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] **E. MacKie**, L. Li, R. Halberstadt, S. R. Jamieson, R. Law, M. Lowe, F. S. McCormack. G. J. G Paxman, A. R. A. Aitken .... R. Venturelli. Towards bridging the gap between Antarctic subglacial boundary conditions and ice-sheet model parameterization. *(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

[33] M. Lösing, A. Aitken, M. Field*, **E. MacKie**, L. Li. (2026). Gravity Topography Modeling of the Denman Glacier Region Using a Geostatistical Approach. *The Cryosphere*, 20(10), 5629-5652. https://doi.org/10.5194/tc-20-5629-2026.

[32] K. Matsuoka, G. Moholdt, J. Arthur, ... **E. MacKie** ... D. Young. (2026). Toward 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 (GravMCMC, 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.** ... & Zuhr, 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 19711979. *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 (Tromso, 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 *Remote Sensing* 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). GStatSim: 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*

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 *2019*
Kathy Vega, Fullerton Community College *2017 - 2018*

OUTREACH

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

PROFESSIONAL AFFILIATIONS

American Geophysical Union, Member *2017 - Present*