Iron isotopic composition of the lower continental crust

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Knowledge of the Fe isotopic composition of the deep continental crust can potentially provide constraints on the growth history of the bulk crust, and Fe isotope fractionation during intra-crustal differentiation. Here we report Fe isotope data for 27 well-characterized granulite xenoliths from Chudleigh and McBride, Australia. The Chudleigh xenoliths display limited Fe isotopic variation (δ^{56}Fe = -0.006 to 0.094‰), which are positively correlated to Nb/La, likely inherited from their protoliths. McBride xenoliths have much heterogeneous isotopic composition (δ^{56}Fe = -0.248‰ to 0.287‰), with δ^{56}Fe negatively correlating with δ^{26}Mg. Calculations indicate a role of Fe-Mg inter-diffusion, which likely occurred during granulite metamorphism. Overall, the lower crust has a heterogeneous Fe isotopic composition, with a weighted mean of 0.050±0.010‰ (2se, 95% c.i.), significantly lower than the estimated upper crustal composition ~0.10‰. Collectively, the bulk continental crust has a mean Fe isotopic composition of 0.065‰, which is different from oceanic basalts but more close to arc lavas, hence supports the consensus that continental crust dominantly grew in arcs.