

4-year Ph.D. position – Computational geomechanics

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Position overview

Fluid injection in the subsurface is recognized as a potential source of induced seismicity, notably aseismic slip along geological faults, and potentially – if not controlled – major induced seismic events that can endanger the population and cause considerable damage to infrastructure. To foster the development of energy technologies known to help mitigate the impacts of climate change, such as geothermal energy production or geological storage of carbon and hydrogen, it is essential to understand and prevent the risk of induced seismicity during field operations.

This doctoral project will study the propagation of aseismic slip along faults in response to transient fluid injection, taking into account thermal effects. The results of this project will contribute to the design of injection scenarios to mitigate the risk of induced seismicity and ensure sustainable and responsible use of subsurface resources. This work is primarily theoretical and numerical.

This doctoral position is funded by the NSERC Discovery Grant “Mitigating the risk of fluid-induced seismicity for the development of sustainable subsurface technologies” held by Prof. Antoine B. Jacquey.

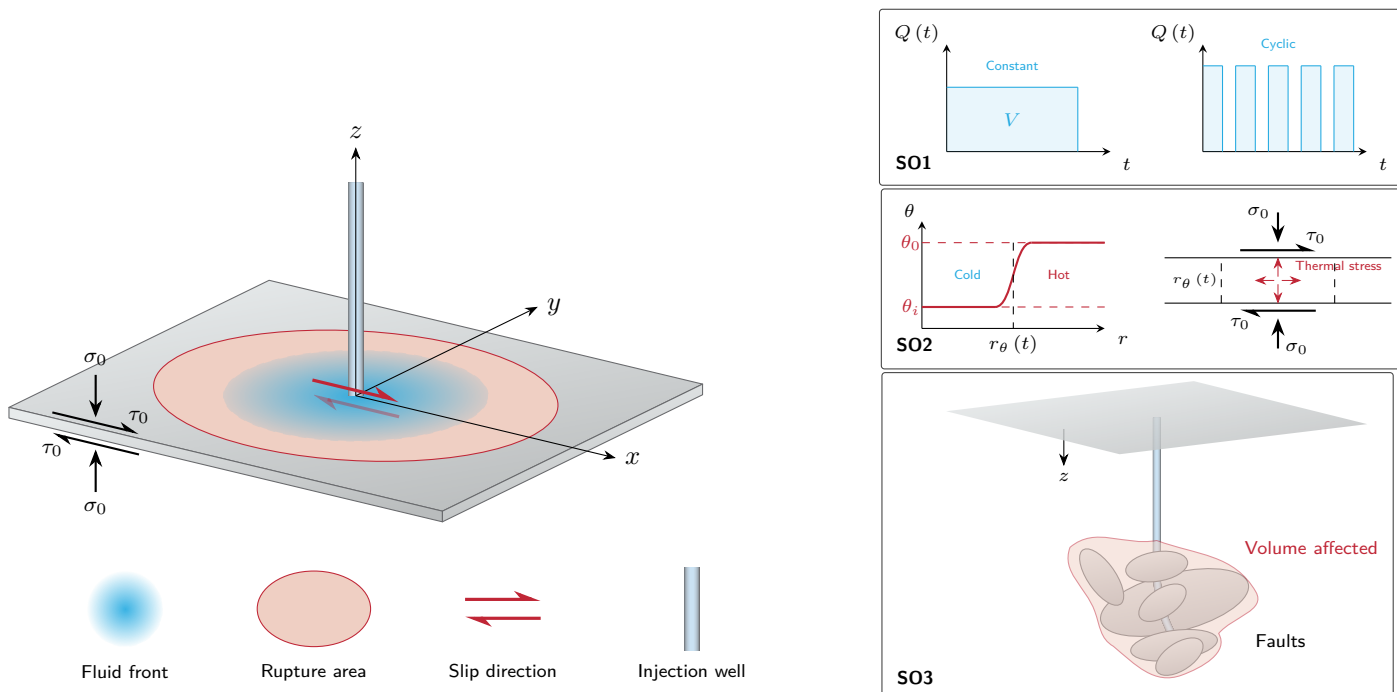


Figure 1: Illustrative summary of the methodological approach for the proposed research. Left: graphical summary of the typical fluid-induced aseismic slip propagation problem for a single planar fault model. Right: each boxed content corresponds to the specific objectives (SO) of the proposed research.

Practical details

- **Duration and starting date:** 4-year position starting in September 2025.
- **Application deadline:** February 10th 2025.
- **Location:** Montréal, Canada. Polytechnique Montréal campus.
- **Funding amount:** between \$35 000–\$40 000 per year depending on applicant's profile and experience.
- **Research environment:** You will be part of the Geotechnical Research Group at Polytechnique Montréal, regrouping 5 professors. Your research will be supervised by Prof. Antoine B. Jacquey withing the Geoenergy & Geomechanics group. You may interact with local collaborators (McGill and Concordia) and international collaborators (Duke University, Tufts University, and Northwestern University, USA) during your research.

Qualifications and candidate profile

- M.Sc. in geological, geotechnical, mechanical or civil engineering, or other relevant field.
- Solid background in solid mechanics and programming.
- Experience in numerical modeling using finite element, finite difference, finite volume or boundary element is required.
- Knowledge of at least one programming language (Julia, Python, or C++) is required.
- Experience in modeling thermo-hydro-mechanical processes in porous media is recommended.
- Strong communication skills in English (a minimum IELTS score of 7.0 is required for international applicants).

How to apply

Interested candidates should send an email to Prof. Antoine Jacquey (antoine.jacquey@polymtl.ca) before **February 10th 2025** with the subject "**PhD application - computational geomechanics**" and the following documents:

- A **cover letter** describing your research interests and how they relate to the above-mentioned topics.
- A **Curriculum Vitae (CV)** including (if applicable) a list of scientific publications or conference proceedings.
- Copies of **transcripts** (B.Sc. and M.Sc.).
- Contact information for 1-2 references/past supervisors.

Employment equity and diversity

We are convinced that a strong, diverse and interdisciplinary team is the key factor to help each member reach their own educational and professional goals. We offer an environment that fosters autonomy, passion, and creativity together with a mentoring shaped for your own career choices.

Employment equity is a commitment to equal treatment and fairness in the workplace. It strives to ensure that no one is denied an opportunity for employment or advancement for reasons unrelated to their abilities. We welcome applications from Aboriginal persons, persons with disabilities, ethnic minorities, persons of minority sexual orientation or gender identity, visible minorities, women and others who may contribute to diversification.

For more information about this position, please visit the description of the [doctoral program](#) at Polytechnique Montréal or contact [Antoine Jacquey](#).