Alexis Sáez

Postdoctoral Scholar
California Institute of Technology (Caltech)
1200 E California Boulevard, Pasadena, CA, USA 91125
Phone: (+1) 626 598 7365, E-mail: saez@caltech.edu

Research interests: My research focuses on understanding the mechanical behavior of the subsurface in relation to problems associated with the development of underground technologies with the potential to decarbonize our energy systems (e.g., deep geothermal energy and geological carbon storage), and the mitigation of geohazards (e.g., earthquakes). I combine tools of theoretical and computational continuum mechanics and applied mathematics to develop physics-based models that are informed by and explain geological, geophysical, and laboratory observations. Current and past specific research topics include: fluid-driven frictional ruptures, injection-induced seismicity, earthquake swarms, slow slip events, tremors and metamorphic dehydration reactions, and earthquake nucleation, arrest, and segmentation of ruptures along faults.

EDUCATION

EPFL - École Polytechnique Fédérale de Lausanne — Lausanne, Switzerland
Ph.D. in Mechanics — 2019-2023

- Advisor: Prof. Brice Lecampion.
- Research areas: Geomechanics, induced seismicity, earthquake and fracture mechanics.
- Awarded the Rocha Medal 2026 by the International Society for Rock Mechanics and Rock Engineering (ISRM) as the best PhD thesis in the field defended in 2023-2024.
- Awarded as the best PhD thesis in Mechanics in EPFL in 2024 (EDME award).

University of Chile — Santiago, Chile
M.Sc.E., B.Sc.E., and professional title in Civil Engineering — 2005-2014

- Awarded as the Best Graduate Civil Engineer of the 2014 Class.

PROFESSIONAL EXPERIENCE

California Institute of Technology | Division of Geological and Planetary Sciences — CA, USA
Postdoctoral Scholar Research Associate in Geology — 2024-Today

- Advisor: Prof. Jean-Philippe Avouac.
- Research areas: Geophysics, earthquake source physics, slow and fast earthquakes, experimental mechanics, geodesy.
- Awarded the Swiss NSF Postdoc.Mobility Fellowship.
- Awarded the Caltech Geophysics Option Postdoctoral Fellowship.

Dalhousie University | Department of Civil and Resource Engineering — NS, Canada
Postdoctoral Fellow in Civil and Resource Engineering — 2024

- Advisor: Prof. Dmitry Garagash.
- Research areas: Earthquake source physics, slow earthquakes.

EPFL - École Polytechnique Fédérale de Lausanne | Institute of Civil Engineering — Lausanne, Switzerland
Doctoral Researcher in Mechanics — 2019-2023

- Advisor: Prof. Brice Lecampion.
- Research areas: Geomechanics, induced seismicity, earthquake and fracture mechanics.
- Awarded the Swiss Government Excellence Scholarship for Foreign Students.

The University of Tokyo | Earthquake Research Institute Tokyo, Japan
Visiting Doctoral Researcher in Geophysics 2022-2023

- Advisor: Prof. Aitaro Kato.
- Research areas: Geophysics, slow earthquakes.
- Awarded the EPFL Doc.Mobility Grant.

CODELCO - Corporación Nacional del Cobre de Chile Santiago, Chile
Project Engineer 2013-2016

- Main role: Structural, geomechanical, and seismic engineering revisions for large mining projects and tailings dams.

TEACHING EXPERIENCE

EPFL - École Polytechnique Fédérale de Lausanne | Institute of Civil Engineering

• *Teaching Assistant for Computational Geomechanics (CIVIL-423)*: Master's course on poroelasticity theory and its numerical solution through the finite element method. 2019-2021

• *Teaching Assistant for Geotechnical Engineering (CIVIL-306)*: Bachelor's course on fundamentals of soil mechanics and engineering design of soil structures. 2020-2021

• *Master's final project supervision*: "Revisiting the Pohang induced earthquake". Student: Tristan Liardon (currently, PhD student at EPFL). 2021

• *Bachelor and Master's semester projects supervision*: 2 bachelors, 2 masters. 2020-2022

PUBLICATIONS

Journal Articles

1. **Sáez, A.**, Lecampion, B., Bhattacharya, P. and Viesca, R.C. (2022). Three-dimensional fluid-driven stable frictional ruptures. *Journal of the Mechanics and Physics of Solids*, 132, 103672. [link]

2. **Sáez, A.** and Lecampion, B. (2023). Post-injection aseismic slip as a mechanism for the delayed triggering of seismicity. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 479, 20220810. [link]

3. **Sáez, A.** and Lecampion, B. (2024). Fluid-driven slow slip and earthquake nucleation on a slip-weakening circular fault. *Journal of the Mechanics and Physics of Solids*, 183, 105506. [link]

4. **Sáez, A.**, Passelègue, F. and Lecampion, B. (2025). Maximum size and magnitude of injection-induced slow slip events. *Science Advances*, 11, eadq0662. [link]

5. **Sáez, A.**, Avouac, J.-P., and Lecampion, B. (2025). Spatiotemporal patterns of micro-seismicity driven by fluid injections and induced aseismic slip. *In prep.*

6. **Sáez, A.**, Kato, A., and Garagash, D. (2025). Slab dehydration–induced hydraulic fracturing: Linking episodic fluid release to slow slip and tremor in subduction zones. *In prep.*

Proceedings/Conference Articles

7. Lecampion, B., **Sáez, A.** and Gupta, A. (2023). Shearing and opening of a pre-existing discontinuity in response to fluid injection. *57th U.S. Rock Mechanics/Geomechanics Symposium*, Atlanta, Georgia, USA, June 25-28. [link]

PhD Thesis

8. **Sáez, A.** (2023). Three-dimensional fluid-driven frictional ruptures: theory and applications. PhD thesis, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland. [link]

AWARDS

2025	**Rocha Medal 2026**: given by the International Society for Rock Mechanics and Rock Engineering (ISRM), to the best PhD thesis in Rock Mechanics defended in 2023-2024.
2024	**2024 EDME award**: given by the Doctoral Program in Mechanics of the École Polytechnique Fédérale de Lausanne, to the best PhD thesis of the 2024 class.
2014	**Best Graduate Engineer Award**: given by the Chilean Society of Engineers (Colegio de Ingenieros de Chile) to the best graduate civil engineer of the 2014 class of the University of Chile.
2006, 2007, 2008, 2009, 2010	**Outstanding Student Award**: granted each year by the Faculty of Physical and Mathematical Sciences of the University of Chile, to undergraduate students belonging to the 6% of higher grades of the faculty.

GRANTS AND SCHOLARSHIPS

2025-2027	**Postdoc Mobility Fellowship**: granted by the Swiss National Science Foundation (SNSF) to conduct research at Caltech on slow earthquakes. Amount: $\sim$ 155,000 USD.
2024-2025	**Geophysics Option Postdoctoral Fellowship**: granted by the Division of Geological and Planetary Sciences, Caltech, to work on the broad field of geophysics. Amount: $\sim$ 70,000 USD.
2022-2023	**EPFL Doc Mobility Grant**: given by the École Polytechnique Fédérale de Lausanne (EPFL) to carry out a doctoral research stay of 6 months in the Earthquake Research Institute (ERI) of the University of Tokyo, on the topic of the role of fluids in slow earthquakes. Amount: $\sim$ 10,000 USD.
2019-2023	**Swiss Government Excellence Scholarship for Foreign Students**: granted by the Swiss Confederation to conduct research at the École Polytechnique Fédérale de Lausanne (EPFL) on the topic of injection-induced seismicity as part of the PhD program in Mechanics. Amount: $\sim$ 75,000 USD.
2022	**EPFL-ETH Zürich Summer School Grant**: given by EPFL and ETH Zürich to organize an international summer course for PhD students: "Mechanics of earthquakes and aseismic slip", held in Zürich, Switzerland, July 2022. Amount: $\sim$ 20,000 USD.
2011	**Full Tuition Fee Waiver Scholarship**: given by the Department of Civil Engineering, University of Chile, once per year to one outstanding student to study the master's program in civil engineering. Amount: $\sim$ 4,000 USD.
2005-2010	**Bicentenario Scholarship**: given by the Chilean government to students with financial difficulties and outstanding results in the admission exam to public universities. Amount: $\sim$ 5,000 USD.

SERVICE (Peer reviewer, events organizer, technology transfer)

2022 - now	Peer reviewer for Journal of Geophysical Research: Solid Earth, Journal of Fluid Mechanics, Philosophical Transactions of the Royal Society A, Geophysical Journal International, Rock Mechanics and Rock Engineering, Communications Earth and Environment.
2022	Creator and principal organizer of the international summer course for PhD students: "Mechanics of earthquakes and aseismic slip", Zürich, Switzerland, 18-21 July 2022.
2014	Development of a proposal for the national code for the seismic design of buildings with passive energy dissipation systems. This proposal was the main output of my master's thesis and provided the basis for the now official national code NCh3411 of the National Standardization Institute of Chile.
2012	Member of conference organizing committee: Behavior of Steel Structures in Seismic Areas (STESSA) 7th International Conference, Santiago, Chile.
2010	Member of conference organizing committee: Proceedings of the 10th Chilean Conference on Seismology and Earthquake Engineering, Santiago, Chile.

PROGRAMMING LANGUAGES

Proficient in C++, Python, Wolfram Mathematica, and Matlab.

LANGUAGES

Fluent in English, Spanish (native), and Portuguese.

CAREER BREAKS

2017-2018	Trip around the world for two years (Australia, China, Brazil, Myanmar, among many other countries).