Geophysical Research Abstracts, Vol. 9, 04747, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04747
© European Geosciences Union 2007

Forced flow and growth of weak Precambrian lithosphere: 3D crustal-scale perspective from a tilted craton

D. Chardon (1), M. Jayananda (2), J.-J. Peucat (3), T.R.K. Chetty (4)

(1) IRD, CEREGE (UMR 161), Nouméa, New Caledonia (chardon@noumea.ird.nc), (2) Department of Geology, Bangalore University, Bangalore, India, (3) CNRS, Geosciences-Rennes (UMR 6118), Rennes, France, (4) National Geophysical Research Institute, Hyderabad, India

The multi-scale structural analysis of the tilted crustal section of the Dharwar craton (India) is used to reconstruct the crustal-scale deformation and flow pattern of a segment of continental lithosphere submitted to a major magmatic accretion episode between 2.55 and 2.51 Ga in a context of overall shortening. The study is based on a new comprehensive map of the tectonic framework of the craton derived from Landsat TM data and existing and new structural field data collected over the years. The Eastern Dharwar craton, which has undergone massive juvenile accretion, shows that horizontal, constrictional pure shear deformation affected large volumes of the mid- and lower crust at the time of regional partial melting and magmatic accretion. Bulk constriction is achieved by a combination of coeval shallow and steep planar fabrics sharing a common horizontal elongation direction, two sets of conjugate strike-slip shears, and extensional shear bands. This illustrates an end-member deformation mode by which a particularly weakened lithosphere responds to convergence by developing homogenous pure shear strain on a crustal scale, resulting from the combination of lateral shortening and gravity-driven flow. Thinning accompanying constrictional deformation is interpreted to be compensated by juvenile magmatic accretion and local thickening of the crust, mainly within and around mid- and upper crustal greenstone belts, allowing to maintain a stationary crustal thickness. Such a crustal scale deformation process may provide a resolution of the batholithic room problem in a softened crust submitted to lateral shortening and explain nearly isobaric retrograde P-T-t paths of HT-LP high-grade terrains. The spatial variability in the regional strain and

conjugate shear zone patterns further points to the contrasted mechanical behavior of juvenile (Eastern Dharwar craton) and previously stabilized (Western Dharwar craton) lithospheres during a same accretion event. Our results are used to define a 3D, crustal-scale structural and kinematic framework achieving longitudinal flow of wide hot orogens typifying the response of weak Precambrian lithospheres to convergence.