Ultra-radiogenic hafnium in Archean BIF: intense sedimentary Lu/Hf fractionation at 3.2 Ga

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The emergence of continental crust above sea level in the early Precambrian would have created the first terrestrial habitats, and initiated atmosphere-driven weathering of the continents, yet the history of continental emergence is largely unknown[1]. Precambrian chemical sediments, specifically Banded Iron Formation (BIF), appear to have sampled the Hf-Nd isotope composition of ancient seawater, and may preserve a historical record of the emergence of the continental landmass[2] via Lu/Hf fractionation induced during subaerial weathering[3,4]. However, paired Hf-Nd isotope data are available for only one BIF to date, indicating appreciable emerged continental landmass ca. 2.7 Ga[2].

Our preliminary work extends this record back into the Eo- and Meso-Archean using samples of 3.7 Ga BIF from Isua, Greenland, and 3.2 Ga BIF from the Moodies Group, S. Africa. Hf isotope systematics in Isua samples appear to have been altered by amphibolite-grade metamorphism. Moodies Group samples, however, appear to retain primary signatures. Their range in $\varepsilon Hf_{(i)}$ values, from -54.6 to +40.7, is among the most extreme ever reported, pointing to unusual and intense sedimentary Lu/Hf fractionation during the Mesoarchean relative to today.

[1] Flament et al. (2013), *Precambrian Res.* **229**, 177-188. [2] Veihmann et al. (2014), *Geology* **42**, 115-118. [3] Bayon et al. (2006), *Geology* **34**, 433-436. [4] Vervoort et al. (2011), *Geochim. et Cosmochim. Acta* **75**, 5903-5926.