

Stacy Larochele

Postdoctoral Research Scientist

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Education	Ph.D. in Geophysics California Institute of Technology, CA, USA	2022
	M.S. in Geophysics California Institute of Technology, CA, USA	2018
	B.Eng. in Civil Engineering McGill University, QC, Canada	2016
Research Experience	Postdoctoral Research Scientist LDEO, Columbia University, NY, USA <i>Impact of meltwater and groundwater on ice-sheet dynamics</i> Mentors: Meredith Nettles, Jonathan Kingslake, Laura Stevens (Oxford)	2022-
	Graduate Researcher California Institute of Technology, CA, USA <i>Mechanical interactions between water and the solid Earth: From quasi-static geodetic deformation to dynamic fault slip</i> Advisors: Jean-Philippe Avouac, Nadia Lapusta	2016-22
	Visiting Graduate Researcher IGN, IPGP, and ENS Paris, France <i>Geodetic insight into aquifer mechanics</i> Mentors: Kristel Chanard, Luce Fleitout, Jérôme Fortin	Fall 2019
	Géoazur, Université Côte d'Azur, France <i>Fault slip modeling of a fluid-injection experiment</i> Mentors: Jean-Paul Ampuero, Frédéric Cappa	July 2019
	Undergraduate Researcher McGill University, QC, Canada 1. <i>Poroelastic stress field due to hydraulic fracturing</i> 2. <i>Fluid flow through fractured and intact limestone</i> 3. <i>Seismic performance of concrete frame structure</i> Advisors: 1. Yajing Liu, 2. Patrick Selvadurai, 3. Denis Mitchell	Fall 2015 Summer 2015 Summer 2014

Publications **In preparation:**

Larochelle, S., Kingslake, J., & Lu, G., Poroelastic aquifer models to assess the impact of groundwater on ice dynamics. In preparation.

Larochelle, S., Stevens, L. A., Nettles, M., Lu, G., Lau, N., Behn, M. D., Fan, W., Das, S. B., Englacial stress triggering of supraglacial lake hydro-fracture drainages. In preparation.

Larochelle, S., Ampuero, J.-P., Lapusta, N., & Lambert, V., Fault slip and earthquake nucleation induced by fixed-length fluid perturbations. In preparation.

Submitted:

Larochelle, S., Chanard, K., Dalaison, M., Fortin, J., Longuevergne, L., Fleitout, L., Argus, D. F., Gauer, L.-M., Jolivet, R., & Avouac, J.-P., Abrupt transition to irreversible damage in the overdrafted Sacramento Valley aquifer system. In review at *Nature Water*.

Alghannam, M., Larochelle, S., Lapusta, N., Rubino, V., Sirorattanakul, K., Lattanzi, A., & Rosakis, A., Rate-and-state simulations motivated by laboratory fluid-injection experiments. In revision for resubmission.

Published:

Sirorattanakul, K., Larochelle, S., Rubino, V., Lapusta, N., & Rosakis, A. J., Sliding and healing of frictional interfaces that appear stationary. *Nature*. doi:10.1038/s41586-025-08673-0

Stevens, L. A., Das, S. B., Behn, M. D., McGuire, J. J., Lai, C.-Y., Joughin, I., Larochelle, S., & Nettles, M., Elastic stress coupling between supraglacial lakes. *Journal of Geophysical Research: Earth Surface*, 129, 5, doi:10.1029/2023JF007481

Michel, S., Jolivet, R., Lengliné, O., Gualandi, A., Larochelle, S., & Gardonio, B. (2022). Searching for transient slow slips along the San Andreas Fault near Parkfield using independent component analysis. *Journal of Geophysical Research: Solid Earth*, 127, doi:10.1029/2021JB023201

Larochelle, S., Chanard, K., Fleitout, L., Fortin, J., Gualandi, A., Longuevergne, L., Rebischung, P., Violette, S., & Avouac, J.-P. (2022). Understanding the geodetic signature of large aquifer systems: Example of the Ozark Plateaus in Central United States. *Journal of Geophysical Research: Solid Earth*, 127, <https://doi.org/10.1029/2021JB023097>

Larochelle, S., Lapusta, N., Ampuero, J.-P., & Cappa, F. (2021). Constraining fault friction and stability with fluid-injection field experiments. *Geophysical Research Letters*, 48, doi:10.1029/2020GL091188

Larochelle, S., Gualandi, A., Chanard, K., & Avouac, J.-P. (2018). Identification and extraction of seasonal geodetic signals due to surface load variations. *Journal of Geophysical Research: Solid Earth*, 123, doi:10.1029/2018JB016607

Dissertation & Reports:

Larochelle, S. (2022). Mechanical Interactions Between Water and the Solid Earth: from Quasi-Static Geodetic Deformation to Dynamic Fault Slip. Dissertation (Ph.D.), California Institute of Technology, doi:10.7907/2r5a-9277

Lapusta, N., Dunham, E., Avouac, J.-P., Denolle, M., van Dinther, Y., Faulkner, D., Fialko, Y., Kitajima, H., Lambert, V., Larochelle, S., et al. (2019). Modeling Earthquake Source Processes (MESP): from Tectonics to Dynamic Rupture, Report to the National Science Foundation.

Larochelle, S., Liu, Y., & Kao, H. (2016). Poroelastic modeling of hydraulic fracturing induced earthquake stress field. Geological Survey of Canada, Open File 8028. doi:10.4095/297811

Grants

NSF Antarctic Glaciology Award 2336328 (\$356,512) <i>Modeling the coupled dynamics of groundwater, subglacial hydrology and ice sheets.</i> PI: <u>Stacy Larochelle</u> , Co-PI: Jonathan Kingslake	Sept. 2024 – Aug. 2026
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Fellowships & Scholarships

STEM Chateaubriand Fellowship (€3,245) Embassy of France in the United States	2019-20
Postgraduate Scholarship - Doctoral (C\$63,000) National Sci. and Eng. Research Council of Canada	2018-21
Gutenberg Fellowship (\$30,000) Seismological Laboratory, California Institute of Technology	2016-17
Gordon Hunt Engineering Scholarship (C\$3,000) McGill University	2015-16
Undergraduate Research Student Awards x2 (C\$9,000) National Sci. and Eng. Research Council of Canada	2014-15
Hydro-Québec Engineering Scholarship (C\$15,000) McGill University	2012-15

Awards & Honors	AGU Outstanding Reviewer for <i>JGR: Solid Earth</i>	2023
	Demetriades-Tsafka-Kokkalis Ph.D. Thesis Award, Caltech	2022
	Student Presentation Award, Seismological Society of America	2021
	Richard H. Jahns Teaching Award, Caltech	2019
	Teaching Quality Report Feedback Registrar Recognition, Caltech	2019
	Outstanding Student Presentation Award, AGU	2018
	British Association Medal, McGill	2016
	Summer Undergraduate Research in Eng. Poster Award, McGill	2015
Dean's Honor List, McGill	2012-16	
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Fieldwork	Supraglacial Lakes on West Greenland Ice Sheet (7 weeks) Maintenance and recovery of on-ice GNSS, ice-penetrating radar, and water pressure instruments. Helicopter field survey of hydro-fracture features.	Summer 2023
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Teaching	Student: Caltech E110 - <i>Principles of University Teaching and Learning in STEM</i>	2021
	Teaching Assistant: Caltech ME/Ge/Ae 102a/160 - <i>Continuum Mechanics</i> Caltech ME/Ge/Ae 266 - <i>Dynamic Fracture & Frictional Faulting</i> Caltech Ge 162 - <i>Introduction to Seismology</i> Caltech Ge/ESE 118 - <i>Introduction to Data Analysis</i> Caltech Ge 1 - <i>Introduction to Earth Sciences</i> McGill CIVE 210 - <i>Surveying</i> (field class) McGill FACC 300 - <i>Engineering Economy</i>	2020 2020 2019 2018 2018 2016 2015-16
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Service	Professional: Session co-convener (G006), AGU Fall Meeting Early career representative of AGU Geodesy Section Student representative of AGU Geodesy Section Organizing Committee of MESP Workshop Reviewer for <i>EPSL</i> , <i>Geophysical Journal International</i> , <i>Geophysical Research Letters</i> , <i>JGR: Solid Earth</i> , <i>Pure and Applied Geophysics</i> , <i>Remote Sensing</i> , <i>Remote Sensing of Environment</i> , <i>Tectonics</i> , and <i>Water Resources Research</i>	2023 2022-25 2021-22 2018 2018-
	University: MPG/SGT (Geophysics) Seminar Organizing Committee, LDEO Postdocs Social Planning Committee, LDEO GPS Local Student Committee, Caltech Seismo Lab Seminars Organizing Committee, Caltech Women in GPS (WinGs) Treasurer, Caltech	2023-24 2023-24 2019-20 2018-19 2018-20

Graduate Student Council Board of Directors, Caltech 2017-19
Graduate Student Council Social Committee, Caltech 2016-19

Community:

Lamont-Doherty Earth Observatory Open House 2022+24
Caltech Y tutoring for Pasadena high schools 2021
Caltech GPS Future Ignited mentoring program 2020
Caltech HerStories organizing committee [cancelled due to covid] 2019-20

**Invited
Talks**

Seminars:

Larochelle, S. (2024), Geophysics of the changing hydro-cryosphere: From California's aquifers to Greenland's supraglacial lakes. Department of Earth, Planetary & Space Sciences, University of California Los Angeles.

Larochelle, S. (2024), Mechanics of the changing hydro-cryosphere: From California's aquifers to Greenland's supraglacial lakes. Department of Earth & Environmental Sciences, Syracuse University.

Larochelle, S. (2023), Geodetic insights into the mechanics of supraglacial lakes. *EGU Geodesy Campfire*, Online.

Larochelle, S. (2023), Englacial stresses and strains due to supraglacial lake drainages. *Mathematics on Ice Forum Seminar Series*, Online.

Larochelle, S. (2023), Geodetic insights into water-driven aquifer and ice sheet dynamics. *AGU Early Career Geodesy Lecture Series*, Online.

Larochelle, S. (2022), Crustal deformation and fault slip due to water injections and extraction. *MPG/SGT Seminar*, Lamont-Doherty Earth Observatory, Columbia University

Larochelle, S. (2022), Crustal deformation and fault slip due to water injections and extraction. *UCLA Geophysics Seminar*, University of California Los Angeles.

Larochelle, S. (2022), Crustal deformation and fault slip due to water injections and extraction. *Institute for Geophysics and Planetary Physics (IGPP) Seminar*, University of California Santa Cruz.

Larochelle, S. (2019), Spatiotemporal Characterization of seasonal crustal deformation due to hydrological processes. *Café des Géosciences Seminar*, École Normale Supérieure (ENS) Paris.

Conferences & Workshops:

Larochelle, S., (2024), Geophysics of the changing hydro-cryosphere. *Earthscope Consortium Innovation & Integration Advisory Committee Meeting*.

Larochelle, S., (2024), 17 years of hydrology-driven geodetic deformation in California's Sacramento Valley. *SCEC Annual Meeting*.

Larochelle, S., Chanard, K., Fleitout, L., Fortin, J., Longuevergne, L., Argus, D. and Avouac, J.-P. (2021), Extracting and separating different sources of hydrology-induced deformation in geodetic datasets. *AGU Fall Meeting*.

Larochelle, S. (2021), Fluid-induced slip and earthquake nucleation on a rate-and-state fault. *SCEC Workshop on Advancing Simulations of Sequences of Earthquakes and Aseismic Slip*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2021), Constraining the stability of a rate-and-state fault subjected to fluid injection. *Seismological Society of America Annual Meeting*.

Larochelle, S. and Avouac, J.-P. (2021), Monitoring of continental water storage from GNSS and GRACE observations. *Saudi Water Forum*, Online.

Larochelle, S. (2020), Numerical modeling of fluid-induced slip on a rate-and-state fault motivated by a field experiment. *11th James K. Knowles Lectures & Caltech Solid Mechanics Symposium*.

Larochelle, S., Gualandi, A., Chanard, K., and Avouac, J.-P. (2019), Spatiotemporal characterization of seasonal crustal deformation due to hydrological processes. *AGU Fall Meeting*.

Other presentations

Larochelle, S., Kingslake, J., & Lu., G. (2024), A coupled model to assess hydro-mechanical interactions between subglacial groundwater and ice-sheet dynamics. Poster presented at *AGU Fall Meeting*.

Larochelle, S., Chanard, K., Dalaison, M., Fortin, J., Longuevergne, L., Fleitout, L., Argus, D. F., Gauer, L.-M., Jolivet, R., & Avouac, J.-P. (2024), Abrupt transition to irreversible damage in the overdrafted Sacramento Valley aquifer system. Poster presented at *AGU Fall Meeting*.

Larochelle, S., Stevens, L. A., Nettles, M., Lu, G., Lau, N., Behn, M. D., Fan, W., Das, S. B. (2023), Spatiotemporal evolution of englacial stress during synchronous, hydro-fracture-driven drainages of neighboring supraglacial lakes. Talk presented at *AGU Fall Meeting*.

Larochelle, S., Stevens, L. A., Nettles, M., Kingslake, J., Lu, G., Lau, N., Behn, M. D., Fan, W., Das, S. B. (2023), Synchronous hydro-fracture-driven drainages of neighboring supraglacial lakes and their impact on ice flow. Talk presented at *West Antarctica Ice Sheet (WAIS) Workshop*.

Larochelle, S., Chanard, K., Dalaison, M., Fleitout, L., Fortin, J., Longuevergne, L., Argus, D., Jolivet, R., and Avouac J.-P. (2022), Monitoring and modeling of the Sacramento Valley aquifer (California) using geodetic and piezometric measurements. *AGU Fall Meeting* [Talk cancelled due to injury].

Larochelle, S., Chanard, K., Fleitout, L., Gualandi, A., Fortin, J., Rebischung, P., Violette, S., and Avouac, J.-P. (2020), Understanding the geodetic signature of large aquifer systems: Example of the Ozark Plateaus in Central United States. Talk presented at *AGU Fall Meeting*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2020), What can fluid-injection field experiments tell us about fault stability? Poster presented at *AGU Fall Meeting*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2020), Slip response to fluid depressurization constrains fault friction. Poster presented at *SCEC Annual Meeting*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2019), Numerical Modeling of Fluid-Induced Slip on Rate-and-State Faults Motivated by a Field Experiment. Poster presented at *AGU Fall Meeting*.

Larochelle, S., Chanard, K., Gualandi, A., and Avouac, J.-P. (2019), Regional fluctuations in hydrological mass inferred from GNSS and GRACE observations. Talk presented at *AGU Fall Meeting*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2019), Numerical modeling of fluid-induced slip on a rate-and-state fault motivated by a field experiment. Talk presented at *GeoProc2019*, Utrecht, Netherlands.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2019), Numerical modeling of fluid-induced slip on a rate-and-state fault motivated by a field experiment. Poster presented at *Symposium on The Applications of Mechanics to Geophysics*, University of California San Diego.

Larochelle, S., Gualandi, A., Chanard, K., and Avouac, J.-P. (2018), Identification and extraction of seasonal geodetic signals due to surface load variations. Poster presented at *AGU Fall Meeting*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2018), Numerical modeling of a fluid-induced aseismic-seismic slip sequence on a rate-and-state fault. Poster presented at *SCEC Annual Meeting*.

Larochelle, S., Lapusta, N., Ampuero, J.-P., and Cappa, F. (2018), Numerical modeling of a fluid-induced aseismic-seismic slip sequence on a rate-and-state fault. Poster presented at *NSF Workshop on Modeling Earthquake Source Processes*, Pasadena, California.

Larochelle, S., Chanard, K., Gualandi, A., and Avouac, J.-P. (2017), Seasonal geodetic strain in the Himalaya: Extraction, modeling & correlation with seismicity. Poster presented at *AGU Fall Meeting*.

Larochelle, S., Lapusta, N., and Ampuero J.-P. (2017), Numerical modeling of fluid-induced seismic and aseismic fault slip. Poster presented at *Cargèse Earthquakes School*, Corsica, France.

Larochelle, S., Selvadurai, A.P.S., and Cao, C. (2015), Fluid flow through a fracture in a Cobourg limestone sample. Poster presented at *McGill SURE Poster Presentation*.

Larochelle, S., Pietkowicz, R., and Mitchell, D. (2014), Simulated earthquake testing of concrete frame structures. Poster presented at *McGill SURE Poster Presentation*.