Geophysical Research Abstracts, Vol. 8, 04998, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04998

Superimposed deformation of Carrara marble: reverted torsion experiments.

C. Delle Piane, L. Burlini, K. Kunze

Geological Institute ETH,Leonhardstrasse 19 /LEB, CH-8092 Zürich Switzerland

(claudio.dellepiane@erdw.ethz.ch)

Field observations show that upper crustal shear zones often localize in calcite-rich rocks; it is commonly thought that shear zones remain inherently weak in respect of the surrounding rocks and that they are susceptible to reactivation, thus the observable microstructures might be the result of several deformation events.

Microstructural and fabric analysis of natural deformed rocks can thus be misleading in discriminating and recognizing superimposed deformation events.

We performed a new set of torsion experiments on Carrara marble with the aim of better understanding the evolution of rheology, fabric and microstructures under complicated strain path.

Each sample underwent two symmetric shear strain steps. Once reached the desired shear strain, the sense of torsion was inverted and the experiment went on until the starting position was attained again.

Experimental conditions were: 300 MPa confining pressure, 727° C temperature, $3*10^{-4}s^{-1}$ shear strain rate, shear strain between 1 and 5 plus symmetric opposite of equal amount.

In agreement with previous studies recrystallization-induced weakening begins at strains of γ of $\sim$1-2 after a peak stress is reached at about γ 0.6. Weakening is related to the volume of recrystallized grains.

We observed the onset of a steady-state regime at larger shear strain after a rheological weakening of $\sim$ 17%.

Microstructural analysis has been carried out on thin sections using UTHSCSA ImageTool: it is not possible to recognize the sense of shear from the less deformed samples ($\gamma = \pm$ 1 and $\pm$ 2), while in largely sheared samples ($\gamma = \pm$3, 4 and 5) recrystallization mechanisms create an evident foliation with sense of shear oriented in agreement with the late torsion direction.

CPO analysis is being performed to study the fabric variation induced by the symmetric shear strain events.