# STRUCTURE AND PROPERTIES OF HIGH STRAIN ZONES IN ROCKS

Verbania (Italy) 3-7 September 1996
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## Abstract Volume

(Edited by E. Pera, L. Burlini, E. H. Rutter, T. James)

Under the aegis of:
IUGS Commission on Tectonics
Consiglio Nazionale delle Ricerche
Società Geologica Italiana
Società Italiana di Mineralogia e Petrologia
Tectonics Studies Group, Geological Society of London
Gruppo di Geologia Strutturale

Computers and e-mail provided by Artecnica snc (Gravellona Toce - VB)

Ricerca scientifica ed educazione permanente. Supplemento n. 107, 1996

# STRUCTURAL EVOLUTION AND TEMPERATURE CONDITIONS ALONG A HIGH-GRADE SHEAR ZONE IN SE BRAZIL

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The Rio Paraiba do Sul Shear Zone (RPSSZ) is a transcontinental strike-slip high-grade fault generated at late stages of collision between the Sio Francisco and Congo cratons during the Neoproterozoic. This dextral NE-SW trending structure (D2), overprints a flat-lying fabric (D1) with kinematic indicators suggesting overthrusting towards WNW. Within areas of low-strain, the latter is represented by a discontinuous gneissic banding marked by segregation of leucocratic material, deformed mafic lenses as well as isoclinal intrafolial folds. Partial melting of granitic composition is frequently localised along extensional structures. Granoblastic polygonal textures with lobate boundaries are widespread.

Flat-lying high-strain zones are defined by a mylonitic foliation marked by quartz ribbons, feldspar, pyroxene and amphibole porphyroclasts as well as garnet porphyroblasts. Stretched mafic bands, asymmetrical boudins and rootless intrafolial folds are common mesoscopic features.

Linear NW to EW-trending structures with low plunges are marked by stretched feldspar porphyroclasts, trails of large garnets and hinges of intrafolial folds. Annealed core-and-mantle structures are typical of feldspar porphyroclasts.

The strike-slip shear zone (D2) is characterised by a high-strain fabric with a well-developed mylonitic foliation and NE-SW- trending low-plunging lineation. Mesoscopic structures marking the mylonitic foliation include highly stretched mafic lenses and lithoclasts, boudinage of foliation and intrafolial folds and asymmetrical porphyroclasts of feldspars and pyroxenes indicating a right-lateral sense of displacement, in addition to syn- to late-tectonic garnet porphyroblasts.

Lineations are defined by quartz ribbons, stretched feldspars and pyroxene porphyroclasts as well as biotite aggregates. Microscopic features include a ubiquitous granoblastic polygonal matrix with annealed feldspar porphyroclast, stretched pyroxene and amphibole crystals which together with asymmetrical crystallographic fabric of plagioclase confirms the dextral sense of displacement for this shear zone.

Temperature conditions of M1 (D1-deformation) vary between an average of 750°C and 710°C (Gr-Bt, Northern & Southern areas, respectively) and 700°C (Hb-Gr) with 5-5.6 kbar (Gr-Pl-Bio-Qz). The M2 (D2-deformation) temperatures vary between 690°C and 680°C (Gr-Bt) while pressures vary from 7 kbar to 5.9 kbar (GRAIL), from the northern to the southern studied segments of the shear zone.

These results indicate that M1 peak temperatures were slightly higher in the northern area of study, while M2 peak temperatures are very similar for both areas along the strike-slip shear zone. Variations of pressure for the M2 event between the northern and southern segments of the strike-slip shear zone can be interpreted as indicating differences between crustal levels exposed in these regions - deeper in the northern region.

A difference of geothermal gradients must be invoked to explain similar M2 peak temperatures in both regions, something that could be interpreted in terms of the occurrence of syntranscurrent granite in this area. In the southern region, similar pressures for M1 and M2 suggest that both tectonic events were developed under similar crustal levels.

If this is correct, then all the southern region must have undergone the same post-tectonic uplift, refuting models proposing differential crustal thickening and uplift during and post-M2, respectively.