

Metamorphic P–T evolution and U–Th–total Pb monazite dating of metapelites from the Nellore schist belt, Southeastern India: Implications for the Proterozoic tectonics

Hari Hrushikesh and Naraga Prabhakar

Indian Institute of Technology Bombay, Mumbai, India (prabhakarnaraga@gmail.com)

The Paleoproterozoic Nellore Schist Belt (NSB) in the southeastern margin of the eastern Dharwar Craton (India) is predominantly described as a collision zone formed by accretionary growth. Two lithological groups are distinguished within the NSB: (a) a lower Vinjamuru Domain (VD) mainly consists of amphibolite facies metagabbros and amphibolites, and (b) an upper Udayagiri domain with greenschist facies platformal metasedimentary sequences. The present study emphasizes on demonstrating the structural, metamorphic, and chronological history of the metapelites from Saidapuram and Malakonda areas of the VD. These metapelites are sporadically exposed as lensoidal bodies composed of garnet + staurolite + kyanite + biotite + muscovite + paragonite and garnet + staurolite + plagioclase + biotite + muscovite ± kyanite mineral assemblages along with quartz and ilmenite. Integration of deformation microtextures with the results of phase equilibrium modelling coupled with conventional thermobarometric studies indicate the presence of three stages of metamorphism (M_1 – M_2 – M_3). The garnet + kyanite + muscovite + quartz ± biotite assemblage characterize the early metamorphic event (M_1), which is syntectonic with F_1 folding at P–T conditions 540–560 °C and 6.0–6.4 kb. The P–T conditions of syn/post- D_2 peak metamorphism (M_2) represented by garnet + staurolite + muscovite + biotite + plagioclase + quartz ± kyanite assemblage were equilibrated at 600–620 °C and 7.8–8.2 kb. The last episode of metamorphism (M_3) coeval with D_3 crenulation cleavage gave rise to chlorite + muscovite ± biotite retrograde mineral assemblage. Texturally constrained U–Th–total Pb monazite dating reveals three distinct populations clustering around 1.65–1.55, 1.45–1.35 and 0.80 Ga in the metapelites. The chemical ages (1.65–1.55 Ga) retrieved from monazite cores limit the upper amphibolite facies peak metamorphism in the pelitic rocks that presumably stabilized major part of the crust within the NSB. Whereas the populations acquired from monazite rims yield post-peak metamorphic age at 1.45–1.35 Ga, which largely coincides with the wide-spread felsic magmatism in and around the NSB. The records of Neoproterozoic (0.80 Ga) event in the Vinjamuru domain is reported for the first time in this study, and arguably interpreted to be an overprint of a significant tectonothermal event that affected NSB during Rodinia breakup. Further, we suggest comparable deformation-metamorphism histories within the various domains associated with the NSB and the Rayner complex (East Antarctica) during Proterozoic accretionary process.