The amalgamation of the Eastern Ghats Belt with the Dharwar craton, India: Constraints from SHRIMP zircon and EPMA monazite dating

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The Eastern Ghats Belt (EGB) is a regional-scale Proterozoic granulite terrane which eventually amalgamated with the cratons of eastern India. In contrast to the Late Cambrian amalgamation of the northern EGB with the Bastar craton, the timing of amalgamation of the southern EGB with the Dharwar craton (DC) was tentatively inferred to be Mesoproterozoic (~1.54 Ga) as this is the youngest metamorphic age hitherto known from the region. However, this age is unlikely to represent the timing of amalgamation because it was reported from an area far away from the tectonic contact between the southern EGB and the DC. In the present study, we present geochronological data from a sector covering both sides of the tectonic contact in order to better constrain the timing of final amalgamation of the southern EGB with the DC.

Charnockites, metabasites and quartzofeldspathic gneisses in the southern EGB were initially metamorphosed under granulite facies conditions (~7–8 kbar; ~880–870 °C), and later retrogressed to amphibolite facies conditions (~5–6 kbar; ~550–600 °C). The age of granulite metamorphism is constrained between 1.63–1.60 Ga from both SHRIMP U-Pb zircon and EPMA U-Th-total Pb monazite dating. Monazites also yield a younger age population at ~0.60–0.50 Ga, which possibly represents the age of amphibolite facies retrograde metamorphism. Zircons from the adjacent cratonic gneisses yield a concordant weighted average age as 2508 ± 3 Ma and a discordant array with the lower-intercept age as 595 ± 89 Ma. The former is interpreted as the timing of magmatic crystallization, while the latter indicates metamorphic resetting. The age of this Neoproterozoic metamorphic event is also recorded in monazites from the same rock as 535 ± 7 Ma. The absence of any meaningful Mesoproterozoic age in the cratonic gneisses precludes the possibility of final amalgamation of the southern EGB with the DC during that era. In contrast, the record of a metamorphic imprint common to these two disparate crustal blocks suggests their amalgamation in the latest Neoproterozoic time.