W Isotopic Compositions of Barberton and Pilbara Komatiites and Basalts

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Prior studies have reported small variations in $^{182}W/^{184}W$ ($^{182}Hf \rightarrow ^{182}W + \beta^-$; $t_{1/2}$=8.9 Myr) for mantle-derived rocks from the Archean and Phanerozoic [e.g., 1-4], indicating that sluggish mixing allowed some early-formed mantle domains to remain chemically isolated for billions of years. The processes that created the reservoirs with variable $^{182}W/^{184}W$ remain unclear, but crystal-liquid fractionation in a magma ocean [2], metal-silicate equilibration at the base of a magma ocean [2], and/or heterogenous distribution of late accreted components with low $^{182}W/^{184}W$ [1] may have played roles. To further constrain the frequency and origin of $^{182}W/^{184}W$ variations, we investigated the $^{182}W/^{184}W$ of komatiites and basalts from different localities worldwide, including the Weltevreden (3.3 Ga) and Komati (3.5 Ga) formations of the Barberton Greenstone belt, as well as the Ruth Well (3.3 Ga) and Warawoona (3.4 Ga) formations of the Pilbara Craton.

Consistent with previously reported results [2], the $\mu^{182}W$ (part per million deviations of $^{182}W/^{184}W$ from terrestrial standards) of komatiites from the Komati and Weltevreden formations are not resolved from standards. By contrast, the $\mu^{182}W$ values of Pilbara mafic volcanics are *ca.* +15 for the Warawoona and Ruth Well formations. The enrichments are similar in magnitude to those previously reported for rocks from a few other localities, including Kostomuksha, Isua, and Nuvvuagittuq [1,2,5]. The $\mu^{182}W$ values of the Pilbara samples likely reflect the $\mu^{182}W$ of their mantle source, and provide additional evidence that some early formed mantle reservoirs were preserved for billions of years. The processes that generated the positive $\mu^{182}W$ values of the mantle source of the Pilbara rocks are currently not well constrained, but the enrichments may be explained by processes similar to those listed above. Data for highly siderophile element abundances, as well as $^{142,143}Nd$ and $^{186,187}Os$ isotopic systematics will be obtained in the future to provide further constraints.

[1] Willbold *et al.* (2011), *Nature* **477**, 195-198. [2] Touboul et al. (2012), *Science* **335**, 1065-1069. [3] Rizo et al. (2016) *Science* **352**, 809-812. [4] Puchtel et al. (2016) *Geochem. Geophys. Geosyst.* **17**, 2168-2193. [5] Touboul et al. (2014) *Chem. Geol.* **383**, 63–75.