Evolution of the Proterozoic Eastern Ghats and the Aravalli-Delhi Mobile Belts: New geochronological constraints

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Recently obtained geochronologic data (both Electron Microprobe dating of monazite and SHRIMP dating of zircon) have provided new insights into the evolution of two major Proterozoic mobile belts of India- the Aravalli-Delhi mobile belt (ADMB) in western India and the Eastern Ghats mobile belt(EGMB) in eastern India. Chemical dating of monazite in a suite of petrologically well characterized rocks from the ADMB reveals a polymetamorphic history- a 1700-1740 Ma medium pressure granulite facies metamorphism and accompanying partial melting, followed by a high pressure granulite to amphibolite facies metamorphism along a clockwise P-T trajectory and subsequent near isothermal decompression at 980-950 Ma. SHRIMP dating of zircon from the EGMB shows that the southern part witnessed UHT metamorphism at lower crustal depths at ~1760 Ma, which was overprinted by another tectonothermal event at 1600-1610 Ma. The central part of EGMB has a record of a tectonothermal event at ~1750-1700 Ma in the form of inherited zircon. The major UHT metamorphism in this part occurred along a counterclockwise P-T trajectory at 1000-990 Ma, which is distinct from the southern part of the EGMB. The UHT granulites were re-worked by a second granulite facies metamorphism along a clockwise P-T path at 950-930 Ma, and were further ductily deformed along shear zones at ~900 Ma. The tectonothermal event at ~1760-1700 Ma recorded in the ADMB and southern EGMB can be clearly identified with regional medium pressure HT-UHT metamorphism, but the significance of inherited zircon of the same age in the central EGMB remains unclear. Nevertheless, it can be safely argued that large parts of the Indian subcontinent were affected by the tectonothermal events associated with the formation/dispersal of the supercontinent Columbia. The Grenvillian age compressional orogenies recorded in the EGMB and ADMB, on the other hand, signify stitching together of the two mobile belts, which along with similar orogenies in the Central Indian Tectonic Zone and Chhotanagpur-Meghalaya belt, probably led to the present crustal architecture of India.