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# Exploring Correlations Between Anomalous $^{187,186}Os$ and $^{182}W$ in Mantle-derived Rocks

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Correlations between suprachondritic $^{187}Os$ and $^{186}Os$ in some plume-derived lavas have previously been explored as possible indicators of core-mantle interactions [1]. This connection has largely been discounted based on the inferred young age of the inner core. Late onset of inner core crystallization would provide insufficient time for the outer core, with potentially fractionated Re/Os and Pt/Os, to grow anomalously radiogenic $^{187,186}Os$ for these two, long-lived systems. More recently, negative $^{182}W$ anomalies present in some plume-derived lavas have been found to correlate with high $^{3}He/^{4}He$ [2-3]. Tungsten-182 is the decay product of the short-lived $^{182}Hf$; variations in $^{182}W/^{184}W$ must reflect early-Earth processes. Based on the assumption of bulk Earth having a chondritic $^{182}W/^{184}W$ composition, it is inferred that the isotopic composition of the core is ~200 ppm lower than that of the bulk silicate Earth. Several recent studies have, therefore, interpreted the observed W-He correlations as evidence for some form of interaction between the outer core and a primordial mantle component incorporated in the plumes [3-4]. Concentrations of both Os and W are much higher in the core than in the silicate Earth, so any process that could conceivably transfer the isotopic composition of the outer core to the mantle would be expected to affect both systems. It is important to assess whether or not a correlation exists between $^{187,186}Os$ and $^{182}W$ isotopes in the mantle, as the nature of possible correlations could be diagnostic of the process involved. At present, the availability of data for both isotope systems obtained from same rocks is limited. In part, this stems from the fact that most lavas derived from high-degrees of partial melting, e.g., picrites and komatiites, that contain relatively high concentrations of Os, also inherently have very low concentrations of W. Conversely, volcanic rocks derived from low-degrees of partial melting, e.g., basalts, with relatively high concentrations of W, have very low Os concentrations. Thus, pairing the isotopic compositions of both elements in a single sample is even more challenging than performing the individual analyses. We will review the existing data for modern and ancient rocks and discuss the most promising directions for future studies.

[1] Brandon et al. (1998) 10.1126/science.280.5369.1570
[2] Mundl et al. (2017) 10.1126/science.aal4179
[3] Mundl-Petermeier et al. (2020) 10.1016/j.gca.2019.12.020
[4] Rizo et al. (2019) 10.7185/geochemlet.1917