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GEOLOGY AND GEOCHEMISTRY OF THE MIDDLE PROTEROZOIC EASTERN GHAT MOBILE BELT AND ITS COMPARISON WITH THE LOWER CRUST OF THE SOUTHERN PENINSULAR SHIELD; **M.V. Subba Rao,** National Geophysical Research Institute, Hyderabad - 500 007 India

Two prominent rock suites constitute the lithology of the Eastern Ghat mobile belt : (1) the khondalite suite - the metapelites, and (2) the charnockite suite. Later intrusives include ultramafic sequences, anorthosites and granitic gneisses.

The chief structural element in the rocks of the Eastern Ghats is a planar fabric (gneissosity), defined by the alignment of platy minerals like flattened quartz, garnet, sillimanite, graphite, etc. The parallelism between the foliation and the lithological layering is related to isoclinal folding. The major structural trend (axial plane foliation trend) observed in the belt is NE-SW. Five major tectonic events have been delineated in the belt[1]. A boundary fault along the western margin of the Eastern Ghats, bordering the low grade terrain has been substantiated by recent gravity[2] and the deep seismic sounding studies[3].

Field evidence shows that the pyroxene granulites (basic granulites) post-date the khondalite suite, but are older than the charnockites as well as the granitic gneisses[4]. Polyphase metamorphism, probably correlatable with different periods of deformation is recorded.

Using geochemical parameters, it is inferred that the basic granulites could be an earlier phase of the charnockite suite and genetically related to the charnockites. The relationships of relatively immobile elements like Mg-Zr, Ca-Y, Zr-Y and the rare earth element (REE) patterns suggest that the protoliths of these rocks are derived from a single source. The REE data supports the field relations that the basic granulites are emplaced earlier compared to charnockites and the source material for these rocks could be a metasomatised mantle, enriched in LREE.

K-Rb relations suggest that these elements have been depleted in all the litho-units during the granulite facies metamorphism; however, restoration of some of these depleted elements to varying degrees by metasomatic enrichment has been observed. This restoration may be the result of the Eastern Ghat orogeny.

The granulites of the mobile belt as a whole are characterised by variable LIL element geochemistry, while the cratonic granulites show a lesser degree of variation. This could be attributed to the deformation and the orogenic effects in the mobile belt. The variation in lithology suggests that, while the lithologies of the Eastern Ghat belt evolved in a geosynclinal type environment, the cratonic

granulites could be the deeply eroded sections of the crust or the high-grade equivalents of the amphibolite grade terrain to the north of this section, which have not witnessed much of tectonic deformation and the attendant chemical changes.

The cratonic granulites are Na-rich, whereas the granulites of the Eastern Ghats are in general K-rich; the latter are also enriched in Rb, Ba and Th. The immobile element concentrations like Zr, Y and REE which indicate the origin of the protolith, are more in the Eastern Ghat mobile belt granulites, compared to the cratonic granulites. Total REE levels as also LREE enrichment are more in the Eastern Ghats granulites. An inhomogeneous amphibolite source of variable mineral or chemical composition has been postulated for the charnockites of the craton[5]. The charnockites of the Eastern Ghats based on their immobile element geochemistry appear to have been derived from a homogeneous source.

The field relations in the Eastern Ghats point to the intense deformation of the terrain, apparently both before, during and after metamorphism. This, coupled with close intermingling of granulites and the khondalite suite and a greater abundance of khondalites[6] indicate that the Eastern Ghats granulites were developed during an intense deformation (perhaps collisional) event, whereas no such evidence has yet been found in the southern granulite terrain.

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