# BRITTLE-DUCTILE SHEAR ZONES IN THE LOW-GRADE VARISCAN BASEMENT IN SOUTHERN NURRA (NW SARDINIA): PRELIMINARY STRUCTURAL AND FLUID INCLUSION DATA

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Meso and microstructural analyses performed in the low-grade metamorphic Variscan basement, outcropping in Southern Nurra (NW Sardinia), highlight a more complex tectonic evolution than was originally envisaged (Carmignani et al., 1979).

Metric shear zones have been recognized within the phyllites and quartzites of the low-grade metamorphic complex. Overprinting criteria show that the shear zones deform the F1 folds that developed during the first D1 tectonic event, and are later deformed by the second D2 tectonic phase, associated, in the study area, with the development of a steeply dipping crenulation cleavage.

Kinematic indicators, represented mainly by S-C fabric, point to a top to the SW sense of the shear, in accordance with the tectonic transport associated with the D1 event. These relations indicate that the development of shear zones may be confined to the final stages of the D1 tectonic phase, but before the D2 event.

In this area the Variscan basement has been affected by a main metamorphic event, syn-D1 related, associated with the dynamic recrystallization of white mica, chlorite, albite, carbonates, epidote and Fe-Ti-oxides at peak conditions of 7-8 kbar and 420°C (Franceschelli et al., 1990).

Fluid inclusion analyses were performed in order to define the P-T conditions during which the shear zones developed.

Microstructural analyses, on oriented samples of quartz veins from the shear zones provided information on the relations between different fluid inclusion trapping events and the development of the shear zones.

Fluid inclusions occur along trails oriented both at high (type I inclusions) and low (type II inclusions) angle respect to the shear zone boundaries. Both types of inclusions contain an aqueous-carbonic fluid. The ranges of the melting temperature of the carbonic phase (-56.5-57.4°C) and of clathrate (8.0-10.0°C) are similar in both inclusion types. On the other hand, the homogenisation temperatures of the carbonic phase are higher in type I (21.0-29.3 °C) than in type II inclusions (10.8-19.2°C). Raman analyses show that the two inclusion types usually have similar gas phase compositions ($CO_2$=95.8-99.3 mole%, $CH_4$=0.3-2.9 mole %, $N_2$=0.2-1.3 mole%). Bulk compositions and densities have been calculated on the basis of the microthermometric and Raman data, and of the volume fraction of the gas phase. These calculations indicate that type I inclusions have lower densities (0.84-0.87 g/cm$^3$) than the type II inclusions (0.88-0.92 g/cm$^3$). The computed isochores of both inclusion types do not match the P-T peak conditions proposed by Franceschelli et al. (1990) for the study area, suggesting that fluid inclusions have been trapped or re-equilibrated during a retrograde metamorphic pattern.

The geometry, kinematics and data on the thermo-baric evolution suggest that the shear zones studied here developed in a compressive tectonic setting and played an important role in the exhumation of the low-grade metamorphic rocks of Northwestern Sardinia.

**References**

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