

^{142}Nd Anomalies in Mid- to Late-Archean Sedimentary Rocks: Large-scale Recycling of Hadean Crust?

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Excesses and deficits in ^{142}Nd compared to modern values are powerful tracers to identify remnants of early-differentiation events in terrestrial rocks. So far, the youngest anomalies have been found in ca. 2.7 Ga-old igneous rocks from the Superior Province in Canada (Debaille et al, *EPSL*, 2013; O'Neil and Carlson, *Science*, 2017). Here, we focused on sedimentary rocks that average the composition of large continental areas to see whether the ^{142}Nd anomalies are restricted to a few igneous bodies or are more widely distributed over the cratons. We analyzed the Nd isotopic compositions of sandstones, shales and cherts from the Superior Province (Quetico, Wawa and Wabigoon Sub-provinces, ca. 2.7 Ga) and from the Barberton granite-greenstone belt (Fig Tree group, 3.23-3.26 Ga; Buck Reef, 3.42 Ga).

Since a few studies have suggested that ^{142}Nd anomalies may result from analytical artifacts during TIMS measurements, we developed a new method based on a 4-line acquisition scheme to (1) determine all Nd isotope ratios dynamically and (2) better evaluate the quality of individual runs. Based on observations and statistics, we defined criteria for which a run should be rejected and introduced a systematic drift-correction for changing mass fractionation when using ratios from different acquisition lines. On three instruments over a 1.5 year interval, measurements yielded long-term precisions < 4, 3, 3, 8, and 20 ppm (2s) for dynamic $\mu^{142}\text{Nd}$, $\mu^{143}\text{Nd}$, $\mu^{145}\text{Nd}$, $\mu^{148}\text{Nd}$ and $\mu^{150}\text{Nd}$, respectively, increasing the across-laboratory reliability of measured ^{142}Nd anomalies in samples. After drift-correction, residual ^{142}Nd deficits exist in a few Barberton samples and low but systematic excesses are recorded in most Superior Province sediments. These excesses cannot be generated by the 2.7 Ga rocks with ^{142}Nd deficits in the northern Superior Province but are proximal to the tholeiites in the southern Superior that contain ^{142}Nd excesses. Thus, sediments can be used effectively to probe for > 1.5 Ga-old heterogeneities and suggest that reworking of Hadean crust may be more widespread than previously thought.