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NEWS AND NOTES

Geometry of Middle Reef Shear Zone, Hutti Gold Mines, Raichur, Karnataka

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The Hutti schist belt is a Neoarchaean greenstone belt in the eastern Dharwar craton of south India. It evolved over a time span of 2.7 – 2.5 Ga (Anand and Balakrishnan, 2007). The greenstone sequence is composed of dominantly a metamorphosed bimodal volcanic suite (pillowed basalt/andesite and rhyolite/dacite) with subordinate meta-sedimentary rocks. The rocks have suffered polyphase deformation, with the first deformation (D_1) producing the schistosity in the rocks, and the second deformation (D_2) producing the regional fold that has folded the schistosity (Roy, 1979, 1991). D_1 and D_2 may constitute a tectonic continuum (Vasudev and Chadwick, 2008). A 1 - 2km wide traceable shear zone is developed on the western limb of the regional D_2 fold. It makes small angles (~20°) with the schistosity. Within this broad shear zone several zones of intense ductile shearing are separated by unsheared or less-sheared rocks. In Hutti, nine such curviplanar, intensely sheared auriferous zones ("reefs" in the miners' parlance) are recognized within a distance of about 1.5km across strike. At places the shear zones bifurcate and may rejoin to form horses. The individual reefs are 2-12m thick and could be traced for a distance of 4-5km along strike. These are unexposed on the surface, but could be traced continuously in the underground mines.

We have studied one of the zones of intense ductile shearing called Middle Reef (MR) which is about 2-12m wide, and about 1.5km along strike. We have mapped the continuous outcrop of the MR in the underground mine at 9 horizontal levels (from 14th to 22nd) with 100ft (~ 30m) vertical interval. A strike length of approximately 800m was mapped on each level on a scale of 1:400. The techniques adopted for this large-scale underground mapping are described in Roy (2013).

The boundaries of the Middle Reef shear zone are sharply demarcated by the contact of the phyllonites and unmylonitized country rock that is mainly pillowed metabasalt. Schistosity (S_1) is generally well developed and is axial planar to early folds developed on quartzose bands. The strike of S_1 varies from N21°W to N10°E and it has 70°-90° westerly dip. Mineral lineation in the form of alignment of the long axes of amphibole needles on S_1 plunges 40° to 45° towards SSE to SSW. The peak metamorphism (M_1) was coeval with D_1 deformation, as indicated by the parallelism of the bladed amphibole grains defining the first schistosity (S_1). The P-T condition during D_2 deformation remains undefined.

There is a clear angular discordance between S_1 and the boundary of the shear zone. S_1 is seen to have a curved form in vicinity of shear zone boundary; the curvature being convex towards the shear zone; the S_1 plane is rotated anticlockwise or dragged to become asymptotic to the boundary. We infer that, S_1 is pre-shearing and is affected by the shear movement. The geometry and the microstructures within the shear zones have been studied. The geometry of structures and finite strain of MR shear zone suggest that the movement was of transpressional type with dextral strike slip component and up-dip thrust component. We have tried to estimate the finite strain parameters in terms of a kinematic model of simple shear combined with shortening normal to the shear zone.

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