiation processes (within the first 60 Myr of Solar System history) in Earth's mantle [1] and core-mantle exchange [2,3]. All prior studies reporting ^{182}W deficits in OIBs relied on TIMS [4], while a prior MC-ICPMS study did not find anomalous ^{182}W in OIBs [5]. To evaluate whether OIBs have negative ^{182}W and to further investigate possible causes of these anomalies, we measured the ^{182}W isotopic compositions of Samoan and Hawaiin OIBs using MC-ICPMS.

The μ^{182}W values (ppm deviations of ^{182}W/^{184}W from terrestrial standards) for Hawaiin and Samoan OIBs measured in our study range from *ca.* 0 to -15, and appear to be roughly correlated with ^{3}He/^{4}He, consistent with previously reported results [1,3]. Based on these new data, we will discuss models that may explain the ^{182}W-^{3}He/^{4}He data, including core-mantle interaction and the incorporation of mantle material formed within the first 60 Myr of Solar System history. We will also propose that the ^{182}W anomalies may be the result of accessing materials that were accreted early in Earth's history and preserved until the present due to at least partial isolation from the convecting mantle.

[1] Mundl et al. (2017), *Science* **356**, 66-69. [2] Rizo et al. (2019), *Geochem. Persp. Let.* **11**, 6-11. [3] Mundl et al. (2019), *Geochim. Cosmochim. Acta* **271**, 194-211. [4] Archer et al. (2017), *Int. J. Mass. Spectrom.* **414**, 80-86. [5] Willbold et al. (2011) *Nature* **477**, 195.