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Geometry and kinematics of Moyar-Bhavani shear zone (central part), Tamil Nadu India: Characterising a Neoproterozoic oblique transpression

Karmakar, S¹, Mukherjee, M.K², Mohanty, B¹ and Jaja Uruzula A¹

¹Geological Survey of India, (SU:TN&P), Guindy, Chennai, India. E-mail: sid.k1984@gmail.com

² Department of Applied Geology, Indian School of Mines, Dhanbad 826004

The central part of the E-W trending Moyar-Bhavani shear zone (MBSZ) of Neoproterozoic age, has been studied with reference to the geometry of structural elements, their distribution, interrelationships, chronology of development and variation that occur within and without the shear zone. The shear zone in the study area is 7-8 km wide and is demarcated on the basis of changes in attitude of pre-existing foliation of the host rocks of Bhavani gneisses as it enters the shear zone across the boundaries.

Beyond the northern boundary of the shear zone to the north, the gneissic foliation is folded to define a Type-2 superposed synform (F2) that is moderate to steeply plunging towards SSW. The early folds (F1) were tight-to-isoclinal, overturned antiforms and synforms that developed due to a N-S shortening and define a crescentic closure due to Type-2 superposition of E-W shortening. At the northern boundary, the gneissic foliation lying outside the shear zone, swerve to become parallel to the shear zone boundary that indicates a north – towards – east sense of shear at the northern boundary of the shear zone.

Beyond the southern boundary of the shear zone to the south, the gneissic foliations are refolded to define Type-2 superposed folds (F2) with crescentic closures that are moderate to steeply plunging towards both NNE and SSW depending upon the vergence of early folds (F1). The early folds (F1) were both northerly and southerly verging, tight-to-isoclinal antiforms and synforms that had resulted due to N-S shortening and had been refolded by a Type-2 superposed E-W shortening that resulted in the crescentic closure patterns of the foliations. At the southern boundary, the gneissic foliation outside the shear zone, curve to align with the southern boundary of the shear zone that indicates a south – towards – west sense of shear.

The MBSZ is divided internally into two sectors – a northern and southern sector that shares a common interface near central part of the shear zone. The northern sector extends from the northern boundary to the central part of the shear zone. The gneissic foliations within this sector show a strike variation that define an extensional overstep type of trajectory. The southern sector extends from the southern limit of the northern sector to the southern boundary of the MBSZ. Within the southern sector, the foliations of the gneisses show a trajectory with z-asymmetry that is compatible with a south – towards – west sense of shear. The MBSZ has a dextral strike – slip sense of movement with a steep dip towards south. On sections parallel to stretching lineations and normal to the mylonitic foliation at several locations within MBSZ, various shear sense indicators, like shear zone related asymmetric folds and lozenges developed on pre-existing gneissic foliations, asymmetric tailed-porphyroclasts, together indicate a thrust – sense of displacement along the shear zone. The stretching lineations are oblique to the strike of the mylonitic foliation. Combining the dip of the shear zone, orientation of stretching lineations and sense of movement of the components along dip and strike of the shear zone, the MBSZ is kinematically characterised to be a product of oblique transpression.

