Geophysical Research Abstracts, Vol. 9, 11553, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-11553

Multiple reactivation of pre-existing fabrics in a basement shear zone: an example from Gavilgarh-Tan Shear Zone, central India

A. Chattopadhyay (1,2) , R.E. Holdsworth (2), L. Khasdeo (1), S. G. Bergh (2,3)

1. Dept. of Geology, University of Delhi, Delhi 110 007, India
2. Reactivation Research Group, Dept. of Earth Science, University of Durham, Durham, DH1 3LE, UK
3. Dept. of Geology, University of Tromso, Tromso Norway.

The Central Indian Tectonic Zone (CITZ) – a crustal scale Proterozoic mobile belt, runs E-W through the Indian shield and is considered to be the zone of amalgamation between the northern and southern continental fragments of India, with a history of repeated crustal accretion and/or subduction throughout the Proterozoic. Extensions of the CITZ into Madagascar, Western Australia and North America have been proposed, making it an important structure in the paleogeographic reconstruction of Rodinia. The CITZ contains a number of map-scale lineaments including the Son-Narmada Faults, Gavilgarh-Tan Shear Zone (GTSZ) and Central Indian Shear, each of which has a distinct geological setting and tectonic history. Of these, the GTSZ has a particularly clear history of reactivation over a protracted period of geological time.

The steeply-dipping GTSZ trends E-W and lies within the central part of the CITZ separating the Mesoproterozoic Betul and Sausar supracrustal belts. A well developed ductile shear zone is developed forming a belt several kilometres wide in Precambrian gneisses and granitoids exposed in the Kanhan river valley and adjoining areas of Chhindwara and Seoni districts of Madhya Pradesh. The Proterozoic shear zone is characterised by a subvertical mylonite foliation with a generally shallow easterly plunging stretching and/or mineral lineation, indicating a strike-slip (slightly oblique-slip) movement. Strain heterogeneity and partitioning are clearly observed from regional-, outcrop- and grain-scales within the shear zone. At many places, dark coloured, aphanitic layers of pseudotachylyte occur within the mylonites, and

are commonly interfolded with the mylonitic foliation, showing evidence of post-melting ductile deformation. This indicates that ductile shearing and mylonitization processes were possibly punctuated by transient episodes of rapid slip with melting in a broadly ductile environment. The principal displacement/slip surfaces related to the pseudotachylyte veins are almost always parallel to the mylonite foliation and appear to have been guided by the pre-existing mechanical anisotropy. There is ample evidence of brittle reactivation of the shear zone. Geophysical studies and exploration drilling within the Permian coal bearing sediments (Kamthi Formation of Gondwana Supergroup) overlying the shear zone has revealed the development of repeated normal growth faults in the sediment package. The Mesozoic Deccan Trap basalts overlying the sheared basement exhibit evidence of extensive crushing and brecciation along narrow, map-scale strike-/oblique-slip faults that link directly downwards and along-strike into brittle faults that reactivate the pre-existing mylonite foliation in the underlying shear zone. Here the faults preserve pseudotachylyte breccias distinctly different in both habit and texture from the ductilely deformed, syn-shearing veins. Geodetic surveys indicate that recent sinistral, strike-slip movements have occurred along the CITZ and there has been a significant earthquake along the Son-Narmada fault zone in the recent past. Hence the CITZ clearly has a long and important movement history, predominantly as a strike-slip fault cutting the Indian Shield.