

# Alexis Sáez

PhD

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## Education

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### Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland

2019-2023 Ph.D. in Mechanics. Advisor: Brice Lecampion

- *Subfield*: Geomechanics.

- *Holder of a Swiss Government Excellence Scholarship for Foreign Students*

2019-2023 to conduct research on the subject: injection-induced seismicity.

### University of Chile, Chile

2014 Professional Title of Civil Engineer.

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

2014 M.Sc.E. in Earthquake Engineering.

- *Holder of the Full Tuition-Fee Waiver Scholarship.* This scholarship is given once per year to one outstanding civil engineering's student to pursue the master program in earthquake engineering.

2010 B.Sc.E. in Civil Engineering.

- *Awarded the Outstanding Student Prize* consecutively from 2006 to 2010. This award recognizes undergraduate students belonging to the 6% of higher grades of the School of Engineering.

## Professional Experience

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06/2019-11/2023 *Doctoral Assistant* at Geo-energy Laboratory, Civil Engineering Institute, School of Architecture, Civil and Environmental Engineering (ENAC), Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland.

09/2022-02/2023 *Visiting PhD Student* at Earthquake Research Institute (ERI), the University of Tokyo, Japan. (Host Professor: Aitaro Kato)

- *Awarded the EPFL Doc.Mobility Grant* to conduct a 6-months research stay on the subject: slow earthquakes and pore pressure transients in subduction zones.

01/2013-12/2016 *Project Engineer* at Corporación Nacional del Cobre de Chile (CODELCO), Santiago, Chile. Structural, geotechnical and seismic revisions for large mining projects and tailings dams.

- *Fellow of the Graduate Program* which focuses on developing technical capabilities and leadership skills of young talented engineers to drive the transformation of the mining of the future for Chile.

## Teaching Experience

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### Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland

- 2019-2021 *Teaching Assistant for Computational Geomechanics (CIVIL-423)*, Civil Engineering Institute.  
Master's course on poroelasticity theory and its numerical solution via the continuous Galerkin finite element method.
- 2020-2021 *Teaching Assistant for Geotechnical Engineering (CIVIL-306)*, Civil Engineering Institute.  
Bachelor's course on fundamentals of soil mechanics and engineering design of soil structures.
- 2021 *Master's final project supervision*: "Revisiting the Pohang induced earthquake".  
Student: Tristan Liardon (currently, PhD student at EPFL).
- 2020-2022 *Bachelor and Master's semester projects supervision* (2 bachelors, 2 masters).

## Publications

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### PhD thesis

1. **Sáez, A.** (2023). Three-dimensional fluid-driven frictional ruptures: theory and applications. PhD thesis, École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland. <https://doi.org/10.5075/epfl-thesis-10303>

### PhD articles – published:

2. **Sáez, A.**, Lecampion, B., Bhattacharya, P. & Viesca, R.C. (2022). Three-dimensional fluid-driven stable frictional ruptures. *Journal of the Mechanics and Physics of Solids*, 132, 103672. <https://doi.org/10.1016/j.jmps.2021.104754>
3. **Sáez, A.** & 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. <http://doi.org/10.1098/rspa.2022.0810>
4. Lecampion, B., **Sáez, A.** & 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. <https://doi.org/10.56952/ARMA-2023-0721>
5. **Sáez, A.** & 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. <https://doi.org/10.1016/j.jmps.2023.105506>

### PhD articles – in preparation:

6. **Sáez, A.** & Lecampion, B. Maximum magnitude of injection-induced slow slip events. [Preliminary results presented at AGU Fall Meeting 2021, New Orleans, USA] <https://www.authorea.com/doi/full/10.1002/essoar.10509487.1>
7. **Sáez, A.** & Lecampion, B. Spatiotemporal signatures of seismic swarms driven by fluid injections and induced aseismic slip. [Preliminary results presented at EGU General Assembly 2022, Vienna, Austria] <https://meetingorganizer.copernicus.org/EGU22/EGU22-11943.html>
8. **Sáez, A.** & Lecampion, B. Extraction of fluids to mitigate the seismic risk associated with post-injection-induced seismicity. [Preliminary results presented at EGU General Assembly 2023, Vienna, Austria] <https://meetingorganizer.copernicus.org/EGU23/EGU23-15861.html>

## Publications (continuation)

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### Master's articles – conferences proceedings (peer-reviewed):

9. **Sáez, A.**, Moroni, M. O. & Sarrazín, M. (2012), “Contributions to the Chilean Code for Seismic Design of Buildings with Energy Dissipation Devices”, Proceedings of the 15th World Conference on Earthquake Engineering, Lisbon, Portugal.  
[https://www.iitk.ac.in/nicee/wcee/article/WCEE2012\\_5761.pdf](https://www.iitk.ac.in/nicee/wcee/article/WCEE2012_5761.pdf)
10. **Sáez, A.**, Moroni, M. O. & Sarrazín, M. (2014), “Correction Factor for Estimating The Maximum Relative Velocity Based on Pseudo Velocity”, 10th U.S. National Conference on Earthquake Engineering, Alaska, EEUU.  
<https://datacenterhub.org/resources/12484/download/10NCEE-001144.pdf>

## Awards

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- 2014 *Best Graduate Engineer of 2014 Class Award*, given by the Chilean Society of Engineers to the best graduate civil engineer of the 2014 class of the Division of Structures, Construction and Geotechnics, Department of Civil Engineering, University of Chile.
- 2006-2010 *Outstanding Student Award*, granted by the School of Engineering and Sciences, University of Chile, to undergraduate students belonging to the 6% of higher grades of the faculty.

## Grants and Scholarships

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- 2019-2023 *Swiss Government Excellence Scholarship for Foreign Students*, granted by the Swiss Confederation to conduct research at EPFL on the topic of injection-induced seismicity as part of the PhD program in Mechanics.  
Amount: ~75,000 USD.
- 2022-2023 *EPFL Doc.Mobility Grant*, given by EPFL to carry out a doctoral research stay of 6 months in the Earthquake Research Institute of the University of Tokyo, on the topic of the role of fluids in slow earthquakes.  
Amount: ~10,000 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.  
<https://earthquake-mechanics-2022.ethz.ch>  
Amount: ~20,000 USD.
- 2010 *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 program in earthquake engineering.  
Amount: ~4,000 USD.
- 2006 *Bicentenario Scholarship*, given by the Chilean government to students with financial difficulties and outstanding results in the admission exam to public universities.  
Amount: ~5,000 USD.

## Invited talks

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- 02/2023 Seismology and Rock Mechanics groups, National Research Institute for Earth Science and Disaster Prevention (NIED), Japan. “Fluid-driven stable fault slip: nucleation, propagation and arrest”, Tsukuba, Japan. (Host: Prof. Eiichi Fukuyama)
- 02/2023 Seismology and Physics of the Earth’s interior group, Department of geophysics, Kyoto University. “Fluid-driven stable fault slip: nucleation, propagation and arrest”, Kyoto, Japan. (Host: Prof. Yoshihiro Kaneko)
- 08/2022 Seismological Laboratory, Caltech - Brown Bag Seminar. “Fluid-driven stable fault slip: nucleation, propagation and arrest”, Pasadena, CA, USA. (Host: Dr. Mateo Acosta)
- 08/2022 Earth Resources Laboratory, MIT. “Fluid-driven stable fault slip in 3D: nucleation, propagation and arrest”, Cambridge, MA, USA. (Host: Dr. Ekaterina Bolotskaya)
- 08/2022 Schlumberger-Doll Research. “Fluid-driven stable fault slip: nucleation, propagation and arrest”, Cambridge, MA, USA. (Host: Dr. Romain Prioul)
- 05/2022 Geoazur Laboratory, Université de Côte d’Azur. “Post-injection pulse-like aseismic ruptures”, Sophia Antipolis, France. (Host: Dr. François Passelègue)
- 06/2021 Applied and Earthquake Seismology Research Group, Department of Earth Sciences, Freie Universität Berlin. “Three-dimensional aseismic ruptures driven by fluid injection”, Berlin, Germany. (Host: Prof. Serge Shapiro) Online.
- 05/2021 Seismology Group, Department of Geophysics, University of Chile,. “Three-dimensional aseismic ruptures driven by fluid pressure diffusion”, Santiago, Chile. (Host: Prof. Sergio Ruiz) Online.
- 04/2021 GFZ German Research Centre for Geosciences - Section 4.1 Lithosphere Dynamics. “Three-dimensional aseismic ruptures driven by fluid injection”, Potsdam, Germany. (Host: Dr. Matthias Rosenau) Online.

## Oral presentations

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- 05/2023 European Geosciences Union (EGU) - General Assembly 2023. “Extraction of fluids to mitigate the seismic risk associated with post-injection aseismic slip”, Vienna, Austria.
- 12/2022 American Geophysical Union (AGU) - Fall Meeting 2022. “Pulse-like aseismic ruptures upon the cessation of fluid injections: regimes of propagation and arrest in 3D”, Chicago, IL, USA. Online.
- 07/2022 11th European Solid Mechanics Conference (ESMC). “Three-dimensional fluid-driven stable frictional ruptures”, Galway, Ireland.
- 05/2022 European Geosciences Union (EGU) - General Assembly 2022. “Spatio-temporal patterns of fluid-driven aseismic slip transients: implications for seismic swarms”, Vienna, Austria.
- 05/2022 European Geosciences Union (EGU) - General Assembly 2022. “2D and 3D numerical modeling of fluid-driven frictional crack growth for geothermal hydraulic stimulation”, Vienna, Austria.
- 05/2021 European Geosciences Union (EGU) - General Assembly 2021. “Three-dimensional aseismic ruptures driven by fluid injection”, Vienna, Austria. Online.

## Peer reviewer

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2022-Now Rock Mechanics and Rock Engineering

2023-Now Geophysical Journal International

## Organizing Committees

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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.  
<https://earthquake-mechanics-2022.ethz.ch>

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.

## Technology Transfer

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2014 Development of a proposal of 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 Standardization National Institute of Chile.

## Memberships

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- European Mechanics Society (EUROMECH).
- European Geosciences Union (EGU).
- American Geophysical Union (AGU).

## Programming languages

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

## Languages

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

## Career Breaks

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