Caitlin Haedrich

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EDUCATION

North Carolina State University — *2020 - Present*

Doctor of Philosophy, Geospatial Analytics
Advisor: Helena Mitasova

Dartmouth College — *2019 - 2020*

Non-degree seeking coursework in Physics

Middlebury College — *2013 - 2017*

Bachelor of Arts, Mathematics and Geology
Geology Advisor: Will Amidon
Mathematics Advisor: David Dorman

WORK EXPERIENCE

Research Assistant — *Dec. 2023 - Present*

NC State Center for Geospatial Analytics, Raleigh NC
Worked on a variety of interdisciplinary projects as an expert in GRASS GIS, Tangible Landscape and geospatial analysis. Focus areas included water quality and agricultural runoff, GIS education and GRASS GIS development, and overland flow modeling.

Teaching Assistant — *Aug. 2021 - Dec. 2023*

NC State Center for Geospatial Analytics, Raleigh NC
Helped teach, grade, and develop assignments for two 700-level geospatial analytics courses (GIS710 and GIS714). Also led several conference and campus workshops on related material.

Google Summer of Code Participant — *Jun. 2021 - Aug. 2021*

GRASS GIS Project, OSGeo Organization
Contributed to GRASS GIS by improving the integration of GRASS GIS and Jupyter Notebooks. Wrote package grass.jupyter that contains classes and functions for launching GRASS GIS in Jupyter and rendering GRASS data in Notebooks.

Research Physical Scientist — *Feb. 2018 - Jul. 2020*

Cold Regions Research & Engineering Laboratory, Hanover NH
Worked for US Army Corps of Engineers with Dr. Daniel Breton on radio frequency propagation in urban and mountainous environments. Conducted research on urban radio-frequency noise. Provided geospatial expertise on a variety of projects.

Environmental Geophysics Intern — *Jun. 2017 - Dec. 2017*

Lawrence Berkeley National Laboratory, Berkeley CA
Processed and analyzed multispectral and RGB (TrueColor) drone imagery. Managed large datasets and worked with a team of scientists to parameterize hydrogeochemical processes in the critical zone.

AmeriCorps Field Education Intern — *May 2016 - August 2016*

Teton Science School, Jackson WY
Taught all ages the ecology, geology, and history of conservation in the Greater Yellowstone Ecosystem.

SERVICE & ACTIVISM

Co-President Geospatial Graduate Student Organization — *Jun. 2022 - Jun. 2023*

Duties included running monthly GGSO meetings, overseeing all GGSO activity, organizing campus GIS Week events and representing the student body on the Departmental Steering Committee.

Social Chair Geospatial Graduation Student Organization — *Jun. 2021 - Jun. 2022*

Organized monthly on and off-campus social events to foster community in the wake of the COVID-19 pandemic. Events included a holiday party, trivia nights and group events to local sports teams.

GRANTS & AWARDS

AGU Michael H. Freilich Student Visualization Competition Winner — *Dec. 2024*

Received Award and $6000 towards travel and professional development for entry titled "Mitigating Agricultural Runoff with Tangible Landscape. Video of talk:https://youtu.be/oCwNH-kSZ2k?si=RTG3M6DpLRso32i2.

NCSU DELTA Exploratory Grant Recipient — *Sept. 2023 - Aug. 2024*

Received $10,000 Digital Education and Learning Technology Applications (DELTA) grant for exploring the integration of coding through Jupyter Notebooks and grass.jupyter into a Master's level GIS course (GIS582). As a prerequisite, I also received a certification in Quality Matters in designing and evaluating online higher education courses.

Center for Geospatial Analytics Beacon Award — *2023*

Given to one student annually who shines a light on the Center for Geospatial Analytics in the wider scientific community.

GRASS GIS Mini Grant Recipient — *Jan. 2022 - Mar. 2022*

Received $1000 grant and mentorship to continue work on the grass.jupyter package that I began during Google Summer of Code. https://trac.osgeo.org/grass/wiki/GSoC/2021/JupyterAndGRASS/MiniGrant2022.

Center for Geospatial Analytics Creativity in Teaching Award — *2022*

Given to one student annually who creates an innovative learning environment that engages diverse learners in the study of geospatial data science.

CRREL Excellence Award Award — *2019*

Given to one researcher at CRREL each year in recognition of outstanding contributions.

PUBLICATIONS

Haedrich, C., Petras, V., Petrasova, A., Blumentrath, S., & Mitasova, H. (2023). *"Integrating GRASS GIS and Jupyter Notebooks to facilitate advanced geospatial modeling education".* Transactions in GIS. https://doi.org/10.1111/tgis.13031.

D. J. Breton and **C. E. Haedrich** (2021). *"Terrain-Scatter Augmented Vertical Plane Model for Radio Path Loss Estimation in Complex Terrain: (Invited Paper)"*, MILCOM 2021 - 2021 IEEE Military Communications Conference (MILCOM), San Diego, CA, USA, , pp. 408-413, https://doi.org/10.1109/MILCOM52596.2021.9653008.

Wilson, D. K., Kamrath, M. J., **Haedrich, C. E.,** Breton, D.J., Hart, C. R. (2021). *"Urban noise distributions and the influence of geometric spreading on skewness".* J. Acoust. Soc. Am. 1 August 2021; 150 (2): 783–800. https://doi.org/10.1121/10.0005736.

Breton, D.J., **Haedrich, C.E.,** Hoch, G.R., Streeter, S.S., Maxson, M.L. (2020). *"The Urban Ground-to-Ground*

Radio-Frequency Channel: Measurement and Modeling in the Ultrahigh Frequency Band." ERDC/CRREL Technical Report 20-8. http://dx.doi.org/10.21079/11681/37554.

Breton, D.J., **Haedrich, C.E.**, Kamrath, M.J., Wilson, D.K. (2019). *"Street-scale Mapping of Urban Radiofrequency Noise at VHF and UHF*". Radio Science, 54, 934–948. https://doi.org/10.1029/2019RS006893.

Haedrich, C. E., Breton, D. J. (2019). *"Measuring Very High Frequency and Ultrahigh Frequency Radio Noise in Urban Environments: A Mobile Measurement System for Radio-Frequency Noise"*. ERDC/CRREL Technical Report 19-8. http://dx.doi.org/10.21079/11681/33290.

POSTERS, CONFERENCE PAPERS & WORKSHOPS

White, C., & **Haedrich, C.** (2025, April 25). Workshop: Propagating DEM Uncertainty to Stream Extraction using GRASS. Geomorphometry 2025, Perugia, Italy. https://doi.org/10.5281/zenodo.15283714

Haedrich, C., Regmi, P. (May 2025). *"An Introduction to GRASS GIS and Tangible Landscape".* Workshop at the CSDMS 2025 Annual Meeting, Boulder, CO.

Haedrich, C., Petrasova, A., & Mitasova, H. (April 2025). *"Building Geospatial Models in GRASS GIS: From Python Workflows to Tangible Landscape".* Workshop at North American Regional Chapter of the International Association for Landscape Ecology (IALE-NA) Annual Meeting, Raleigh, NC.

Haedrich, C., Meeks, A., Petrasova, A., Jones, M. G., & Mitasova, H. (December 2024). *"An Open-Source Tangible Platform for Modelling Nature-Based Agricultural Runoff Control Strategies"*. Poster at AGU24, Washington, DC.

White, C., **Haedrich, C.**, & Mitasova, H. (December 2024) *"Sensitivity Analysis of Spatial Scale and Particle Density on Overland Flow Pattern Accuracy and Computational Demand"*. Poster at AGU24, Washington, DC.

Haedrich, C., & Ahrent, S. (June 2024). *"Topography to GRASS GIS to Landlab model grid"*. CSDMS Tutorial. https://csdms.colorado.edu/wiki/Lab-0037

Haedrich, C., Regmi, P. (May 2024). *"Coastal evolution analysis and inundation modeling with GRASS GIS"*. Workshop at the CSDMS 2024 Annual Meeting, Montclair, NJ.

Andreo, V., **Haedrich, C.** (April 2024). *"GRASS GIS 101: From GUI Clicks to Writing Scripts"*. Workshop at the Tennessee Geographic Information Council's 2024 Annual Meeting.

Haedrich, C., Petrasova, A., & Mitasova, H. (December 2023). *"Modeling vegetated stream buffer impacts on water depth and discharge at the watershed scale with GRASS GIS and Jupyter Notebooks"*. Poster at AGU23, San Francisco, CA .

Petrasova, A., **Haedrich, C.**, Petras, V. (November 2023). *"Unlock the Power of GRASS GIS".* Workshop at FOSS4G North America 2023, Baltimore, MD.

Petrasova, A., **Haedrich, C.** (August 2023). *"Parallelization of geoprocessing workflows in GRASS GIS and Python".* Workshop at OpenGeoHub 2023, Poznan, Poland.

Kamrath, M.J., Wilson, D.K., **Haedrich, C.E.**, Hart, C.R. (March 2023). *"Spatial variation of exponentially modified Gaussian parameters in an urban setting"*. J. Acoust. Soc. Am. 1 March 2023; 153 (3_supplement): A44. https://doi.org/10.1121/10.0018093

Haedrich, C., Petras, V., Petrasova, A. "Using GRASS GIS in Jupyter Notebooks: An Introduction to grass.jupyter". Talk at FOSS4G (2022).

Petrasova, A., **Haedrich, C.,** Petras, V. (August 2022). *"Unleash the power of GRASS GIS with Jupyter".* Workshop at

FOSS4G 2022, Firenze, Italy.

Wilson, D.K., Kamrath, M.J., **Haedrich, C.E.,** Breton, D.J., Hart, C.R. (April 2022). *"A survey of statistical models for urban noise and their physical interpretations"*. J. Acoust. Soc. Am. 1 April 2022; 151 (4_Supplement): A35. https://doi.org/10.1121/10.0010574

Suer, C., Breton, D. J., **Haedrich, C. E.,** Lang, R. (2021). *"Bistatic Scattering Coefficients of a Tree Covered Mountainside at L Band"*. 2021 USNC-URSI Radio Science Meeting (USCN-URSI RSM), Honolulu, HI, USA, pp. 060-063, https://doi.org/10.23919/USNC-URSIRSM52661.2021.9552359.

Breton, D.J., **Haedrich, C.E.** (July 2020). *"Occluded Scatterers and the Urban Ground-to-ground Channel at Low UHF."* North American Radio Science Meeting and IEEE International Symposium on Antennas and Propagation.

Haedrich, C.E., Breton, D.J. (July 2020). *"Modeling RF Noise in Urban Environments with Spatially Distributed Point Sources."* North American Radio Science Meeting and IEEE International Symposium on Antennas and Propagation.

Suer, C., Lang, R., Breton, D.J., **Haedrich, C.E.** (July 2020). *"P and L Band Coherent Wave Propagation through a Tree Covered Mountainside."* North American Radio Science Meeting and IEEE International Symposium on Antennas and Propagation.

Haedrich, C.E., Breton, D.J., Wilson, D.K. (October 2019). *"Isarithmic mapping of radio-frequency noise in urban environments."* Proceedings of the Military Sensing Symposia on Battlespace Acoustic, Seismic, Magnetic and Electric-Field Sensing and Signatures. San Diego, CA.

Lang, R., Suer, C., Breton, D.J., **Haedrich, C.E.** (July 2019). "UHF Mountain Propagation: Measurements and Modeling." USNC-URSI Radio Science Meeting. Atlanta, GA.

Kamrath, M.J., Wilson, D.K., Hart, C.R., Breton, D.J., **Haedrich, C.E.** (June 2019). *"Evaluating parametric probability density function for urban acoustic noise."* INTER-NOISE and NOISE-CON Congress and Conference Proceedings.

Haedrich, C.E., Breton, D.J., Wilson, D.K. (October 2018). *"Preliminary measurements on the geography of urban VHF radio-frequency noise."* Proceedings of the Military Sensing Symposia on Battlespace Acoustic, Seismic, Magnetic and Electric-Field Sensing and Signatures. Gaithersburg, MD.

Falco, N., Dafflon, B., Wainwright, H., Leger, E., **Haedrich, C.**, Peterson, J., Hubbard, S. (2018). *"Integrated imaging of above and below ground properties and their interactions: A case study in East River Watershed, Colorado."* In SEG Technical Program Expanded Abstracts 2018. https://doi.org/10.1190/segam2018-2998456.1.

Haedrich, C., & Amidon, W. H. (March 2016). *"Lidar Ground Surface Classification in the Middlebury River Watershed"*. Poster at Geological Society of America Northeast Section Annual Meeting 2016. Albany, NY. https://doi.org/10.1130/abs/2016NE-272812.