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Karur–Kambam–Painavu–Trichur Shear Zone (KKPTSZ) as a possible terrane boundary in Madurai Granulite Block, Southern India: Current understanding and future perspectives

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The Southern Granulite Terrane (SGT) of southern India being a regional granulite-facies terrane with exposed mid- to lower-crustal rocks has been the attention of several studies focusing on amalgamation of Gondwana supercontinent. It comprises of a collage of several crustal blocks bisected by crustal scale shears [1]. Among these, the Madurai Granulite Block (MGB) forms the central and largest block in SGT, bounded by Palghat-Cauvery Shear Zone (PCSZ) to the north and Achankovil shear zone (AKSZ) in the south. Within the MGB, a V-shaped shear zone extending towards SW direction from Karur to Kambam, then taking a sharp NW turn at Painavu Shear Zone (KKPTSZ) in the central region of the MGB. Previous studies, however, contradict on the nature and evolution of the KKPTSZ [2,3]. The lithological makeup north of the shear zone is more comparable to the counterparts of Dharwar Craton, while the rocks south of the KKPTSZ are more akin to those of the Eastern Ghats. A recent tectonic model suggests the extension of Karur–Kambam lineament up to the AKSZ, and demarcated it as Kambam ultrahigh-temperature (UHT) belt [2] This has been interpreted to mark a fundamental collisional crustal boundary between eastern and western MGBs. Though, the newly suggested eastern and western crustal block model has greatly aided in understanding the evolution of the HP-UHT belt in north-central MGB, it suffered with inadequate data in identifying basement characteristics and age variations in southern part of the MGB. The present study attempts to synthesize multifarious geological information across the terrain integrated with new petrological, geochemical data for a comprehensive understanding of tectonic and metamorphic processes and thereby crustal evolution in the central Madurai block. The petrological and geochemical characteristics of the granulite-facies rocks suggest igneous origin of the protolith by partial melting of the source region. They are enriched in Na_2O over K_2O, thus the K_2O/Na_2O ratio is less than one suggesting it is Tonalitic charnockite [4]. The K/Rb values of the charnockite vary between 81 and 400 with an average of about 245. Ba/Rb ratios in the charnockites are high, between 3.95 and 27.58 (average 12.23) indicating that they are not derived directly from a mantle melt, rather suggesting the role of internal differentiation of a pre-existing TTG-type crust through intra-crustal melting [5]. The result gives similarity to arc granitoid, while from the major and trace element data it is inferred that the formation is during a collisional event. With limited isotope geochronology data and field evidence, the argument of KKPTSZ as a possible terrain boundary is withered. Therefore, more convincing field-based data, integrated

with petrological, geochronological, and phase equilibria models are required from this belt for a comprehensive understanding of the crustal evolution in Madurai Block.

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