

## A 2 billion-year record of cratonic lower crust formation and evolution

S. AULBACH<sup>1</sup>, C. KRAUSS<sup>2</sup>, B. FÖRSTER<sup>1</sup>, A.  
GERDES<sup>1</sup> AND T. CHACKO<sup>2</sup>

<sup>1</sup>Institut für Geowissenschaften, Goethe University  
Frankfurt, Germany (s.aulbach@em.uni-  
frankfurt.de)

<sup>2</sup>Earth and Atmospheric Sciences, University of  
Alberta, Edmonton T6G 2E3, Canada

Kimberlite-borne granulite xenoliths provide rare insights into the age, composition and tectonothermal evolution of lower continental crust (LCC). Whole-rock Nd-Hf isotope compositions of nine mafic (MGX), one gabbroic (GGX) and two metasedimentary (SGX) granulite xenoliths from the central Slave craton, combined with mineral radiogenic isotope compositions, span ages between ca 3.3 and 1.3 Ga. The trace-element patterns of some MGX, with depletions in Sr, Eu and Ti, but enrichment in Pb, suggest the addition of ?subduction fluids to their mantle source and crystallisation in the crust after fractionation of plagioclase.

Single sulphides in two MGX lie on a 3.3 Ga array coinciding with a period of juvenile crust and deep lithospheric mantle formation during plume impingement beneath the pre-existing cratonic nucleus [1]. The large spread in Re/Os for these sulphides suggests that they essentially behave as “islands” within the silicate matrix. Sm-Nd isotopes in MGX show large scatter, but fall on a 2.7 Ga age array with depleted initial  $\epsilon_{Nd}$ . This contrasts with their enriched Sm/Nd, which may have been acquired during interaction with fluids in the course of craton amalgamation at that time. The Lu-Hf errorchron age for these samples ( $2.29 \pm 0.12$  Ga) is somewhat younger than zircon ages (2.64-2.51 Ga) for similar samples from the central Slave craton [2]. Given that the middle CC in parts of the Slave craton experienced temperatures  $>825^\circ\text{C}$  at  $\sim 2.59$  Ga [3], and that MSX are now virtually biotite-free, it is likely that the LCC was substantially hotter at the time. This, combined with a mildly enriched initial  $\epsilon_{Hf}$  of -2.3, may indicate isotopic resetting during a thermal/metamorphic event when the LCC had already evolved for some time at measured, predominantly sub-depleted mantle Lu/Hf. It also casts doubt on the age significance of Sm-Nd isotopes, given that this system should be less robust than Lu-Hf. Finally, U-Pb in rutile gives upper intercept ages coincident with the giant Mackenzie dike swarm event at 1.27 Ga, indicating that rutile in the lower crust has been below the effective blocking temperature with respect to U-Pb since that time, whereas zircon was transparent to this event.

[1] Aulbach *et al.* 2010 *GCA*; [2] Davis *et al.* 2003 *Lithos*; [3] Pehrsson *et al.* 2000 *Geology*