

Timing of high-grade metamorphism in Madurai Block, south India: Insights from new U-Pb zircon & monazite ages

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Madurai Block represents the largest crustal block within Southern Granulite Terrain (SGT), south India with crustal evolution history ranging from Early Archaean to late-Neoproterozoic. The granulites in Madurai Block preserve evidences for polyphase deformation, multiple tectonothermal and multiphase exhumation episodes. Kambam ultra-high temperature Belt (KUB), within the Madurai Block preserves rare occurrences of UHT mineral assemblages bordering the transcrustal Suruli shear/suture zone. This provides a unique opportunity to study UHT metamorphism and deformation in relation to Gondwana assembly. New U-Pb zircon ages from sapphirine-bearing granulites from the area records Paleoproterozoic high-T metamorphism and crustal anatexis ca. 2.5 Ga with Ti-in-zircon temperatures > 650°C. This event was synchronous with the emplacement of carbonatites and quartz monzonites dated ca. 2.5 Ga. This pervasive event is also recorded in high-pressure granulite facies metamorphic rocks of Moyar-Bhavani-Cauvery suture and Salem Block in SGT. The Paleoproterozoic tectonothermal event is strongly overprinted by the late-Neoproterozoic granulite facies metamorphism recorded in monazites with new ages clustered around ca. 535 Ma. This event represents significant partial melting and UHT metamorphism in the area resulting in the formation of sapphirine-bearing assemblages at > 6 kbar and > 900°C. Our new results provide alternate interpretations to the currently accepted tectonic models proposed in SGT.