ParisTech

Arts et Métiers Sciences et Technologies

RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM
(one page maximum)

Field: Materials Science, Mechanics, Fluids

Subfield: (Applied Mechanics)

Title: Influence of rheological and frictional slip properties on fault mechanics and localization phenomena.
ParisTech School: Arts et Métiers Sciences et Technologies

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Lab location: Angers, France
(Lab/Advisor website):http://lampa.ensam.eu/

Short description of possible research topics for a PhD:
In the last two decades, considerable observational and theoretical work has been devoted to all aspects of earthquake prediction research, for solving fundamental questions concerning the mechanics of fault systems, as well as for answering questions regarding earthquake hazard. The european natural observatory of the Corinth Rift (http://crlab.eu), a very rapidly deforming area (opening strain rate of ~10^{-6} /yr) where one or more earthquakes with magnitudes above 6 are expected in the coming decades provides a framework in which the mechanics of faults can be studied in details. It is densely instrumented and provides an exceptional data base (seismological, GPS and strain data). All the prediction approches in the litterature rely on some probalistic description of earthquake generation and timing, through empirical laws guided, or structured, by some simplification of the underlying physical process. This requires that relevant physical models and observational constraints are put at the core of any probabilistic law seismic-hazard assessment. Based on numerical modeling of the CRL region with realistic rheology and fault geometry, our objective is to constrain these key mechanical parameters by improving our ability to model the mechanics of faults in the Corinth Rift as well as their interactions.
Required background of the student: Mechanics, Physics, Applied mathematics.

A list of 5 (max.) representative publications of the group:
1. P. Bernarda, H. Lyon-Caen, al. Tectonophysics, Volume 426, Issues 1–2, 30 October 2006, Pages 7–30

2. S. El Arem, H. Lyon-Caen, P. Bernard, J-D Garaud, F. Rolandone, and P. Briole. In EGU General Assembly Conference , volume 15, page 14477, Vienna, Austria, 2013
3. S. El Arem, H. Lyon-Caen, P. Bernard, J-D Garaud, F. Rolandone, and P. Briole. In EGU General Assembly Conference , volume 15, page 14477, Vienna, Austria, 2013

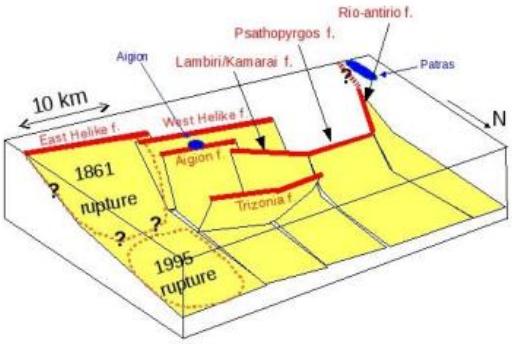

Figure 1: sketch of the major active faults of the CRL area. *Surface scarps in red. Trizonia fault is the only south dipping fault. The 1995 may have occurred on the Helike fault (uncertain dip and connectivity)*

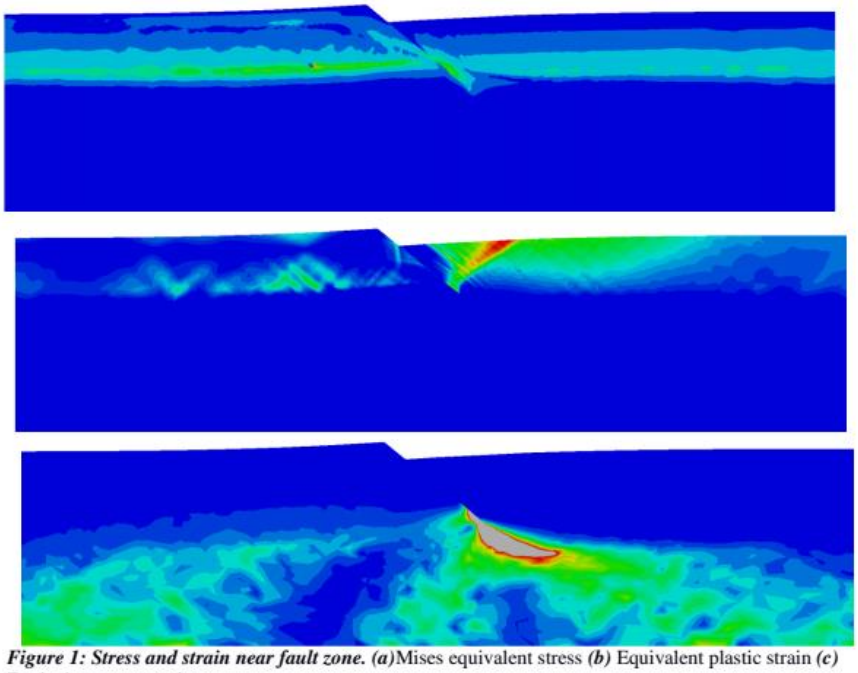

Figure 1: Stress and strain near fault zone. (a) Mises equivalent stress ***(b)*** Equivalent plastic strain ***(c)*** Equivalent creep strain.