UNIVERSITÀ DI PAVIA

Corso di Dottorato in Scienze della Terra e dell'Ambiente

1. Project title

The lithological control on the earthquake nucleation at different geological conditions: a numerical approach

2. Proposer

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3. Research Unit

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4. Key words

(Max. 5 – at least 2)

Seismic cycle – rheology - numerical modelling

5. Abstract

(Max.1.500 characters with spaces)

The project aims at investigating how the heterogeneity of crustal rocks influences the strain and stress partitioning leading to shear localization. In particular, the project focuses on composition- and size-dependent mechanisms triggering earthquakes at different scales. Strength is propbably the most important factor for fault initiation and growth through the stick-slip mechanism, which well describes the periodic elastic response of the brittle crust. However, geological and geophysical data demonstrate that earthquakes may nucleate also at conditions where ductile flow dominate over long timescales, (i.e., lower crust, subduction channel and clay-rich wedge). It is commonly assumed that fluids play the major role promoting the seismic nucleation under these conditions. However, geological evidence suggests that mechanical decoupling provided by compositional heterogeneities with significant viscosity contrast may be also important for extreme strain localization. In this project, we propose to quantify these feedbacks by numerical simulations combining the solution of the elastodynamic equations controlling the earthquake initiation and propagation with the elasto-visco-plastic rheology describing the flow during the inter-seismic periods. This research can provide a new and quantitative contribution in understanding the physical processes leading to strong earthquakes, in this way improving the seismic hazard assessment.