

Cansu Culha | Natural Hazard Fluid & Thermodynamics

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Current Appointment

- **NSF EAR Fellow at University of British Columbia** **Vancouver, Canada**
June 2023– today
○ *Retrospective Thaw Slumps*
Advisors: Mark Jellinek and Shandin Pete

Awards

- **National Science Foundation (NSF) – Division of Earth Science (EAR) Fellowship** – May, 2022
- **Schmidt Science Fellowship, Rhodes Trust** (Finalist) Developing the next generation of science leaders to transcend disciplines, advance discovery, and solve the world's most pressing problems – May, 2021
- **Lieberman Fellowship/Award** awarded to a PhD candidate in each school "whose research accomplishments, teaching, and service to [Stanford] University have demonstrated their potential for becoming academic leaders." – April, 2019
- **Department Community Award** in the Department of Geophysics – June, 2021
- **Diversity, Equity, and Inclusion Award** in the School of Earth, Energy and Environmental Sciences for DEI efforts – June, 2021
- **Certificate of Achievement in Mentoring** in the School of Earth, Energy and Environmental Sciences – June, 2020
- **National Science Foundation (NSF) – Graduate Research Fellowship Program (GRFP)** – February, 2015

Grants and Fellowships

- **National Science Foundation (NSF) – Division of Earth Science (EAR) Fellowship** (June 2023-2025, USD\$180,000, 2 years, research equipment and salary)
- **Lieberman Fellowship** (April, 2019, USD\$ 59,974, 1 year, tuition and stipend)
- **William R. Normark Research Fellowship** (April, 2018, USD\$ 59,974, 1 year, tuition and stipend)
- **NSF, Graduate Student Fellowship Program** (February, 2015, USD\$ 138,000, 3 years, tuition and stipend)
- **GCP Research Credits** Google Grant for computational COVID-19 research – 2020 (August, 2020, USD\$ 2,564)
- **SPICE Grant** Student Projects for Intellectual Community Enhancement at Stanford for communicating ocean research through arts – (August, 2019, USD\$ 2,200)
- **Mel Lane Grant** "Stanford student-driven-and-managed environmental projects that make a measurable impact on sustainability issues through direct activities or applied research" – (August, 2019, USD\$ 1,500; 2020, USD\$ 1,500)
- **McGee Grant** Stanford funded grant to seed pioneering research – (July, 2018, USD\$ 1,500)

Publications

- [7] **C. Culha**, S. Spinner, and J. Suckale, The pahoehoe to a'a transition as a shear instability in stratified lava flow, *Geophysical Research Letters*, 2023. DOI: <https://doi.org/10.1029/2022GL101302>
- [6] **C. Culha**, T. Keller, and J. Suckale. Biased Witnesses: Crystal Thermal Records May Give Conflicting Accounts of Magma Cooling, *Journal of Geophysical Research: Solid Earth*, 2022. DOI: <https://doi.org/10.1029/2021JB023530>.
- [5] **C. Culha**, J. Suckale, T. Keller, and Z. Qin. Crystal fractionation by crystal-driven convection, *Geophysical Research Letters*, 2020. DOI: <https://doi.org/10.1029/2019GL086784>.
- [4] **C. Culha**, D. Schroeder, T.M. Jordan, and M. Haynes, Assessing Europa's Eutectic using Radar Sounding, *Icarus*, 2019. DOI: <https://doi.org/10.1016/j.icarus.2019.113578>.
- [3] **C. Culha** and M. Manga. Geometry and spatial distribution of lenticulae on Europa, *Icarus*, 271: 49-56, 2016. DOI: [10.1016/j.icarus.2015.12.052](https://doi.org/10.1016/j.icarus.2015.12.052).
- [2] M. Townsend, D.D. Pollard, K. Johnson, and **C. Culha**. Jointing around magmatic dikes as a precursor to the development of volcanic plugs, *Bull Volcanol*, 77:92 2015. DOI: [10.1007/s00445-015-0978-z](https://doi.org/10.1007/s00445-015-0978-z).
- [1] **C. Culha**, A.G. Hayes, M. Manga, and A. Thomas. Double Ridges on Europa Accommodate Some of the Missing Surface Contraction, *Journal of Geophysical Research–Planets*, 119 (3): 395-403 2014. DOI: [10.1002/2013JE004526](https://doi.org/10.1002/2013JE004526).

Education

- **Stanford University** **Ph.D.**
Department of Geophysics *August 2015–September 2021*
Advisor: Jenny Suckale, **Defense:** June 28, 2021; **Conferral:** August 27, 2021
- **University of California, Berkeley** **B.A.**
Department of Earth and Planetary Science, Geophysics *August 2011–May 2015*
Advisor: Michael Manga

Thesis

- [1] **C. Culha**. Quantifying the crystalline-scale signatures of volcano-scale magma dynamics through multiphase fluid and thermodynamics modeling, *Stanford Thesis*, 2021.

Past Experiences

- **Permafrost Physics Postdoctoral Researcher** **Zurich, Switzerland**
Environmental Physics, ETH, Zürich *June 2022–June 2023*
Supervisor: James Kirchner
- **Environmental and Social Risk Consultant** **Washington, DC, USA**
International Finance Corporation (IFC), World Bank Group (WBG) *November 2021– June 2023*
Regions: Latin America and Europe
- **Chief Sustainability Officer (Interim)** **San Francisco, CA, USA**
FUNA, an alternative meat start-up *November 2022– June 2023*

- **Fluid Mechanics and Thermodynamics, Geophysics Researcher**
Research Assistant, Stanford University
Supervisor: Jenny Suckale
Stanford, CA, USA
September 2021– June 1, 2022
- **Stanford Future Bay Initiative Advisor for COVID-19 Response**
Advisor, Stanford University
Supervisor: Derek Ouyang
Stanford, CA, USA
March 2020– January 2021
- **Fluid Mechanics and Thermodynamics, Geophysics Researcher**
PhD, Stanford University
Supervisor: Jenny Suckale
Stanford, CA, USA
August 2015– September 2021
- **Deglaciation and Flooding, DAAD Research Fellowship**
DAAD, Martin Luther University of Halle/Saale
Supervisor: David Morche
Halle/Saale, DE
July 2014–August 2014
- **Image Processing of Fracture Networks**
Stanford University, Geophysics Department
Supervisor: David Pollard
Stanford, CA, USA
June 2014–July 2014
- **Image Processing of Bubble Networks**
University of Hawai'i, Mānoa, Earth Sciences Department
Supervisor: Bruce Houghton
Mānoa, HI, USA
May 2014–June 2014
- **Planetary Science, NSF Fellowship**
Cornell University, Astrophysics Department
Supervisor: Alex Hayes
Ithaca, NY, USA
June 2013–August 2013
- **Heliophysics High School Intern Fellowship**
NASA, Goddard Space Flight Center
Supervisor: Shing Fung
Goddard, MD, USA
June 2010–August 2011

Teaching

- **CEE 218Z: Shaping the Future of the Bay Area,**
Teaching Assistant
Teachers: Derek Ouyang, Jenny Suckale
Stanford University
Spring, Summer 2020
- **GEOPHYS 171: Tectonics Field Trip,**
Teaching Assistant
Teachers: Simon Klemperer
Stanford University
Spring 2019
- **Multiphase Fluid Mechanics and Thermodynamics in Magmatic Systems**
Lecturer for undergraduate interns
Stanford University
Summer 2017
- **Field Class, Santorini, Greece**
Class Mentor
Teachers: Alison Rust and Laura Robinson
Bristol University
Summer 2017

Supervision of Junior Researchers

- **Sam Spinner**
Undergrad Research Mentor
Duration 2 year
Stanford Univ.
Title: The pahoehoe to 'a'a transition as a shear instability in stratified lava flow.

- **Stanford Bay Initiative Students** **Stanford Univ.**
Research Mentor for a COVID Modeling Initiative,
 Mentees: Laura Miron, Zihan Wei, Emma Liu
Duration 2 academic quarters
Title: Hindering COVID-19 through manual contact tracing in San Francisco .
- **Stanford Bay Initiative Students** **Stanford Univ.**
Research Mentor for a COVID Modeling Initiative,
 Mentees: Simone Speizer, Spencer Robinson
Duration 2 academic quarters
Title: Determining COVID-19 vulnerability in San Francisco Bay Area.

Workshops & Conferences

- **European Conference on Permafrost (EUCOP)** – 2023, *poster*
- **American Geophysical Union Fall Meetings (AGU)** – 2013-2017, 2019-2021, *4x posters, 5x talks (1 invited)*
- **European Geoscience Union General Assembly (EGU)** – 2015, 2020,2023 *poster, talk, PICO*
- **Geological Society of America (GSA)** – 2015, *talk*
- **Lunar and Planetary Science Conference (LPSC)** – 2013, 2018, *2x posters*
- **Deep Carbon Observatory, Mt. Etna, Italy** – 2017, *poster, talk*
- **Field class of Santorini, Greece, Bristol University** – 2017
- **Advanced School on Physics of Volcanoes, ICTP, Trieste, Italy** – 2016, *poster*
- **Ocean Sciences Meeting** – 2014
- **Field Study of Big Island, Hawai'i, Cornell University** – 2014
- **Cornell University Seminar in Astrophysics Department, invited talk** – 2014

Contributions to conferences (oral presentations or poster)

* indicate my presentations

- [23] ***C. Culha** and J. Kirchner. Characterizing long and short term drivers of periglacial catchment hydrology, EUCOP, 2023, Poster.
- [22] ***C. Culha** and J. Kirchner. Characterizing melt water properties in the periglacial active layer through seasonal and yearly variations in catchment hydrology, EGU 4291, 2023, PICO.
- [21] ***C. Culha**, R. Gellman, CLM Kelly. Deceptive crystals, AGU ED42A-01, 2021, invited talk.
- [20] ***C. Culha**, T. Keller, J. Suckale. Crystal fractionation by crystal-driven convection, International Volcano Seminar, January 2021, talk.
- [19] ***C. Culha**, T. Keller, J. Suckale. Heterogeneity in crystal zonation records variability in the crystal settling dynamics, AGU V026-08, 2020, talk.
- [18] J. Suckale, M.H. DiBenedetto, Z. Qin, **C. Culha**, Z. Wei. Eruption forensics: Deciphering the imprint left by the conduit-flow regime on individual crystals through multi-scale, multi-physics models, AGU V025-01, 2020, talk.
- [17] D. Ouyang, S. Speizer, J. Wagenfehr, **C. Culha**, I. Kashmalkar, D. Ho, etc. Leveraging Mobile Device Location and administrative data to predict localized COVID-19 surges in the San Francisco Bay Area, CA, AGU GH008-0003, 2020, poster.

- [16] ***C. Culha**, Z. Wei, E. Liu, L. Miron, D. Ouyang, J. Suckale. Optimizing contact tracing policies to intervene in the spread of COVID-19 in San Francisco, CA, AGU GH008-0005, 2020, poster.
- [15] ***C. Culha**, T. Keller, J. Suckale. Crystal fractionation by crystal-driven convection, EGU, 2020, talk.
- [14] S. Spinner, **C. Culha**, J. Suckale. The pahoehoe to 'a'a transition as a shear instability in stratified lava flow, AGU V23E-0238, 2019, poster.
- [13] ***C. Culha**, T. Keller, J. Suckale, Z. Qin. Thermal history of phenocrysts during mafic injection resolved by granular-scale simulations, AGU V53A-06, 2018, talk.
- [12] ***C. Culha**, D. Schroeder, M. Haynes. Assessing the potential for detecting Europa's eutectic using radar sounding, LPSC 1213, 2018, poster.
- [11] J. Suckale, Z. Qin, **C. Culha**, E. Lev. Towards an avatar for deciphering the modes of three-phase interactions in lava lakes, AGU V34C-02, 2016, talk.
- [10] Z. Qin, J. Suckale, **C. Culha** A virtual laboratory for three-phase flow dynamics in the magmatic system, AGU DI21A-07.
- [9] ***C. Culha**, J. Suckale, Z. Qin. Crystalline heterogeneities and instabilities in thermally convecting magma chamber, AGU V33E-3164, 2016, poster.
- [8] M. Manga, C. Michaut, **C. Culha**. Domes, Pits, and Small Chaos on Europa produced by water sills, LPSC 1213, 2016.
- [7] *M. Manga, C. Michaut, **C. Culha**. Domes, Pits, and Small Chaos on Europa produced by water sills, GSA, 2015, talk by me.
- [6] ***C. Culha** and M. Manga. Shape of lenticulae on Europa and their interaction with lineaments, EGU 7891, 2015, poster.
- [5] H. Baewert, D. Morche, and **C. Culha**. On the surface roughness of a braidplain in an Alpine proglacial area. AGU, EP41B-3518, 2014, poster.
- [4] M. Townsend, **C. Culha**, K. Johnson, D.D. Pollard. Jointing around magmatic Dikes as a precursor to conduit geometry evolution, AGU V11B-4703, 2014, poster.
- [3] ***C. Culha**, A.G. Hayes, M. Manga, A. Thomas, Identifying contraction and expansion along double ridges and bands on Europa with strike slip displacements, Cornell University, Astrophysics Department Seminar, 2014, invited talk.
- [2] ***C. Culha**, A.G. Hayes, M. Manga, A. Thomas, Identifying contraction and expansion along double ridges and bands on Europa with strike-slip displacements, AGU, 2013, talk.
- [1] ***C. Culha**, A.G. Hayes, M. Manga, A. Thomas, Identifying Contraction and Expansion Along Double Ridges and Bands on Europa with StrikeSlip Displacements, LPSC 2085, 2013, poster.

Institutional responsibilities

- **Stanford Pod Leader**
Unlearning Racism in the Geosciences (URGE)

NSF & Scripps, USA
January 2021– June 2021

- **Title IX Panelist**
Stanford University, Title IX Office

Stanford, CA, USA
August 2019– September 2020

Outreach activities

- [8] **IPA RTS Action Group** action group on retrogressive thaw slump mapping and machine learning, funded by Internation Permafrost Association (2023-today)
- [7] **Volcano Seminar** co-founder of the inter-departmental seminar series at Stanford. (2016-2021)
- [6] **Arts as Science Communication Initiative (Arts-SCI)** co-founder of an imitative that uses art to communicate scientific discoveries (2019-2022)
- [5] **Mediterranean Sustainability Coalition** co-founder of a seminar series aimed at combining Cypriot, Turkish, and Greek minds in discussing geopolitically and environmentally sustainable ideas. (2020-2021)
- [4] **San Fransisco Science Fair** with SwissNex and HackZurich, I gave a talk on my COVID-19 research and had audience members interact with the research for 1.5 hours. (2020)
- [3] **Stanford Future Bay Initiative** a Research-Education-Practice Partnership to help policy makers in local Bay Area communities shape a more equitable, resilient, and sustainable urban future. (2020-2021)
- [2] **Ocean Trilogy** hosted a dance company, SpectorDance, and a Broadway musical artist, Baba Brinkman, to explain ocean research. (April, 2019)
- [1] **Workshop Series on Communication** organized a 3 part workshop series on Communication with the School of Earth, Energy and Environmental Sciences at Stanford (July, 2018)

Skills

Computer Languages: MatLab, Python, Fortran, SQL, R

Python Packages: pandas, numpy, matplotlib, torch

Software: GIS, ArcGIS, QGIS, GitHub

Engineering: Computational Mathematics, Machine Learning, Bayesian Optimization, Markov Chain, Monte Carlo, HPC, Remote Sensing

Languages: English (fluent), Turkish (fluent), Spanish (basic), German (learning)

Developed Software

- [3] **C. Culha. Fluid thermodynamic simulator software, DOI:10.5281/zenodo.4393097, [https : //zenodo.org/badge/latestdoi/316609089](https://zenodo.org/badge/latestdoi/316609089), 2021**
- [2] S. Spinner and **C. Culha**. Internal shear instability software, DOI: 10.5281/zenodo.5213717, [https : //zenodo.org/badge/latestdoi/281829305](https://zenodo.org/badge/latestdoi/281829305), 2021
- [1] **C. Culha**. Crystal fractionation software, [http : //zapad.stanford.edu/cansu.culha/crystal – fractionation.git](http://zapad.stanford.edu/cansu.culha/crystal-fractionation.git), 2021