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Unraveling μ^{142}Nd anomalies of late Archean continental crust

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The rate of net-continental growth across Earth's history is critical for evaluating the geodynamical processes which dominated the early Earth. Models of continent formation suggest the nascent production of continental crust began prior to the Archean and modern tectonic-driven lithospheric development[1]. However, there is a scarcity of ancient Hadean material preserved at the surface, making it difficult to construct a comprehensive view of the deep-time continental record[2]. Notably, the Slave Province (Canada) features a near-constant record of episodic Archean crustal growth, with 4020-2850 Ma gneisses across the Acasta, Central Slave, and Tree River regions. Additionally, 2620-2580 Ma granitoids occur across the province, with long-lived Nd-isotope and Pb-isotope data indicating formation from both ancient and juvenile sources[3]. The amalgamation of extant older crust with potential younger juvenile crust makes the Slave Province an excellent testing ground for continental growth models.

Archean terranes are dominated by granitoids including tonalite-trondhjemite-granodiorites (TTGs) and younger Neoarchean granites, some of which have diagnostic evidence for derivation from a Hadean protocrust[2]. Widespread melting of ancient Hadean crust in the late Archean suggests large quantities of ancient crust were potentially stable for a billion years during the Archean Eon. Ancient crust can be traced within the products of later magmatism with the use of short-lived isotope systems, specifically the ^{146}Sm-^{142}Nd system. O'Neil and Carlson (2017) indicated anomalously low μ^{142}Nd (^{142}Nd/^{144}Nd normalized to the bulk terrestrial composition) of late Archean TTGs of the Superior Province, suggesting these rocks formed from reworking of an ancient (> 4200 Ma) mafic precursor.

Our results document a more widespread presence of Hadean signatures in Eoarchean crust than previously reported (ca. -16 ppm μ^{142}Nd). Additionally, our initial data from granitoids may suggest reworking of ancient crust occurred in the Neoarchean. In this work we will present and discuss high-precision whole-rock ^{142}Nd isotopic compositions for fourteen Neoarchean granitoids and Meso- to Eo-Archean gneisses from across the Slave Province, to further explore the degree of reworking of ancient crust and better constrain crustal growth models.

[1]Dhuime, et al. (2012), *Science*, 335(6074), 1334-1336. [2]O'Neil & Carlson (2017), *Science*, 355, 1199-1202. [3]Davis, et al. (1996), *Chem.Geo.,* 130(3-4), 255-269.