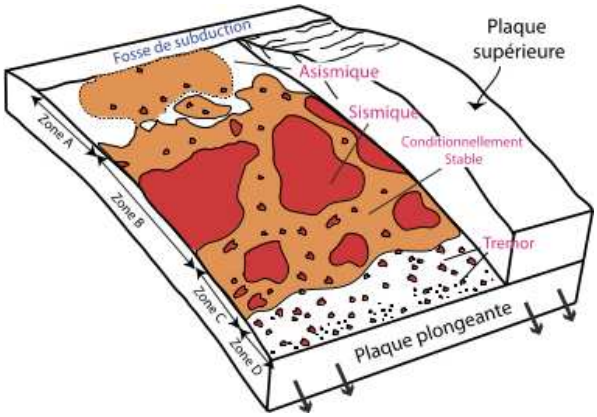
MSIAM2 MSc thesis project proposal – *Research*

Numerical simulation of fault dynamics

Option : modeling, scientific computing and image analysis (MSCI)

Context – Plate tectonics describes the **slip**, along faults, of plates of the Earth crust. These slips, when they are sudden, come with vibrations : they are earthquakes. In order to better estimate this earthquake risk, it is necessary to improve the mathematical description and the **numerical resolution** of these slips.



Objectives – In a first step, the objective of this work wil be to implement the numerical resolution of the slip-and-friction along the fault of two plates of the Earth crust. The code will be based on the C++ Rheolef. finite element library. The non-smooth minimization problem obtained from the yield slip could be solved by an algorithm from **convex optimization** : augmented Lagrangian or non-smooth Newton method.

In a second step, our aim is to elucidate under which condition we obtain either a sudden slip (earthquake) or a slow one (creep). Numerical results will be compared to available data in the Japanese subduction zone.

This work could continue during a PhD.

Required skills : applied mathematics ; computer science

Keywords : partial differential equations ; finite element method ; application to geosciences

Working place : LJK, Grenoble

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References

[1] P. Saramito (2016)

[2] Rheolef C++ library

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