

Thesis project proposed by Laboratoire Sols Solides Structures Risques (*L3S-R*), Grenoble & Laboratoire Système et Matériau pour la mécatronique (*SYMME*), Annecy, to start October 2007.

Localised damage in soft rocks : experimental characterisation by field measurements and multi-scale modelling

Thesis supervisors: Cino VIGGIANI et Steve HALL (Laboratoire 3S-R) & Pierre VACHER (SYMME).

The objective of this thesis is to understand the processes of rupture in soft rocks at the micro-scale and their emergence at the macro-scale in order to simulate the behaviour of geostructures (tunnels...). To achieve this objective, we propose on the one hand to follow the damage during the diffuse-localised transition by a combination of our diverse experimental techniques for field measurements. On the other hand, we will associate these measurements with multi-scale numerical modelling.

The project will start with an experimental programme using the plane-strain (biaxial) loading cell at L3S-R, which allows observation of the external faces of a prismatic specimen during mechanical loading. Different types of field measurements (geophysical and geomechanical) will be carried out during this study: digital image correlation (of photographs) to map the strain; multi-channel acoustic emission monitoring to locate the emissions; measurements of wave propagation to map the propagation properties (velocities, attenuation). The modelling work will use models previously developed in the team at 3S-R and a calibration of the parameters for the multi-scale law will be carried out based on the experimental results. The principal results expected from this integration of experimental and numerical methods is better understanding, and so better simulation, of localised damage by micro-fracturing in rocks.

The thesis will be based in Grenoble at Laboratoire 3S-R in the team “Geomaterials, Deformation and Rupture” (GDR) in collaboration with SYMME at the Université de Savoie in Annecy (Laboratoire 3S-R is a “Unité Mixte de Recherche” of the CNRS, Université Joseph Fourier and the Institut National Polytechnique de Grenoble) The funding for the thesis will come from the RhoneAlpes region within the Macodev framework.

Contact Steve Hall (hall@geo.hmg.inpg.fr / 04 76 82 51 86) or Cino Viggiani (cino.Viggiani@hmg.inpg.fr / 04 76 82 70 38).

Links:

Team GDR: http://l3sphnum.hmg.inpg.fr/HomepageS1/GDR_UK.html

Université Joseph Fourier - <http://www.ujf-grenoble.fr>

Institut National Polytechnique de Grenoble - <http://www.inpg.fr>

Grenoble - <http://www.grenoble.fr>

SYMME - <http://www.symme.univ-savoie.fr/>)