

**STRIKE-SLIP TECTONICS ALONG A CRATON-MOBILE
BELT CONTACT: STRUCTURE, METAMORPHISM,
GEOCHRONOLOGY AND GRAVITY ACROSS THE
EASTERN GHATS PROVINCE-RENGALI
PROVINCE BOUNDARY, INDIA**

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by

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Abstract

In the Indian shield, the northern margin of the Eastern Ghats Province (EGP: a Proterozoic mobile belt) is in contact with the Rengali Province (an Archaean craton), along an ESE-WNW trending interface. The *western side* of the contact is covered with the sediments of Talchir basin, while the *eastern side* of the contact is well exposed but less studied. In the contact zone, granulite facies metapelites (khondalites), charnockites, and K-feldspar augen gneisses represent dominant lithologies in the EGP, while the Rengali Province contains a variety of amphibolite and granulite facies gneisses, intruded by amphibolite and dolerite dykes. The EGP underwent **D_{EGP1}** and **D_{EGP2}** deformation under granulite facies conditions, while the metamorphic grades of the **D_{ER1}** and **D_{ER2}** deformations in the Rengali Province vary from granulite to amphibolite facies. Along the contact, the penetrative foliations in both the EGP and the Rengali Province units strike ESE-WNW with subvertical dips, suggesting their reorientation during a later shared deformation event **D₃** that amalgamated the EGP with the Rengali Province. Electron Backscatter Diffraction (EBSD) analyses of quartz are consistent with dextral strike-slip shearing under greenschist to lower amphibolite facies conditions during **D₃**. Crosscutting micro-faults and pseudotachylite veins associated with the mylonites in the EGP suggest that the **D₃** shearing at the exposed level occurred near the brittle-ductile transition depth. The granulite facies assemblages stabilized during **D_{EGP1}**-**D_{EGP2}** in the EGP indicate the peak metamorphic P-T conditions around 818 ± 48 °C, 10.7 ± 1.3 kbar at low water activity ($X_{H_2O} = 0.5$); monazite chemical ages indicate 1000-900 Ma ages for the EGP granulite metamorphism, with 800-500 Ma monazites in high **D₃** strain zones. Amphibole-plagioclase thermometry in the Rengali lithologies suggests equilibrium metamorphic temperatures varying from 700 ± 13 °C at 10 kbar to 739 ± 17 °C at 5 kbar. Monazite chemical dates of 3000/2800/2500 Ma without any 1000 Ma or younger overprint suggest **D_{ER1}** and **D_{ER2}** to be Archaean. Gravity data across the contact reveals a distinct gravity contrast that coincides spatially with the geological terrane boundary; 3D compact inversion of Bouguer gravity anomalies indicate that the contact is subvertical at least up to 25 km depth. Thus, the Rengali Province and EGP amalgamated along a ~500 Ma, ESE-WNW trending subvertical dextral crustal-scale strike-slip shear zone (the Brahmani Shear Zone, BSZ). The BSZ can be correlated with a shear zone in the Rauer Group of east

Antarctica that preserves similarly juxtaposed subvertical bands of Archaean and Proterozoic lithologies intersected by ~550-500 Ma-age mylonites. (409 words)

(Keywords: *strike-slip craton-mobile belt, gravity contrast, Eastern Ghats, Rengali, Rauer*)