ABSTRACT

The granulite facies Eastern Ghats Province is characterized by a Grenvillian metamorphic event with a Pan-African thermal overprint. Mapping of over 180 km^2 and structural analysis in the Angul Domain (northernmost part of the province) reveals that the area has suffered five phases of deformation. D_1 deformation forms the gneissic layering S_1 that can be traced over the whole area. Penetrative shearing, isoclinal folding and open refolding characterize the D_2 thrust deformation. M1 granulite facies metamorphism (7-8 kbars, >850°C) and subsequent isobaric cooling (garnet coronas along orthopyroxene-plagioclase interfaces) followed D_2 deformation. D_3 extension is manifested in the emplacement of N-S trending mafic dykes, and N-S trending, west dipping shears with extensional sense, resulting in isothermal decompression (garnet breakdown to orthopyroxene-plagioclase symplectites). Granitoid emplacement occurred concomitant with E-W trending, strike-slip D_4 shears. Hydrous fluid infiltration accompanied and outlasted granitoid intrusion during D_4, and culminated in terrane uplift and emplacement of pegmatite. The D_3 and D_4 events are not penetrative, and are manifested as warps, folds and interference patterns outside their respective shear zones. WNW-ESE trending, north dipping shears with top-to-the-south sense characterize the D_5 deformation. D_5 reoriented foliations on a regional scale and defines the structural trend of the Angul Domain, and induced renewed heating and loading of the terrane during M2 metamorphism (5.5 kbar, 630°C). Carbonic fluid infiltration accompanied M2, leading to grossular garnet breakdown to anorthite, calcite and quartz, and biotite dehydration reactions. Fluid inclusion evidence in the form of vapour carbonic inclusions, graphite precipitation within inclusions and explosion textures in aqueous inclusions testify to rapid exhumation following the M2 peak. Rb-Sr and Sm-Nd dates on augen gneiss, enderbite and amphibolite indicate M1 metamorphism at ~ 1.0 Ga, hydrous fluid infiltration and amphibolite facies metamorphism at ~ 905 Ma, and M2 metamorphism probably in the Pan-African time (~ 550 Ma). Thus, the Angul Domain preserves a Pan-African thermal event like the rest of the Eastern Ghats Province, but preserves evidence of an intermediate phase of amphibolite facies metamorphism, uplift and subsequent reworking in the Pan-African, that distinguishes it from the rest of the Eastern Ghats Province.

Keywords: *Eastern Ghats, Angul Domain, superposed deformation, reworking, granulites*