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Structural and metamorphic evolution of the Nellore schist belt: implications to the Paleo- to Mesoproterozoic collisional tectonics in SE India

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Greenschist to amphibolite facies Nellore schist belt (NSB) is believed to have formed by polycyclic accretion and amalgamation between proto-India and East Antarctica during the Paleoproterozoic. The belt encompasses greenschist facies Udayagiri domain (UD) to the west and amphibolite facies Vinjamuru domain (VD) to the east. Garnet-chloritoid schist, garnet-muscovite-biotite schist, quartzites and phyllites dominate the UD. The VD encompasses amphibolites, quartzo-feldspathic gneiss and isolated patches of metapelites. The inadequate knowledge of the tectonic and metamorphic evolution of UD and VD lithologies impedes our understanding of the Proterozoic accretionary history operated in SE India. Therefore, the present study focuses on the garnet-bearing metapelites of UD and VD to better understand the comprehensive tectonothermal evolution of the NSB. The structural relations from the UD and VD metapelites suggest that the belt has undergone three phases of deformation (D_1, D_2, and D_3). The early F_1 tight folds are preserved as interfolial foliation to the penetrative S_2 fabric. The D_2 deformation is characterized by flat-lying S_2 foliation with recumbent F_2 geometry. Crenulation folds and NNE-SSW striking and steeply dipping foliations on S_2 foliation represent the D_3 deformation episode in the belt. The peak *P-T* metamorphism in the UD and VD metapelites is contemporaneous with the D_2-D_3 deformations. The garnet-chloritoid schist from UD recorded the peak *P-T* conditions at 14.0–15.8 kbar and 520–540 °C (High-P/Low-T) along with a clockwise *P-T* path showing an initial near isothermal compression followed by a decompression. The garnet-staurolite-kyanite schists from VD show a clockwise *P-T* path with compressional heating, in which the peak metamorphic conditions are estimated at P = 6.5–7.5 kbar, T = 620–640 °C. The distinct metamorphic conditions between the VD and UD metapelites suggest these domains occupied deeper and shallow depths during the tectonic evolution, respectively. U-Th-total Pb monazite dating constrains the timing of peak metamorphism at 1.35–1.25 Ga, which broadly coincides with widespread felsic magmatism in the NSB. The Mesoproterozoic metamorphism (1.65–0.76 Ga) in the NSB is similar to those recorded in the basement rocks of East Antarctica, suggesting a tectonic linkage along accretionary margins.