Experimental Report

Proposal: **5-26-184** **Council:** 4/2006

Title: Quantitative Texture Analysis of naturally deformed rocks: comparisonbetween experimental and natural textures

This proposal is a new proposal

Researh Area: Other

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Local Contact: OULADDIAF Bachir

Samples: Natural Silicate and Sulfates

Instrument	Req. Days	All. Days	From	To
D20	3	3	13/10/2006	16/10/2006
D19	2	2	16/10/2006	18/10/2006

Abstract:

In this experiment we propose the study of naturally deformed rocks from the Alpine chain. These samples are characterized by high strain structures and textures due to strain localization during Alpine subduction and collision. These rocks developed at different times and depth during the Alpine evolution and thus reflect different rock deformation mechanism and metamorphic conditions (e.g. pressure and temperature), governing rheology of rocks during large scale thrusting/faulting. Neutron diffraction is the only technique able to collect Textures (crystallographic preferred orientation) with enough statistics and resolution to allow the complete reconstruction of the Orientation Distribution Function (ODF). Combined Quantitative Texture Analysis (QTA) will be applied to reconstruct the ODF and main cristallographic orientations in order to recognize deformation mechanisms active within lithosphere, during Cretaceous-Eocene times and to compare them with results obtained by experimental deformation on rocks and minerals.

Experiment 5-26-184 (October 2006) - M. Zucali, D. Chateigner, V. Barberini

D20 – D19 ~ Local contact: B. Ouladdiaf

Quantitative Texture Analysis of naturally deformed rocks: comparison between experimental and natural textures

The aim of this experiment was to perform Quantitative Texture Analysis on naturally and experimentally deformed rocks.
The importance of using neutron diffraction has already been discussed by previous studies (1, 2, 3).
Particularly, we have planned to carry out three tasks.
1. To study new samples of naturally deformed rocks of various mineralogical composition from different parts of the Alps. The understanding of deformation mechanisms and texture development of rocks during geodynamic processes occurring during the Alpine chain evolution.
2. To compare textures of experimentally deformed samples with naturally deformed rocks. For this purpose, evaporitic rocks (mainly gypsum) have been chosen (4), since almost monomineralic and not much studied material but generally involved in large scale thrusting.
3. To compare the results with two different instruments, D20, already used with good results for QTA on rocks, and D19, only recently applied also to texture analysis, allowing, with the new setting to acquire in 288 steps what at D1B and D20 needs 1368 steps.

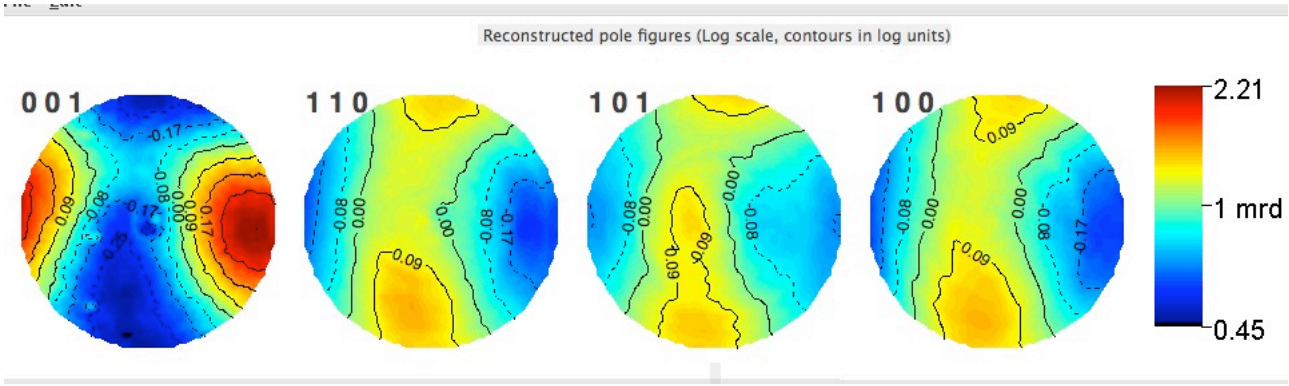
RESULTS

1. We measured 25 samples (carbonates, marbles, amphibolites, granulites and metaintrusives) scanning in phi from 0 to 355 degrees, by 5 degrees steps, and in chi from 0 to 90, by 5 degrees steps in order to obtain a complete coverage for the Orientation Distribution Function ODF calculation. Some results are exposed in figure 1, where the QTA have been obtained for marbles and carbonaceous rocks (Jurassic in age); QTA is defined by the crystallographic preferred orientation of calcite in both rock samples. The results will be used in definition of rock mechanics and deformation mechanisms of lower continental crust, typically constituted by marbles, amphibolites, granulites and metaintrusives.

2. Concerning the analysis of gypsum ($CaSO4 * 2(H2O)$), the obtained textures are of lower quality than those of other samples. This is probably due to the not excellent signal-to-noise ratio and large background caused by the incoherent scattering effect of H. To avoid this, we performed few experiments with longer acquisition times (three/four times more); future experiment may also take into account to exchange H with D in the same samples. From preliminary results, however, we could observe that textures from naturally and experimentally deformed rocks are quite similar. Very good results were obtained with anhydrite. The obtained textures will be used in seismic properties calculation.

3. The comparison of the results obtained from the measurements performed with D20 and D19 instruments on the same samples gave very good results. However, if the collecting procedures on D20, in terms of experimental conditions, are well known, those on D19 can be further improved. In figure 2 textures of the same sample obtained from measurements on D20 and D19 are shown.

Figure 1: CC2 – deformed Jurassic carbonate



EWIMV – Permo-Triassic deformation in Marble (Mortirolo)