

EMMA “MICKEY” MACKIE

Department of Geological Sciences, University of Florida
emackie@ufl.edu ◊ GatorGlaciology.com

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 IN REVIEW

*Graduate researcher, **Undergraduate researcher

- [1] Schoedl, N.**, MacKie, E.J., Field, M.*, Stubbs, E.A., Zhang, A.**, Gravey, M. A Python multi-processing approach for fast geostatistical simulations of subglacial topography.

PUBLICATIONS

*Graduate researcher, **Undergraduate researcher

- [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

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

NSF Geosciences Open Science Ecosystem (\$253,946) Title: <i>Enhancing the accessibility of novel geostatistical inversion workflow for cryosphere research</i> PI: E.J. MacKie Period: 8/23 - 8/25	2023
Earth Science Information Partners GeoSMART award (\$4,000)	2022
Achievement Rewards for College Scientists (ARCS) Scholarship Award (\$90,000)	2020

TEACHING EXPERIENCE

Introduction to Machine Learning in the Geosciences, University of Florida (instructor)	2023
Arctic Seismology, University Center in Svalbard, Norway (Guest Lecturer)	2022
Arctic Seismology, University Center in Svalbard, Norway (Teaching Assistant)	2020
Introduction to the Foundations of Contemporary Geophysics, Stanford (Teaching Assistant)	2019, 2020

INVITED TALKS

Lamont-Doherty Marine Geology, Geophysics, Seismology, Geology, and Tectonophysics seminar	2023
University of Florida Data Science and Informatics Symposium	2023
Data management and data assimilation keynote at Antarctic RINGS workshop in Norway	2022
Compute Antarctic seminar series at University of Tasmania	2022
University of Florida Data Science and Informatics Symposium	2022
Stanford Geophysics Brown Bag Seminar	2020
Data Science Keynote, International Thwaites Glacier Collaboration Meeting	2019
Aarhus Department of Geoscience	2019

PROFESSIONAL SERVICE

Guest editor for <i>Remote Sensing</i> special issue: Machine Learning and Artificial Intelligence in Remote Sensing Image Understanding	2022 - present
Steering Committee: West Antarctic Ice Sheet Initiative	2022 - present
Steering Committee: Women in Data Science Conference	2019
Steering Committee: International Thwaites Glacier Collaboration Early Career Meeting	2019

UNIVERSITY SERVICE

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 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, 2023
Greenland - Radar	2019
Svalbard - Seismology	2019
Washington, Idaho, and British Columbia - Geology	2016
Juneau Icefield - Glaciology	2015
Death Valley - Geology	2015

SELECTED CONFERENCE ABSTRACTS

- [14] **MacKie, E.J.**, D.M. Schroeder., C. Zuo, Z. Yin, J. Caers, 2020. Quantifying Subglacial Hydrologic Uncertainty with Stochastic Simulation. *AGU Fall Meeting*.
- [13] Teisberg, T., D.M. Schroeder, **E.J. MacKie**, 2020. Dynamically Optimizing Radar Sounder Sampling Based on Estimated Uncertainty in Bed Topography. *AGU Fall Meeting*.
- [12] **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*.
- [11] **MacKie, E.J.**, D.M. Schroeder, 2019. Paleo Observations Used to Geostatistically Simulate the Subglacial Geology of Thwaites Glacier. *AGU Fall Meeting*.
- [10] Conger, A., D.M. Schroeder, **E.J. MacKie**, 2019. Radiometric Characterization of Subglacial Lake Floors from Archival Radar Data. *AGU Fall Meeting*.
- [9] Schroeder, D.M., **E.J. MacKie**, A. Conger, 2019. Radiometric signature of subglacial conditions in archival radar sounding data recovered from optical film. *AGU Fall Meeting*.
- [8] **MacKie, E.J.**, D.M. Schroeder, 2019. Geostatistically Simulating the Topography and Geology of the Amundsen Sea Embayment. *WAIS Workshop*.
- [7] **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*.
- [6] **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*.
- [5] **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*.
- [4] Schroeder, D.M., **E.J. MacKie**, T.T. Creyts, J.B. Anderson, 2019. A subglacial hydrologic switching hypothesis for silt sorting and deposition during ice sheet retreat in the in the Amundsen Sea Embayment. *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*.

GRADUATE MENTORING

Michelle Babcock, Geological Sciences, University of Florida - primary advisor	<i>2022 - present</i>
Niya Shao, Geological Sciences, University of Florida - primary advisor	<i>2022 - present</i>
Michael Field, Geological Sciences, University of Florida - primary advisor	<i>2022 - present</i>
Nicole Greco, Geological Sciences, University of Florida - second project mentor	<i>2022 - present</i>
Theo Richardson, Astronomy, University of Florida - committee member	<i>2022 - present</i>
Briar Conger, Scripps, UC San Diego - second project mentor	<i>2021 - present</i>
Franklyn Dunbar, Computer Science, University of Montana - second project mentor	<i>2020</i>

UNDERGRADUATE MENTORING

Chaitra Peddireddy, University of Florida	<i>2023 - present</i>
Nate Schoedl, University of Florida	<i>2022 - present</i>
Allan Zhang, University of Florida	<i>2022 - present</i>
Caleb Koresh, University of Florida	<i>2022 - present</i>
Caroline Riggall, University of Florida	<i>2021 - present</i>
Matthew Hibbs, University of Florida	<i>2021 - present</i>
Carson Ward, University of Florida	<i>2022</i>
Angela Wang, University of Florida	<i>2022</i>
Stella Moore, University of Florida	<i>2022</i>
Jack Magalsky, University of Florida	<i>2022</i>
Samuel Williams, University of Florida	<i>2021</i>
Angelo Tarzona, Dickinson College	<i>2020</i>
Ha Tran, Stanford University	<i>2020</i>
Connery Wood, Stanford University	<i>2019</i>
Kathy Vega, Fullerton Community College	<i>2017 - 2018</i>

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

Institute of Electrical and Electronics Engineers, Member	<i>2020 - Present</i>
International Glaciological Society, Member	<i>2019 - Present</i>
American Geophysical Union, Member	<i>2017 - Present</i>