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Crustal evolution of south Indian granulites: Insights from zircon Hf isotopes

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Hafnium isotope signature in zircons combined with precise U-Pb age dating, is a powerful tool to understand the role of crustal reworking and/or juvenile magmatism in the evolutionary history of a terrane. This is particularly applicable in case of Precambrian granulite terranes, which have witnessed many cycles of igneous emplacement, metamorphism and sedimentation. The Precambrian granulite terrane of south India, known as the Southern Granulite Terrane (SGT), preserves a continuous record of distinct magmatic and metamorphic episodes spanning Late Archaean-Neoproterozoic. This study reports new 290 zircon U-Pb/Hf data from different rock types including basement charnockites, gneisses, granites, intrusive alkaline bodies and quartzites, from the central part of SGT known as the Madurai Block. This in combination with 595 zircon U-Pb/Hf data reported earlier (presented in the U-Pb age vs Epsilon Hf diagram) points to distinct juvenile magmatic and crustal recycling pattern in the terrane. The results show that crustal growth via juvenile magmatic addition is restricted upto ~1.9 Ga, succeeded by a period of intense crustal reworking incorporating older crustal components and spatially limited juvenile magmatism. These results are significant considering the presently proposed model of SGT as a collage of sutured crustal blocks that amalgamated only during the final phase of East African orogeny.