



Stochastic mechanical analysis of geological structures in NE Switzerland

PhD project

CY Cergy Paris Université

For underground exploration, the validation of structural interpretations and the estimation of stress and of damage states are important. In this project, numerical implementations of the theory of limit analysis shall be used to estimate the stress field and the potential for increasing plastic deformation in a set of 2D and 3D idealized geological prototypes. The scale and the geological nature of the prototypes are inspired by the NE Jura setting where a shallow thrust belt overlies Permocarboniferous graben structures, the boundaries of which have influenced fold and thrust nucleation. The project will simulate the evolution of stress and deformation over one million years. Estimations should be cast in probabilistic terms to describe their uncertainties.

Part 1: Construction of numerical prototypes by analysis of published interpretations, 2D and 3D seismic data, well data and petrophysical data to retain the meaningful tectonic and mechanical features. Development will be needed to produce stochastically 3D models with slight variations representing the uncertainties.

Part 2: Mechanical modelling and uncertainty analysis using the OptumG2/G3 softwares to calculate stress fields and determine their statistical variability. Collaboration with the Optum development team is planned.

Part 3: Evolution of stress and plastic deformation fields using sequential limit analysis (software SLAMTec) by assuming various tectonic and climatic scenarii : ice cap (load, incision, water drainage), river incision, sediment transport, tectonic loading.

Searched profile: we are looking for a Geophysicist with knowledge on 3D basin imaging and modelling, and with interest in programming, or mechanics, or geo-technical engineer, with interest and knowledge in Geophysics.

Supervisors: [Bertrand Maillot](#), [Christophe Barnes](#), [Pauline Souloumiac](#), [Pascale Leturmy](#).

Place : CY Cergy Paris Université, Laboratoire GEC, Maison Internationale de la Recherche, 1 rue Descartes, 95000 Neuville-sur-Oise ([GEC web site](#)).

Funding: Standard PhD contract at CY institute of doctoral studies “Sciences et Ingénierie” (three years including possibly teaching tasks), beginning october 1st, 2020 (funding through a research contract between CY, swisstopo and ENSI), net salary: approx. 1700€/month.

Application before june 10th, 2020. (cv+letter+references+master program and marks).