

The Tl and Cr isotope composition of the upper continental crust from the Archean to present

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Both thallium and chromium isotopes are fractionated by surficial processes, especially in marine systems. If continental crust has been produced primarily at subduction zones through most of Earth's history, fractionated isotope signatures carried by subducting slabs might be expected to result in significant isotope heterogeneities in the composition of the upper continental crust (UCC)

We characterized the Tl and Cr isotope composition of the UCC by analysing glacial diamictites with depositional ages ranging from Mesoarchean to Paleozoic. Tl isotope compositions of glacial diamictites do not systematically vary with age and have an average $\epsilon^{205}\text{Tl}$ of -1.9 ± 2.4 (1 SD), indistinguishable from published estimates of the modern UCC and depleted MORB mantle (DMM). Additionally, Cr isotopes show limited systematic variation with age and have an average $\delta^{53}\text{Cr}$ of -0.12 ± 0.06 , comparable to DMM. The isotope composition of continental input to oceanic archives for these systems therefore remained constant throughout Earth's history, which suggests that variation in inputs do not account for variations in the sedimentary record, reiterating the importance of ocean oxidation as the primary driver.