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What drives and sustains high geothermal gradient metamorphism during Gondwana amalgamation?

Chris Clark (1), Ian Fitzsimons (1), and David Healy (2)
(1) TIGeR, Curtin University, Australia, (2) School of Geosciences, King's College, University of Aberdeen, United Kingdom

The Ediacaran-Cambrian assembly of Gondwana occurred by the collision and amalgamation of numerous continental blocks along a number of disparate orogenic belts. In recent Neoproterozoic palaeogeographic reconstructions, India did not amalgamate with the other Gondwanan continents until latest Neoproterozoic or Cambrian times. In these reconstructions, southern India and adjacent regions of Madagascar, Sri Lanka and Antarctica are located at the meeting point of a number of separate orogenic belts that formed as India, Australia, Azania, Kalahari and Antarctica collided to form Gondwana. In addition to it's central location in the terminal stages of Gondwanan formation the rocks of Southern India contain a unique record of high to ultrahigh temperature (UHT; T > 900 °C) metamorphism over 1000's of square kilometers that is unrelated, both temporally and spatially, to the emplacement of voluminous high temperature magmatic rocks. This observation raises the possibility that the generation and exhumation of regional scale HT and UHT metamorphic rocks is related to the sequence of events that initiate with the breakup of Rodinia from 750 Ma, continue through the subsequent collision of continents and microcontinents that are continually accreting to East Africa from ∼650 to ∼530 Ma and the eventual collapse of the East African Orogen after 530 Ma. The lack of magmatism associated with the UHT metamorphism and the duration of high temperature conditions (>60 Ma) necessitates that, to some degree, the orogen is internally heated. The nature of this heat source is most probably the enrichment of heat producing elements (U, Th and K) that have been incorporated into the orogen during amalgamation. In this contribution we will present geochronological and petrological datasets that constrain the timing of UHT metamorphism within an amalgamating Gondwana. We will also link the timing of these events to numerical models that are constrained by measured heat production values collected in the field. These datasets can then be used to infer a mechanism that relates the break-up and amalgamation of supercontinents to the formation and exhumation of regional scale UHT terranes through Earth history without the need to invoke voluminous mafic magmatism or underplating - features that are seldom observed.