Tungsten isotope patterns of rocks from the Pilbara Craton, Australia

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Recent analytical improvements have revealed the presence of small ^{182}W isotope anomalies in terrestrial rocks ranging in age from the Archean [e.g.1-2] to Phanerozoic [e.g. 3-4]. Both, excesses [1,4] and deficits of ^{182}W [2,3], respectively, have been found. The ^{182}W isotope anomalies are vestiges of ancient chemical heterogeneities that have been preserved in Earth's mantle. Incomplete addition of late veneer or early silicate differentiation are the two preferred explanations for the ^{182}W anomalies. A straigthforward interpretation of ^{182}W anomalies, however, is often hampered by disturbed elemental W patterns that are often affected by secondary W enrichments in altered rocks [e.g. 2,5].

Here, we present the first comprehensive high-precision ^{182}W isotope dataset for mafic Archean rocks from the Pilbara Craton, NW Australia, that is one of the best preserved early Archean successions on Earth. Our set of samples covers all major mafic units of the Pilbara Supergroup. All samples were initially screened for W-alteration by isotope dilution measurements of high field strength elements (HFSE), U, and Th. Only those samples were further considered that exhibit primary W abundances, as reflected by canonical W/Th ratios. All measured samples from the Pilbara Supergroup exhibit positive ^{182}W excesses ranging in $\mu^{182}W$ from +6 to +14ppm with uncertainties generally better than ±5 ppm (95% conf. limit). Samples from the Warrawoona Group are indistinguishable with a mean excess of +9.4 ± 2.6 ppm (95% conf. limit), significantly lower than previously reported [6]. At present, the origin of the ^{182}W isotope anomalies in the Pilbara Craton cannot unambiguously be resolved. However, independent evidence for older depleted mantle domains is provided by consistently superchondritic ε Hf(t) and ε Nd(t), ranging from 0 to +3.2 and +0.3 to +2.0, respectively.

[1] Willbold et al. (2011) *Nature* **477**, 195-198. [2] Puchtel et al. (2016) *G³* **17**, 2168-2193. [3] Mundl et al. (2017) *Science* **356**, 66-69. [4] Rizo et al. (2016) *Science* **352**, 809-8012. [5] Tusch et al. (2017) *Goldschmidt 2017*. [6] Archer et al. (2017) *Goldschmidt 2017*.