

Post-Conference Report for EuriMinSci Dissemination Grant: Daniel Tatham

Grant Received By:

Daniel Tatham
Earth & Ocean Science,
University of Liverpool,
Liverpool.
L69 3GP. U.K.

tatham@liverpool.ac.uk

EuroMinSci Affiliation:

Mineral Substructure Dynamics CRP group.

Event:

16th Deformation Mechanisms, Rheology and Tectonics;
Milano, Italy;
27th -29th September 2007;

Presented Abstract:

(Poster, Quantitative Microstructure Session)

In situ heating and deformation experiments in the SEM

D. J. Tatham, D. J. Prior

University of Liverpool, Liverpool. U.K.

The development of substructure is an important process in rocks deforming at elevated temperature by crystal-plastic processes. Substructure is a useful indicator of deformation mechanisms and palaeostress in the lithosphere. Moreover, it provides an important control on the mechanical properties of materials. A comprehensive study of the nature and mechanical significance of substructures is key, therefore, in increasing the accuracy and reliability of palaeostress estimates and to properly describe the rheological properties of rock aggregates deforming by dislocation processes. Such an understanding will prove central in the advancement and refinement of manifold models of multi-scale dynamic processes through the materials and Earth sciences, from the atomic-scale to orogenesis and mantle convection.

In situ high-temperature electron backscatter diffraction (EBSD) and SEM imaging experiments on metals and selected rock-forming minerals have proved successful in the observation and quantification of recrystallisation and phase transformations up to ~1000°C (e.g. Seward et al., 2002; Seward et al., 2004; Bestmann et al., 2005), and the incorporation of the resulting microstructural data into numerical models (e.g. Piazzolo et al., 2004).

We aim to document the kinematics of intracrystalline substructure development and the way such substructures interact with intergranular boundaries during high temperature deformation experiments of MgO and forsterite. The primary project objective is to develop experimental protocols into high-temperature (<1400°C) deformation experiments, *in situ* in a scanning electron microscope (e.g. Seward et al.,

2002). These will provide information on sub-structure development and the interaction of sub-structure with boundaries that are relatively easy to relate to 2D models, and those representative of real rock microstructures, respectively.

Conference Summary & Report:

The DRT conference in Milan, 2007, proved to be an enormous success on a number of levels.

Being a thematic conference, the scientific program was particularly well suited to my interests, with almost all presentations having bearing either directly to the IP “*In situ* deformation of MgO and forsterite at high temperatures”, or to the upscaling and downscaling topics approached by the Mineral Substructure Dynamics CRP group.

Conference sessions included:

- Crust and Mantle rheology from micro- to mega-scale,
- Palaeorheology,
- Brittle and ductile reactivation of compositional and structural heterogeneities,
- The geophysical signature of deformation processes in crust and mantle,
- Interaction between climate, erosion and tectonics,
- Interaction between magmatism and deformation: field studies, numerical models and analogue experiments,
- Deformation-metamorphism interaction: what does condition the memory of a rock? Insights from natural data, experiment and modelling,
- Absolute dating vs. deformation: the rate of tectonics,
- Quantitative microstructure,
- Numerical and analogue modelling of deformation processes.

In addition to the stimulating and thought provoking presentations, the conference was well attended by other members of the Mineral Substructure Dynamics CRP group, which afforded the opportunity to discuss our current position in Individual Projects, networking, and new results and developments in a stimulating and vibrant setting. Moreover, oral and poster presentations could be discussed at the time and on-site with other members of the research group.

Good participation and representation by the Mineral Substructure Dynamics CRP group, and EuroMinSci via oral and poster presentations was a positive advert for ESF and EuroCores Programmes as a whole.