Structural Architecture of a Dismembered Ophiolite Suite from Gondwana: New Results from the Cauvery Suture Zone, Southern India

T.R.K.CHETTY[1], T.YELLAPPA[1], P.NAGESH[1], D.P..MOHANTY[1], V.VENKATASIVAPPA[1], M.SANTOSH[2], T.TSUNOGAE[3]

[1] National Geophysical Research Institute (Council of Scientific & Industrial Research), Hyderabad (AP), India;
[2] Kochi University, Japan;
[3] Tsukuba University, Japan
E-mail: trkchetty@gmail.com

Suture zones, the sites of obducted oceanic lithosphere, are characterized by deformation zones of extraordinary complexity. The Cauvery suture zone (CSZ), juxtaposes two discrete crustal blocks: the Northern Block (also termed Salem Block) and the Madurai Block, southern granulite terrain (SGT), southern India. The CSZ has been recently regarded as part of the Neoproterozoic/Cambrian suture zone extending from the Betsemisaraka suture zone of Madagascar (Collins et al., 2007). Recent geological investigations and petrologic and geochemical studies of the Manamedu ophiolite complex (MOC), located at south eastern part of the CSZ, suggest a supra-subduction setting associated with the subduction of the Neoproterozoic Mozambique Ocean (Yellappa et al., in press). The prograde high-pressure metamorphism followed by ultrahigh-temperature (UHT) event recorded from the metamorphic orogens of the zone correlate well with the subduction-collision tectonics associated with the final stage of amalgamation of the Gondwana supercontinent (Santosh et al., 2009).

The MOC is characterized by mafic-ultramafic assemblages and associated metamorphic-sedimentary rock units. Detailed structural mapping with the aid of a hand held GPS reveals the detailed anatomy of a dismembered ophiolite succession comprising actinolite-hornblendite, hornblendite, pyroxenite, gabbro-norite, gabbro, anorthosite, amphibolite, plagiogranite, mafic dykes, and associated pelagic sediments such as chertmagnetite bands and carbonate horizons. The succession displays imbricate thrust sheets and slices of a dismembered ophiolite suite and pelagic sediments s. The lithological boundaries are considered as magmatic foliations. The foliation trajectory map of MOC reveals inward dipping foliations both in the east and west and shows isoclinal fold structures in the north and south. Several north-south lozenge shaped structural features wrapped by inward dipping foliations suggest synformal geometry. A major detachment zone occurs at the western margin with the development of high amplitude tight folds and the intrusive plagiogranites. Based on the geometry of fold styles, foliation trajectories and several large scale sketches, it is inferred that the rocks are folded into tight and refolded - isoclinal folds with large variations in N-S trending hinge lines suggesting sheath fold geometries.

East-west structural cross-section across the MOC reveals gentle inward dips with repetition and omission of different lithologies and curvilinear hinge lines. The MOC can be interpreted as a deformed large scale sheath fold, associated with south-verging back thrust system in a crustal- scale 'flower structure' (Chetty and Bhaskara Rao, 2006). The MOC and other similar complexes recently discovered from within the CSZ provide a unique opportunity to unravel the different stages of Wilson cycle of the Mozambique Ocean as well as the tectonics associated with the subduction-accretion-collision history during the amalgamation of the Gondwana supercontinent in the end Precambrian.

Keywords: Architecture; ophiolite; gondwana; suture zone

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