ABSTRACT

In the Neoproterozoic time, the contact between granulites of the Eastern Ghats Belt (EGB) and the Archaean cratons of the Indian shield was the site of a major continent-continent collision. Along the collisional interface, the western boundary of the EGB with the Bastar Craton is characterized as a thrust; however, the nature of the northern boundary of the EGB with the Singhbhum Craton is controversial, with proposed models ranging from thrusting and strike-slip shearing to transpressional tectonics. The primary cause of the controversy regarding the northern margin is the presence of a structurally complex lithotectonic domain called the Rengali Province that is distinct from both the bounding terranes. Detailed structural and geological mapping of the Rengali Province reveals that two WNW-ESE trending strands of a strike-slip system enclose a multiply deformed (D_1 to D_3) intervening domain, with D_3 representing dextral shearing. The D_1 and D_2 deformation events are interpreted as a deformation continuum characterized by recumbent isoclinal folding and refolding about parallel fold axes with associated penetrative fabric formation. In a granulite (charnockite) lens within the province, the penetrative fabric retains a cylindrical geometry. In the surrounding quartzofeldspathic gneisses, quartzites and mica schists of the province, superimposition of syn-D_3 shortening on D_1-D_2 folds generated complex non-cylindrical geometries while the granulites escaped D_3 strain. Low D_3 strain domains within the province preserve an annealed granoblastic mosaic texture, with a mineralogy characteristic of the amphibolite facies. In the province-bounding shear zones, D_3 deformation was associated with mylonitization, dynamic recrystallization and greenschist facies metamorphism. Strain analyses and Anisotropy of Magnetic Susceptibility studies in the quartzites indicate that post-D_2 strain ellipsoids are characterized by sub-vertical axial planes and extrusion directions consistent with crustal shortening. Samples from high D_3 strain zones are associated with sub-horizontal extrusion parallel to the inferred direction of strike-slip shearing, and have kinematic vorticity numbers > 0.90 indicating dominantly simple shear deformation. Thus, D_3 strike-slip shearing was associated with a limited pure shear component, indicating that it is unrelated to the widespread shortening structures documented from the region. Quantitative estimates of peak metamorphic temperature are about ~ 750°C in the pressure range 6-10 kb, obtained from post-D_2, pre-D_3 assemblages in charnockites and amphibolites. SHRIMP ages from zircons within the charnockite unit are identical to those reported earlier from the surrounding hornblende orthogneiss, with c. 2.8 Ga magmatic cores overgrown by c. 2.5 Ga rims. Chlorite bearing syn-D_3 assemblages within the mica schists

yield ages of 490-470 Ma, indicating that greenschist facies metamorphism in the Rengali Province operated 2000 Ma after the amphibolite facies event. Since the province-bounding shears form a step-over zone, the structural complexity within the Rengali Province arises from superposition of syn-D_3 shortening structures on initially asympathetically oriented, inherited cylindrical D_1-D_2 folds. Hydrous fluid channeling causing greenschist facies metamorphism and quartz vein emplacement accompanied D_3 as the step-over zone was dilational in nature. Interpretation of the structural set-up as a step-over zone suggests that the Rengali Province is probably a fragment of the eastern fringe of the Bastar Craton, equivalent to the Jeypore Province that has charnockites of identical ages. This c. 2.5 Ga orogen, that appears to extend along the eastern boundary of the Bastar Craton to the southern part of the Eastern Dharwar Craton (i.e. the Salem Block), may indicate the site of an older amalgamation event that assembled the expanded 'Ur' supercontinent.

(**Keywords:** *Rengali Province, Singhbhum craton, dilational step-over zone, strike slip, transpression*)