Reworking of enriched ^{142}Nd signatures in early Archean crustal rocks from the eastern Kaapvaal Craton (South Africa)

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The short-lived ^{146}Sm-^{142}Nd isotope system is an important tool for tracing crust-mantle differentiation processes that operated on the early Earth. In this study, we report the first comprehensive set of high precision ^{142}Nd analyses for granitoids and amphibolites from the Ancient Gneiss Complex (AGC; Swaziland) and the Barberton Greenstone Belt (BGB; South Africa). The investigated samples span an age range of 3661 Ma to 3216 Ma, representing the main geological units of the AGC and the lower Onverwacht Group of the BGB. Measured μ^{142}Nd values range from -6.2 ± 3.1 ppm to +3.0 ± 3.0 ppm for most samples. Five samples show a tendency to slightly negative μ^{142}Nd anomalies that are, however, within error not clearly resolvable from the JNdi-1 standard (2sd <4.5 ppm, n=30). The only confidently resolvable μ^{142}Nd anomalies are found in a 3442 Ma Ngwane Gneiss sample and in amphibolites from the 3450 Ma Dwalile Greenstone Remnant, revealing μ^{142}Nd values of -7.9 ± 3.1 ppm (2se) and -6.2 ± 1.8 ppm (2sd, n=2), respectively. Interestingly, the μ^{142}Nd deficits do not correlate with age or ε^{176}Lu and ε^{143}Nd values. Instead, our results reveal complex reworking of older felsic crust that was initially produced from melting of an enriched Hadean mafic protocrust. Such complex intracrustal differentiation processes have been previously proposed for the AGC based on Hf isotope compositions in zircons [1;2] and geochemical modelling on ca. 3.45 Ga granitoids [3].

[1] Kröner, A. et al. (2014) *Precambrian Res* **255**, 823–846. [2] Kröner, A. et al. (2016) *Precambrian Res* **279**, 123–143. [3] Hoffmann, J.E. et al. (2016) *Precambrian Res* **276**, 43–66.