

Andrew Edward Brettin

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New York, NY, 10012

Education

PhD, Atmosphere-Ocean Science and Mathematics

Courant Institute of Mathematical Sciences, New York University
Advisor: Laure Zanna

May 2025

New York, NY

Bachelor of Science, Mathematics

University of Minnesota, College of Science & Engineering
Summa cum laude with high distinction (GPA 3.92)

May 2019

Minneapolis, MN

Technical Skills

Programming languages	Python (scipy, dask, xarray, scikit-learn, PyTorch, Keras) • MATLAB • Julia • C++
Workflows	Bash • git/GitHub • VS Code • Jupyter • Pytorch Lightning • Weights & Biases
Computational skills	Numerical methods (optimization, quadrature, interpolation, finite difference, spectral methods) • MCMC • High performance computing • Distributed data parallelism
Statistics and ML	Linear/logistic regression • PCA • Maximum likelihood estimation • Unsupervised learning • Gaussian processes • Autoencoders • CNNs • Statistical-dynamical techniques (Linear inverse models, dynamic mode decomposition, Kalman filtering)

Research Projects

Constraining estimates of coastal sea level variability using quantile neural networks | 2024–2025

- Devised a novel yet explicit quantile regression neural network framework for learning probability distributions
- Constrained estimates of tide gauge sea level observations under ERA5-estimated atmospheric conditions

Learning improved propagators for regional sea surface height dynamics | 2024

- Developed a machine learning architecture based on Koopman operator theory to learn an improved propagator for regional sea surface height forecasts
- Enhanced prediction skill by ~5%–10% over conventional statistical-dynamical techniques

Identifying sources of dynamic sea level predictability with mean-variance networks | 2023–2024

- Leveraged uncertainty-quantifying neural networks to identify changes in sources of dynamic sea level predictability over daily-to-seasonal forecast leads

Publications

1. **Brettin, Andrew**, Zanna, L. & Barnes, E. A. Learning Propagators for Sea Surface Height Forecasts Using Koopman Autoencoders. *Geophysical Research Letters* **52**. [10.1029/2024GL112835](https://doi.org/10.1029/2024GL112835), e2024GL112835 (2025).
2. **Brettin, Andrew**, Zanna, L. & Barnes, E. A. Uncertainty-permitting machine learning reveals sources of dynamic sea level predictability across daily-to-seasonal timescales. *Submitted to Artificial Intelligence for the Earth Systems*. [10.48550/arXiv.2502.11293](https://doi.org/10.48550/arXiv.2502.11293) (2025).
3. Falasca, F. *et al.* Exploring the nonstationarity of coastal sea level probability distributions. *Environmental Data Science* **2**. [10.1017/eds.2023.10](https://doi.org/10.1017/eds.2023.10), e16 (2023).
4. Meyer, K. *et al.* Nitrogen-induced hysteresis in grassland biodiversity: a theoretical test of litter-mediated mechanisms. *The American Naturalist* **201**. [10.1086/724383](https://doi.org/10.1086/724383), E153–E167 (2023).
5. **Brettin, Andrew**, Rossi-Goldthorpe, R., Weishaar, K. & Erovenko, I. V. Ebola could be eradicated through voluntary vaccination. *Royal Society Open Science* **5**. [10.1098/rsos.171591](https://doi.org/10.1098/rsos.171591), 171591 (2018).

Communication Experience

- **Selected presentations**

- Andrew Brettin, Laure Zanna, and Elizabeth Barnes (2023). *Identifying Drivers of Subseasonal-to-Seasonal Sea Level Predictability Using Uncertainty-Permitting Machine Learning*. Oral session, AGU Fall Meeting.
- Andrew Brettin and Laure Zanna (2022). *Constraining Estimates for South American Sea Level Extremes Using Uncertainty-Permitting Machine Learning*. Poster session, AGU Fall Meeting.
- Andrew Brettin and Laure Zanna (2022). *Characterizing the Impacts of Continental Shelf Depth on Sea Level Variability Using Clustering*. Poster session, AGU Ocean Sciences Meeting.

- **Teaching and tutoring**

- Recitation leader, Numerical Methods, *New York University* (Fall 2021)
- Peer tutor, Honors Calculus I–IV, *University of Minnesota, University Honors Program* (Fall 2016–Spring 2019)

Workshops

- NASA/JPL Summer School on Satellite Observations and Climate Models | 2023
Keck Institute for Space Studies, Caltech, Pasadena, CA
- LEAP Momentum Bootcamp on Climate Data Science | 2022
Columbia University, New York, NY
- OceanHackWeek Data Science and Oceanography Interactive Workshop | 2021
University of Washington eScience Institute, Virtual workshop
- Workshop on Climate Change and Resilience: Methods of Dynamical Systems and Data Assimilation | 2018
American Institute of Mathematics, San Jose, CA

Service and Outreach

- Vice President, Courant Student Organization, *New York University* (Fall 2021–Summer 2022)
- Volunteer tutor, math grades 5–8, *Common Denominator* (Fall 2021–Spring 2022)
- Project mentor, Undergraduate Research Program in Data Science, *NYU Center for Data Science, in collaboration with NSBP* (Spring 2021)
- Reviewer, *Geophysical Research Letters* (2025–)