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High-grade gneiss terrains of southern India: The imperative archives for early Earth tectonics and secular lithospheric evolution

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The plate tectonic system in silicate planets is not at all generated automatically, but triggered due to thermo-mechanical changes leading to the formation of a dynamic system that helps the planet to dissipate its internal heat. Widely available models, however, discourse conflicting time periods such as one school of thought favours a late initiation of tectonics only within the last 1000 million years in Earth history [1], whereas others argue that the tectonic processes were in operation as early as 4.4–4.5 billion years ago [2,3]. Therefore, it is essential to infer the timing of the initiation of plate tectonics and to interpret the consequences of changes that might have been recorded in geological formations through time to unravel the intricacies concerning the evolution of the Earth. Here, an attempt is made to address the question of "when did plate tectonics begin?" or more precisely, when exactly did the modern-style plate tectonics took over from an earlier style of tectonics by evaluating the genesis of lower-crustal derived metagranitoids of southern India.

The metagranitoids of southern Indian granulite terrain (SGT) record multiple episodes of tectono-magmatic events with distinct spatio-temporal as well as chemical affinities. The contrasting metagranitoid groups comprise (i) metatonalites with characteristic Archaean tonalite–trondhjemite–granodiorite (TTG) affinity and (ii) metagranites showing geochemistry archetypal of the post-Archaean granites. The petrological and geochemical variations of these granitoids are argued as a consequence of the difference in their tectonic styles. In recent years, the documentation of accretion and/or collision tectonics for the terrane assembly from Archaean magmatic rocks offered avenues for the confirmation of early tectonic processes operated in this region [4]. The contrasting magmatic episodes of the SGT, thus, provide evidence for the disputed change in subduction style, suggesting as flat subduction of old mafic crust in the Archean followed by a change in tectonic style from flat to steep during the Archaean–Proterozoic transition.

[1] Stern (2005) *Geology* **33,** 557–560. [2] Harrison, Blichert-Toft, Müller, Albarede, Holden & Mojzsis (2005) *Science* **310**, 1947–1950. [3] Bercovici and Ricard (2014) *Nature* **508**, 513–516. [4] Ravindra Kumar & Sreejith (2016) *Lithos* **262**, 334–354.