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Fabric Analysis in the Koppal Granitoid (Southern India) using AMS and its significance in understanding the structural evolution of Dharwar Craton

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The Dharwar Craton in southern India is known to have formed by the accretion of East Dharwar Craton (EDC) and West Dharwar Craton (WDC) at ca. 2500 Ma. This accretion occurred along the Chitradurga Boundary Fault (CBF), which is considered to demarcate the WDC from the EDC (Chadwick et al., 2003). In recent years, several structural studies integrating field, anisotropy of magnetic susceptibility (AMS) and paleostress analyses have been carried out on metabasalts and granite (Mulgund Granite) in the vicinity of Gadag town that lie in WDC, i.e., west of CBF (Mondal and Mamtani, 2013; 2014; 2016). These have established the following: (a) Rocks around Gadag have undergone three deformation events – D_1/ D_2 was due to NE-SW compression that led to the development of NW-SE fabric elements in the metabasalts and granitic rocks; the latter is manifested in the magnetic foliation recorded from AMS. D_3 was on account of NW-SE compression that led to doubly plunging magnetic lineations. (b) The metabasalts are replete with quartz veins many of which are gold bearing. These dominantly strike in NW-SE direction and formed due to dilation during D_3. (c) Strain partitioning took place at the contacts between the Mulgund Granite and surround rocks resulted in development of oblique-slip normal faults within the granite during late stages of D_3. In comparison to such in-depth knowledge of the WDC, structural evolution of the rocks of EDC has remained to be poorly understood. Therefore, in the present study, the authors have focused on rocks of the Koppal region that lie to the east of CBF in EDC. The objectives of the research are to evaluate the deformation fabric in the region and compare the results with those of the WDC (cited above) to understand the kinematics associated with formation of the Dharwar Craton. To fulfill this objective, the authors have investigated Peninsular Gneisses and granitoids (Koppal Granitoid) around Koppal town (61 km east of Gadag). The field fabric recorded in the gneisses is having an orientation varying from NW-NNW. In some parts of the Koppal Granitoid, a foliation with NE-NNE orientation is recorded; however several parts of this granitoid do not show a clear foliation. Therefore, to analyse the fabric in the granitoid, the authors have carried out AMS analysis, and it is found that the mean orientation of the magnetic foliation is NNE (20˚/64˚/110˚). These initial results indicate that whilst the host rock (gneiss) has NW-SE fabric, the Koppal granitoid is dominated by NE-SW planar fabric. This indicates that the granitoid fabric developed during regional D_3 deformation that was on account of NW-SE compression, which is in contrast to the granitoids of WDC (Mulgund Granitoid). It is envisaged that further integration of microstructural studies with the above information will enhance the existing knowledge of the accretionary processes and kinematic evolution of Dharwar craton.

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