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Early Earth decoupling of Hf-Nd isotopes: the accessory mineral perspective

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The widespread application of Hf isotope analyses of zircon, particularly using *in situ* methods, has profoundly shaped our understanding of early Earth's evolution. These data reveal that the earliest silicic (zircon-bearing) crust in nearly all Eo- to Paleoarchean cratons was derived from a broadly chondritic source, with a conspicuous lack of signatures from a depleted reservoir. The Sm-Nd record from the same localities determined via bulk-rock analyses paints a very different picture of early crust-mantle evolution, in that both strongly positive and negative e_{Nd} values are registered. Importantly, the positive e_{Nd} values suggest the formation of a suprachondric reservoir(s) very early in Earth's history. To address this Hf-Nd discrepancy recent studies have utilized *in situ* analysis of Sm-Nd isotopes in rare earth element (REE) enriched minerals like apatite and titanite. These mineral-scale results demonstrated modification of the Sm-Nd isotope system in Eo- to Paleoarchean gneisses that show highly variable and non-chondritic whole-rock isotope compositions. Here, we examine and reconcile the behaviour of Sm-Nd and U-Pb isotopes in accessory minerals and bulk-rocks from Eo-to Paleoarchean cratons with different metamorphic histories. We discuss the implications of these data for the early Earth Hf-Nd isotope record, and for formation of ancient continental and mantle reservoirs.