Tectonic history of the Archaean Kolar Schist Belt, South India: constraints from structural history

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The dominantly mafic-ultramafic Kolar Schist Belt in the south Indian craton is a long and narrow (80 km, 4-6 km), N-S trending linear belt occurring within 'Peninsular Gneiss' - an unclassified migmatitic gneiss complex. A wealth of recent geochemical data (see Rajamani 1990 for references) on the schist belt and the adjacent gneisses led Krogstad *et al.* (1989) to identify at least four discrete terrains, each with its own distinct evolutionary history, around the Kolar Schist Belt. These four terrains include an eastern and a western gneissic terrain, and a western and an eastern amphibolite terrain, approximately separated along the middle of the belt. Further, geochemical dissimilarities also suggest that these four terrains must have formed at disparate geographic locations and were juxtaposed during a late Archaean tectonic event. This juxtaposition could have been either due to large-scale N-S shearing (brittle or ductile) or by accretion in an E-W direction.

Detailed analysis of mesoscopic structures from the banded ferruginous quartzite in the schist belt (Mukhopadyay 1989) suggests four phases of folding episodes (F_1-F_4) and a post-F_2 but pre-F_3 shearing movement. The first two sets of folds are tight to isoclinal, with attenuated limbs and sharp hinges, of insignificant areal extent. They are nearly coaxial with fold axes plunging steeply in most instances. However, the plunges (but not trends) show considerable variation from this attitude along a subvertical girdle striking approximately N-S. The axial planes of these folds are mostly subvertical, with N-S strike. Evidence for buckling attendant with flattening is ubiquitous for these folds. An E-W simple shear acting on subhorizontal layerings produced isoclinal and recumbent or gently plunging reclined folds of first generation (F_1), with N-S axial trend. Continued compression in the same direction resulted in pure shear, which coaxially refolded the F_1 folds. When the F_2 folds could not be tightened anymore, the same deformation produced steeply dipping mesoscopic shear zones whose orientations were controlled by the attitude of existing foliation planes. The last two sets of folds formed at the relaxation period of the earlier deformation and are unimportant in large scale.

In the gneisses on either side of the schist belt, ductile to brittle-ductile shear zones are spectacularly well preserved (Mukhopadyay and Haimanot 1989). These shear zones are conjugate with subvertical sinistral and dextral shear zones striking towards NW and NE respectively. The bisectors of the conjugate shear zones show that the maximum, intermediate and minimum compression directions were approximately E-W horizontal, vertical and N-S horizontal, respectively. Shear lineations on the brittle-ductile shear zones invariably plunge very gently, indicating subhorizontal displacement. Estimates of shear strain indicate that if the schist belt is a major shear zone, the displacement across it is small.

The structural history suggests, therefore, that an E-W subhorizontal compression was operating over a considerable period of time; and it indicates that the juxaposition of discrete terrains was primarily by accretion in an E-W direction. The Kolar Schist Belt, then, marks the site of a continent-continent collision tectonic event of Archaean age.

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