

Evolution of upper continental crust from ^{142}Nd in glacial diamictites

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Terrestrial variations in $^{142}\text{Nd}/^{144}\text{Nd}$ derive from the decay of short-lived ^{146}Sm (half-life = 0.103 Ga), and reflect silicate differentiation during the first 0.5 Ga of Earth's history. Early Earth terranes record enrichments and depletions of some 20 ppm in $^{142}\text{Nd}/^{144}\text{Nd}$, while modern volcanic rocks show almost no variation. Quantifying the persistence or disappearance of crust formed from Hadean components can help constrain the growth rate of continents through time and possibly the onset of plate tectonics.

We focus here on defining the secular variation in $^{142}\text{Nd}/^{144}\text{Nd}$ compositions of the upper continental crust (UCC), using a well-studied suite of fine-grained diamictites from four continents that were deposited between c.2.9 Ga and c.0.3 Ga. These glacial deposits provide robust averages of the composition of upper continental crust (UCC) at the time and place of their provenance. Their compositions record milestones of Earth's evolution: the transition of average Archean UCC composition from mafic to felsic [1]; and the Paleoproterozoic onset of oxidative weathering [2]. Detrital zircon ages and ^{143}Nd model ages suggest some diamictites with Paleo-Proterozoic depositional ages include a large contribution from Archean components [3,4], yet their ^{182}W signatures appear to indicate that W in the UCC and mantle had been largely isotopically homogenized by at least the Paleoproterozoic [3]. To evaluate the extent to which UCC retains the imprint of source regions formed by silicate processing during the Hadean, we will present ^{142}Nd data on these diamictites. To assure complete dissolution, diamictite samples were fused using lithium metaborate; Nd purification and TIMS analysis methods are described in [5]. Well-resolved depletions in $^{142}\text{Nd}/^{144}\text{Nd}$ are present in 2.9 Ga diamictites from the Kaapvaal Craton.

[1] Gaschnig RM et al., 2016 GCA 186:316-343. [2] Gaschnig RM et al., 2014; EPSL 408, 87-99. [3] Mundl A et al., Chem. Geol. 2018, 494, 144-152. [4] Cornell DH et al., 2011, Lithos 152, 482-502. [5] Horan MF et al., 2018, EPSL 484, 184-191.

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