

EMMA “MICKEY” MACKIE

Department of Geological Sciences, University of Florida

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ACADEMIC APPOINTMENTS

University of Florida, Gainesville FL

2021 - Present

Assistant Professor

Department of Geological Sciences

EDUCATION

Stanford University, Stanford CA

2017 - 2021

Ph.D. in Geophysics

Advised by Dustin Schroeder

Thesis title: *Modeling the Subglacial Environment with Geostatistics*

Harvard University, Cambridge MA

2013 - 2017

B.A. in Earth and Planetary Sciences, with High Honors

Advised by Francis Macdonald

Senior Thesis: *Cryogenian Stratigraphy of Northeastern Washington: A Glacial and Tectonic History*

MANUSCRIPTS ACCEPTED OR IN REVIEW

*Graduate researcher, **Undergraduate researcher

- [2] M. Lösing, A. Aitken, M. Field*, **E. MacKie**, L. Li. Gravity Topography Modeling of the Denman Glacier Region Using a Geostatistical Approach. (*in review*).
- [1] B. Conger, J. Greenbaum, D. Schroeder, **E. MacKie**, R. Culberg. Radiometric Characterization of Antarctic Subglacial Lake Floor Reflections. (*Accepted*).

PUBLICATIONS

*Graduate researcher, **Undergraduate researcher

- [32] K. Matsuoka, G. Moholdt, J. Arthur, ... **E. MacKie** ... D. Young. (2026). Towards an improved understanding of the Antarctic coastal zone and its contribution to future global sea level. *Reviews of Geophysics*, 64(3), e2022RG000803. <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2022RG000803>.
- [31] McCormack, F. S., Stl, T., Shao, N.*, **MacKie, E.**, Fabela Hinojosa, A., Lsing, M., ... & Dow, C. (2026). Synthetic bed topographies for Antarctica and their utility in ice sheet modelling. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 384(2319). <https://doi.org/10.1098/rsta.2024.0537>.
- [30] D.M. Schroeder, E. Abrahams, A.L. Broome, W. Chu, R. Culberg, E.J. Dawson, **E. J. MacKie**, D.F. May, M.R. Siegfried, T.O. Teisberg, S. Zhao. (2026). Next-generation radar bed measurements should be optimized for assimilation or repeat-pass profiling. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 384(2319), 20240548. <https://doi.org/10.1098/rsta.2024.0548>.
- [29] R. Culberg, C.Y. Lai, **E. MacKie**. (2026). Modified von Mises stress a robust predictor of the spatial distribution of ice slab crevasse fields in Greenland. *Journal of Geophysical Research: Earth Surface*, 131(5), e2025JF008385. <https://doi.org/10.1029/2025JF008385>.

- [28] L. Pan, **E. MacKie**, J. Mitrovica, R. Ackert, S. Jamieson, K. McColl. (2026). Impacts of Glacial Isostatic Adjustment on Antarctic Subglacial Water Routing Since the Last Glacial Maximum. *Journal of Geophysical Research: Earth Surface*, 131(5), e2025JF008982. <https://doi.org/10.1029/2025JF008982>.
- [27] N. Shao*, **E. MacKie**, M. Field*, F. McCormack. (2026). A Markov chain Monte Carlo approach for geostatistically simulating mass-conserving subglacial topography. *Journal of Glaciology*, 72, e51. <https://doi.org/10.1017/jog.2026.10164>.
- [26] M. Field*, **E. MacKie**, L. Wang, A. Muto, N. Shao*. (2026). Improved bathymetry estimates beneath Amundsen Sea ice shelves using a Markov Chain Monte Carlo gravity inversion (GravM-CMC, version 1). *Geoscientific Model Development*, 19(4), 1749-1768. <https://gmd.copernicus.org/articles/19/1749/2026/>.
- [25] Bingham, R. G., Bodart, J. A., Cavitte, M. G., Chung, A., Sanderson, R. J., Sutter, J. C., ... **MacKie, E. J.** ... & Zuhre, A. (2025). AntArchitecture building an agedepth model from Antarctica's radiostratigraphy to explore ice-sheet evolution. *The Cryosphere*. <https://egusphere.copernicus.org/preprints/2024/egusphere-2024-2593/>.
- [24] Pritchard, H. D., Fretwell, P. T., Fremand, A. C., Bodart, J. A., Kirkham, J. D., Aitken, A., ... **MacKie, E. J.** ... & Zirizzotti, A. (2025). Bedmap3 updated ice bed, surface and thickness gridded datasets for Antarctica. *Scientific data*, 12(1), 414. <https://www.nature.com/articles/s41597-025-04672-y>.
- [23] Chudley, T. R., Howat, I. M., King, M. D., **MacKie, E.** (2025). Increased crevassing across accelerating Greenland Ice Sheet margins. *Nature Geoscience*, 1-6. <https://www.nature.com/articles/s41561-024-01636-6>.
- [22] **MacKie, E.**, Millstein, J., Serafin, K. (2024). 47 Years of Large Antarctic Calving Events: Insights from Extreme Value Theory. *Geophysical Research Letters*. 51(23), e2024GL112235. <https://doi.org/10.1029/2024GL112235>.
- [21] J. MacGregor, W. Colgan, G. Paxman, K. Tinto, B. Csatho, M. Fahnestock, T. Kokfelt, **E. MacKie**, M. Morlighem, O. Sergienko. (2024). Geologic provinces beneath the Greenland Ice Sheet from geophysical data synthesis. *Geophysical Research Letters*. 51(8). <https://doi.org/10.1029/2023GL107357>.
- [20] Karlsson, N. B., Schroeder, D. M., Srensen, L. S., Chu, W., Dall, J., Andersen, N. H., ... **MacKie, E. J.** ... Skou, N. (2024). A Newly Digitised Ice-penetrating Radar Data Set Acquired over the Greenland Ice Sheet in 1971-1979. *Earth System Science Data Discussions*, 16(7), 3333-3344. <https://doi.org/10.5194/essd-16-3333-2024>
- [19] Schoedl, N.** , **MacKie, E.J.**, Field, M.* , Stubbs, E.A., Zhang, A.** , Gravey, M. (2023). A Python multiprocessing approach for fast geostatistical simulations of subglacial topography. *Computing in Science & Engineering*. <https://doi.org/10.1109/MCSE.2023.3317773>
- [18] **MacKie, E. J.**, Field, M.* , Wang, L., Yin, Z., Schoedl, N.** , Hibbs, M.** , Zhang, A.** (2023). GStatSim V1. 0: a Python package for geostatistical interpolation and conditional simulation. *Geoscientific Model Development*, 16(13), 3765-3783, <https://doi.org/10.5194/gmd-16-3765-2023>.
- [17] Law, R., Christoffersen, P., **MacKie, E.**, Cook, S., Haseloff, M., Gagliardini, O. (2023). Complex motion of Greenland Ice Sheet outlet glaciers with basal temperate ice. *Science Advances*, 9(6), eabq5180, <https://www.science.org/doi/10.1126/sciadv.abq5180>.
- [16] McKenzie, M. A., Miller, L. E., Slawson, J. S., **MacKie, E. J.**, Wang, S. (2023). Differential impact of isolated topographic bumps on ice sheet flow and subglacial processes. *The Cryosphere*, 17(6), 2477-2486, <https://doi.org/10.5194/tc-17-2477-2023>.

- [15] Wang, L., Peeters, L., **MacKie, E. J.**, Yin, D. Z., Caers, J. (2023). Unraveling the uncertainty of geological interfaces through data-knowledge-driven trend surface analysis. *Computers & Geosciences*, 105419, <https://doi.org/10.1016/j.cageo.2023.105419>.
- [14] Frémand, A. C., Fretwell, P., Bodart, J., Pritchard, H. D., Aitken, A., Bamber, J. L., ... **MacKie, E.J.**... & Zirizzotti, A. (2023). Antarctic Bedmap data: Findable, Accessible, Interoperable, and Reusable (FAIR) sharing of 60 years of ice bed, surface and thickness data. *Earth System Science Data*, 15(7), <https://doi.org/10.5194/essd-15-2695-2023>.
- [13] Yin, Z., C. Zuo, **E.J. MacKie**, J. Caers (2022). Mapping high-resolution basal topography of West Antarctica from radar data using non-stationary multiple-point geostatistics. *Geoscientific Model Development*, <https://doi.org/10.5194/gmd-15-1477-2022>.
- [12] Bienert, N.L., D.M. Schroeder, S.T. Peters, **E.J. MacKie**, E.J. Dawson, M. Siegfried, R. Sanda, P. Christoffersen (2022). Post-Processing Synchronized Bistatic Radar for Long Offset Glacier Sounding. *IEEE Transactions on Geoscience and Remote Sensing*, <https://doi.org/10.1109/TGRS.2022.3147172>.
- [11] Schroeder, D.M., A.L. Broome, A. Conger, A. Lynch, **E.J. MacKie**, A. Tarzona (2021). Radiometric analysis of digitized Z-scope records in archival radar sounding film. *Journal of Glaciology*, <https://doi.org/10.1017/jog.2021.130>.
- [10] **MacKie, E.J.**, D.M. Schroeder, C. Zuo, Z. Yin, J. Caers (2021). Stochastic Modeling of Subglacial Topography Exposes Uncertainty in Water Routing at Jakobshavn Glacier. *Journal of Glaciology*. <https://doi.org/10.1017/jog.2020.84>.
- [9] **MacKie, E.J.**, D.M. Schroeder, G. Steinbrügge, R. Culberg (2021). Quantifying Spatial Relationships in Ice Penetrating Radar Measurement Uncertainty through Clutter Simulation. *2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS*. <https://doi.org/10.1109/IGARSS47720.2021.9553045>.
- [8] Teiesberg, T.O., D.M. Schroeder, **E.J. MacKie** (2021). A Machine Learning Approach to Mass-Conserving Ice Thickness Interpolation. *2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS*. <https://doi.org/10.1109/IGARSS47720.2021.9555002>.
- [7] Schroeder, D.M., N.L. Bienert, R. Culberg, **E.J. MacKie**, T.O. Teisberg, W. Chu, D.A. Young (2021). Glaciological Constraints on Link Budgets for Orbital Radar Sounding of Earth's ICE Sheets. *2021 IEEE International Geoscience and Remote Sensing Symposium IGARSS*. <https://doi.org/10.1109/IGARSS47720.2021.9553237>.
- [6] Bartlett, O.T., S.J. Palmer, D.M. Schroeder, **E.J. MacKie**, T.T. Barrows, A.G. Graham (2020). Geospatial simulations of airborne ice-penetrating radar surveying reveal elevation under-measurement bias for ice-sheet bed topography. *Annals of Glaciology*. <https://doi.org/10.1017/aog.2020.35>.
- [5] **MacKie, E.J.**, D.M. Schroeder, J. Caers, M.R. Siegfried and C. Scheidt (2020). Antarctic Topographic Realizations and Geostatistical Modeling Used to Map Subglacial Lakes, *Journal of Geophysical Research: Earth Surface*. <https://doi.org/10.1029/2019JF005420>.
- [4] Zuo, C., Z. Yin, Z. Pan, **E.J. MacKie**, J. Caers (2020). A tree-based direct sampling method for stochastic surface and subsurface hydrological modeling, *Water Resources Research*. <https://doi.org/10.1029/2019WR026130>.
- [3] **MacKie, E.J.**, D.M. Schroeder (2020). Geostatistically simulating subglacial topography with synthetic training data. *IGARSS 2020-2020 IEEE International Geoscience and Remote Sensing Symposium*. <https://doi.org/10.1109/IGARSS39084.2020.9324563>.
- [2] Schroeder, D.M., **E.J. MacKie**, T.T. Creyts, J.B. Anderson (2019). A subglacial hydrologic drainage hypothesis for silt sorting and deposition during retreat in Pine Island Bay, *Annals of*

Glaciology. <https://doi.org/10.1017/aog.2019.44>.

- [1] Schroeder, D.M., J. Dowdeswell, M. Siegert, R. Bingham, W. Chu, **E.J. MacKie**, M.R. Siegfried, K. Vega, J. Emmons and K. Winstein (2019). Multi-Decadal Observations of the Antarctic Ice Sheet from Archival Radar Film, *Proceedings of the National Academy of Sciences*. <https://doi.org/10.1073/pnas.1821646116>.

SOFTWARE AND DATA PRODUCTS

GStatSim (1.0). **E.J. MacKie**, M. Field, L. Wang, Z. Yin, N. Schoedl, M. Hibbs (2022). Zenodo. <https://doi.org/10.5281/zenodo.7274640>.

Subglacial Topography Training Image Database. **E.J. MacKie**, Z. Yin, C. Zuo, J. Caers. (2021). Zenodo. <https://doi.org/10.5281/zenodo.5083715>.

HONORS AND AWARDS

University of Florida Excellence Award for Assistant Professors	2026
American Geophysical Union Cryosphere Early Career Award	2025
University of Florida Pioneering Research with HiperGator Award	2024
University of Florida AI Rising Star Award	2024
Graham Cogley Award from the International Glaciological Society	2023
Exceptional Thesis Award from the Stanford Department of Geophysics	2022
Best Student Oral Presentation at IGS Symposium on Glacial Erosion and Sedimentation	2019
Flash Freeze Cryosphere Innovation Award (oral presentation)	2018
Harvard College Research Program grant awarded for senior thesis research	2016

GRANTS AND FUNDING

NASA Snow4Flow —*selected, being processed*— (anticipated amount: \$157,575) 2026
Title: *cSMB-RADAR: Constraining Snow on Mountainous Glaciers*
Role: CoI
Period: 2026-2031

Astera Institute (\$47,506) 2025
Title: *Topography Module for GeoBRIDGE: Geological Boundary Representation for Ice Dynamics and Glacial Evolution*
Role: PI
Period: 2025-2026

UF/NVIDIA Artificial Intelligence and Complex Computational Research (\$90,132) 2024
Title: *Mapping Antarctica's Underworld*
Role: PI
Period: July 2024 - January 2026

NSF Geosciences Open Science Ecosystem (\$253,946) 2023
Title: *Enhancing the accessibility of novel geostatistical inversion workflow for cryosphere research*
Role: PI
Period: August 2023 - August 2026

Earth Science Information Partners GeoSMART award (\$4,000) 2022

Achievement Rewards for College Scientists (ARCS) Scholarship Award (\$50,000) 2020

TEACHING EXPERIENCE

Introduction to Machine Learning in the Geosciences, University of Florida (Instructor)	2023, 2025
Geophysical Exploration of the Cryosphere, University of Florida (Instructor)	2024-2026
AI in a Changing Climate, University of Florida (Instructor)	2024, 2026
Arctic Seismology, University Center in Svalbard, Norway (Guest Lecturer)	2022-2026
Arctic Seismology, University Center in Svalbard, Norway (Teaching Assistant)	2020
Introduction to the Foundations of Contemporary Geophysics, Stanford (Teaching Assistant)	2019, 2020

INVITED TALKS

Washington University Department of Earth, Environmental, and Planetary Sciences Seminar (St. Louis, MO)	2026
Georgia Tech School of Earth and Atmospheric Sciences Seminar (Atlanta, GA)	2025
University of South Florida College of Marine Sciences Seminar (St. Petersburg, FL)	2025
Daytona Community College STEMinar (Daytona, FL)	2025
Keynote speaker for AI CURE workshop (Gainesville, FL)	2025
UF Water, Wetlands, and Watersheds Seminar (Gainesville, FL)	2024
HiPerGator research highlight presentation for Chris Malachowsky (Gainesville, FL)	2024
University of Texas Austin Geophysics Department Seminar (Austin, TX)	2024
Berkeley AI Research seminar series (virtual)	2024
Florida Undergraduate Research Leadership Summit (Gainesville, FL)	2024
International Glaciological Society seminar series (virtual)	2024
Maths on Ice seminar (virtual)	2024
Winter Conference on Applications of Computer Vision (Waikoloa Village, HI)	2024
American Geophysical Union (San Francisco, CA)	2023
University of Tasmania, Ice and Oceans seminar (Hobart, Tasmania)	2023
Lamont-Doherty Marine Geology, Geophysics, Seismology, Geology, and Tectonophysics seminar (virtual)	2023
University of Florida Data Science and Informatics Symposium (Gainesville, FL)	2023
Data management and data assimilation keynote at Antarctic RINGS workshop in Norway (Tromsø, Norway)	2022
Compute Antarctic seminar series at University of Tasmania (virtual)	2022
University of Florida Data Science and Informatics Symposium (Gainesville, FL)	2022
Stanford Geophysics Brown Bag Seminar (Stanford, CA)	2020
Data Science Keynote, International Thwaites Glacier Collaboration Meeting (UK)	2019
Aarhus Department of Geoscience (Aarhus, DK)	2019

PROFESSIONAL SERVICE

Co-lead of Scientific Committee for Antarctic Research Antarctic Subglacial Boundary Conditions working group	2023 - present
Organizing Committee: West Antarctic Ice Sheet Annual Workshop	2022 - present
Organizing Committee: Subice Workshop in Tasmania	2023
Guest editor for <i>Remote Sensing</i> special issue: Machine Learning and Artificial Intelligence in Remote Sensing Image Understanding	2022 - 2023
Organizing Committee: Women in Data Science Conference	2019
Organizing Committee: International Thwaites Glacier Collaboration Early Career Meeting	2019

UNIVERSITY SERVICE

Organizing member for UF AI-CURE Faculty Learning Community	2026
Committee member for UF chapter of Women in High Performance Computing	2023 - 2025

Organizing committee: UF AI Days	2023
Member of Graduate Studies committee, UF Department of Geological Sciences	2022 - present
Officer for Stanford Women in Mathematics, Statistics and Computational Engineering	2018 - 2021
Founder and leader of Ice Break, a glaciology paper discussion group at Stanford	2018 - 2021
Officer for Stanford Women in Earth Sciences	2018 - 2020
Member of Stanford Geophysics Graduate Student Advisory Committee	2018 - 2019
Harvard Undergraduate Geological Society, president and social chair	2015 - 2017

FIELD EXPERIENCE

Svalbard - Radar and active source seismology	2019, 2022-2026
Greenland - Radar	2019
Svalbard - Seismology	2019
Washington, Idaho, and British Columbia - Geology	2016
Juneau Icefield - Glaciology	2015
Death Valley - Geology	2015

SELECTED CONFERENCE ABSTRACTS

- [13] **MacKie, E.**, Millstein, J.D., Serafin, K. (2024). Extreme value theory shows no increase in Antarctic calving size over the last half century. *AGU24*.
- [12] **MacKie, E.**, Millstein, J., Serafin, K. (2024). An extreme value theory perspective on large iceberg calving events. Scientific Committee on Antarctic Research Open Science Conference. Pucon, Chile.
- [11] **Mackie, E.**, Schoedl, N., Field, M., Wang, L., Yin, D. Z., Zhang, A., Gravey, M. (2023). GStat-Sim: a FAIR geostatistics software package in Python. *AGU23*.
- [10] **MacKie, E.J.**, D.M. Schroeder., C. Zuo, Z. Yin, J. Caers, 2020. Quantifying Subglacial Hydrologic Uncertainty with Stochastic Simulation. *AGU Fall Meeting*.
- [9] **MacKie, E.J.**, D.M. Schroeder, C. Zuo, Z. Yin, J. Caers, 2020. Geostatistical Simulations of Subglacial Topography: Implications for Water Routing at Jakobshavn Glacier. *WAIS Workshop*.
- [8] **MacKie, E.J.**, D.M. Schroeder, 2019. Paleo Observations Used to Geostatistically Simulate the Subglacial Geology of Thwaites Glacier. *AGU Fall Meeting*.
- [7] **MacKie, E.J.**, D.M. Schroeder, 2019. Geostatistically Simulating the Topography and Geology of the Amundsen Sea Embayment. *WAIS Workshop*.
- [6] **MacKie, E.J.**, D.M. Schroeder, 2019. Geostatistical simulations of subglacial topography used to study paleo and modern bed conditions in the Amundsen Sea sector. *IGS Symposium on Five Decades of Radioglaciology*.
- [5] **MacKie, E.J.**, M. Murray, A. Pollack, D.M. Schroeder, 2019. Producing multi-decadal observations of grounding line change in East Antarctica with archival radar data, *IGS Symposium on Five Decades of Radioglaciology*.
- [4] **MacKie, E.J.**, D.M. Schroeder, 2019. Using radar and geostatistical simulations to compare paleo and modern bed morphology in Pine Island Bay *IGS Symposium on Glacial Erosion and Sedimentation*.
- [3] **MacKie, E.J.**, C. Scheidt, J. Caers, D.M. Schroeder, 2018. A new model for Antarctic Subglacial Lakes, *AGU Fall Meeting*.
- [2] **MacKie, E.J.**, C. Scheidt, J. Caers, D.M. Schroeder, 2018. Simulating Antarctic bed topography to quantify uncertainty in subglacial water storage, *WAIS Workshop*.

- [1] **MacKie, E.J.**, D.M. Schroeder, J.A. Dowdeswell, K.I. Vega, M.R. Siegfried, W. Chu, R.G. Bingham, 2018. Digitization and Analysis of the SPRI-NSF-TUD Radar Data Archive, *SCAR/IASC Open Science Conference*.

POSTDOC MENTORING

Massimiliano Schiavo (visiting postdoc), Geological Sciences, University of Florida	2024
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GRADUATE MENTORING

Agnes Koury, Geological Sciences, University of Florida - primary advisor	2026 - present
Maile Corso, Geological Sciences, University of Florida - primary advisor	2025 - present
Niya Shao, Geological Sciences, University of Florida - primary advisor	2022 - present
Michael Field, Geological Sciences, University of Florida - primary advisor	2022 - present
Eric Damman, Geological Sciences, University of Florida - committee member	2025 - present
Stephanie Killingsworth, Geological Sciences, University of Florida - committee member	2025 - present
Rachael Durr, Geological Sciences, University of Florida - committee member	2024 - present
Fabian Quichimbo, Geological Sciences, University of Florida - committee member	2025 - present
Megan Black, Geological Sciences, University of Florida - committee member	2023 - present
Theo Richardson, Astronomy, University of Florida - committee member	2022 - 2025
Brian Kelly, Geological Sciences, University of Florida - committee member	2023 - 2024
Michelle Babcock, Geological Sciences, University of Florida - primary advisor	2022 - 2024
Nicole Greco, Geological Sciences, University of Florida - second project mentor	2022 - 2024
Briar Conger, Scripps, UC San Diego - second project mentor	2021 - 2022
Franklyn Dunbar, Computer Science, University of Montana - second project mentor	2020

UNDERGRADUATE MENTORING

Tyler Le, University of Florida	2025 - present
Milo Rasz, University of Florida	2025 - present
Lillian Barrett, University of Florida	2025 - present
Sean Hamilton, University of Florida	2025 - present
Maheer Bansari, University of Florida	2025 - present
Allison Nix, University of Florida	2024 - present
Sunny Gupta, University of Florida	2024 - present
Olivia Zhang, University of Florida	2024 - present
Alisha Jithesh, University of Florida	2023 - 2025
Nate Schoedl, University of Florida	2022 - present
Allan Zhang, University of Florida	2022 - 2025
Aidan Burrowes, University of Florida	2023 - 2024
Caleb Koresh, University of Florida	2022 - 2024
Caroline Riggall, University of Florida	2021 - 2024
Matthew Hibbs, University of Florida	2021 - 2023
Carson Ward, University of Florida	2022
Angela Wang, University of Florida	2022
Stella Moore, University of Florida	2022
Jack Magalsky, University of Florida	2022
Samuel Williams, University of Florida	2021
Angelo Tarzona, Dickinson College	2020
Ha Tran, Stanford University	2020

Connery Wood, Stanford University
Kathy Vega, Fullerton Community College

2019
2017 - 2018

OUTREACH

Instructor for Scientist in Every Florida School (SEFS)	<i>2022 - present</i>
Stanford Ask A Scientist	<i>2018 - 2019</i>
GeoKids instructor. Taught geology to second graders	<i>2018</i>
Stanford Splash teacher. Educational outreach for local high school students	<i>2018</i>

PROFESSIONAL AFFILIATIONS

American Geophysical Union, Member	<i>2017 - Present</i>
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