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Non-steady strain in the terrane boundary shear zone of the Ambaji Granulite, NW India: Implications for understanding towards the dynamics of emplacement of the lower-middle crustal rocks.

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Shear zones in the high-grade terranes represent the tectonic- fossils of strain history. One such shear zones, namely Balaram-Jogdadi shear zones defining the terrane boundary of the Ambaji granulites of the South Delhi terrane Aravalli –Delhi Mobile belt, NW India, provide evidence for strain variation during exhumation of lower-middle crustal rocks. Compilation of field and microscopic analysis of various samples of mylonite from shear zones suggest that the part of shear zone contains high-grade mineral assemblages such as cordierite, sillimanite, spinel, garnet in quartzo-feldspathic mylonite rock and exhibit signature of thrusting in which garnet behaved as brittle phase and quartz and feldspar grain show ductile deformation. 2D and 3D strain analysis estimate a plane to flattening type of strain pattern. Principal strain planes are used to calculate the strain ratios for estimation of variation of strain along the shear zone. This study indicates high-grade mylonite accommodates high strain. The flow of rigid porphyroclasts estimates mean kinematic vorticity number varies from 0.47 to 0.68, which indicates the dominance of pure shear during shearing. Vorticity by the Rs/θ method in quartz grain estimates ranges from 0.7 to 0.95, suggesting a non-steady strain towards the end of deformation. High-grade mylonites were overprinted by low-temperature mylonitisation marked by minerals like quartz, feldspar, biotite in which feldspar porphyroclast shows brittle deformation and quartz, biotite show ductile deformation. Several shear kinematics indicate top-to-NW sinistral strike-slip shearing. Thus it has been interpreted that the shear zone had undergone non-steady strain. The initial thrusting phase was dominated by more pure shear component. The strike-slip shearing part was dominated by more simple shear component. Monazite geochronology sets the age of shearing at 834-778 Ma suggesting the exhumation was a transition event between Grenville to Pan-African orogeny.

Keywords: Shear zone, Deformation, Vorticity, 3D strain analysis, Monazite dating