Claire Valva

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Positions

California Institute of Technology — **Pasadena, CA**
Postdoctoral Scholar in Computing & Mathematical Sciences — 2025 – present
Mentor: Andrew M. Stuart

Woods Hole Oceanographic Institution, Geophysical Fluid Dynamics Program — **Woods Hole, MA**
PhD student fellow, *Mentors: Jeremy P. Parker, Peter Schmid* — 2022
Staff member — 2025

Education

Courant Institute of Mathematical Sciences, New York University — **New York, NY**
PhD student in Atmosphere Ocean Science and Mathematics — 2020 – 2025
Advisors: Edwin P. Gerber and Dimitrios Giannakis

University of Chicago — **Chicago, IL**
BS in Geophysical Sciences, Mathematics — 2016 – 2020

Publications

* denotes alphabetical author ordering

- Xu, Y., **C. Valva**, B. Gao, I. Ishikawa (2026). Learning Kolmogorov backward operators for spectral analysis and forecasting: A variational Galerkin framework. arXiv:2610.39580.
- **Valva, C.**, E. P. Gerber (2026) A more predictable Madden-Julian Oscillation index from Koopman spectral analysis. arXiv:2609.19435
- *Giannakis D., **C. Valva**, (2025). Physics-informed spectral approximation of Koopman operators. *Physica D: Nonlinear Phenomena* 10.1016/j.physd.2025.134835
- **Valva, C.**, E. P. Gerber (2025). The QBO, the annual cycle, and their interactions: Isolating periodic modes with data-driven Koopman analysis. *Journal of Climate* 10.1175/JCLI-D-24-0411.1
- *Giannakis D., **C. Valva**. (2024). Consistent Spectral Approximation of Koopman Operators Using Resolvent Compactification. *Nonlinearity*. 10.1088/1361-6544/ad4ade
- Parker, J. P., **C. Valva** (2023) Koopman analysis of the periodic Kortewegde Vries equation. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 10.1063/5.0137088, *Editor's Choice*
- Lloret, J., **C. Valva**, I. Valiela, J. Rheuban, R. Jakuba, D. Hanacek, K. Chenoweth, E. Elmstrom (2022). Decadal trajectories of land-sea couplings: Nitrogen loads, sources, and interception in SE New England watersheds, discharges to estuaries and effects on water quality. *Estuarine, Coastal and Shelf Science*, 10.1016/j.ecss.2022.108057
- **Valva, C.**, N. Nakamura (2021). What controls the probability distribution of local wave activity in the midlatitudes? *Journal of Geophysical Research: Atmospheres*, 126, 10.1029/2020JD034501.

Awards

SIAM Student Travel Grant — 2022, 2024, 2025
Outstanding student poster presentation award, Conference on Atmospheric and Oceanic Fluid Dynamics — 2024
Bella Manel Award, NYU Courant — 2024
Rising Star in Computational and Data Science, Oden Institute at the University of Texas at Austin — 2024
Dean's conference fund, NYU GSAS — 2022, 2023
Geophysical Fluid Dynamics Fellow (Woods Hole Oceanographic Institution) — 2022
National Science Foundation Graduate Research Fellowship — 2020
Departmental honors in Mathematics, Geophysical Sciences, University of Chicago — 2020

Service

Co-organizer of *Reliable data-driven learning and inference for dynamical systems* — 2027
Minisymposium, SIAM Conference on Applications of Dynamical Systems
Co-organizer of *Data-driven Methods for Extreme Events and Climate Inference* — 2026
Minisymposium, SIAM Conference on Mathematics of Planet Earth
Grant review panelist, National Science Foundation, Geosciences Directorate — 2026

Reviewer for *Quarterly Journal of the Royal Meteorological Society*, 2023 – present
Journal of Nonlinear Science, *Mathematical Reviews (MathSciNet)*,
EGU: Atmospheric Chemistry and Physics, *Journal of Geophysical Research: Atmospheres*,
IEEE Signal Processing Letters

Proposal Reviewer, Caltech Summer Undergraduate Research Fellowships (SURF) 2026

NYU Atmosphere-Ocean Science colloquium student coordinator 2022, 2024, 2025

NYU Courant Diversity, Equity, and Inclusion (DEI) journal club discussion leader 2021 – 2024

Mentoring

Summer Undergraduate Research Fellow (SURF): Huy Nguyen Caltech, Summer 2026
Project: Multimodal contrastive learning (CLIP) for Lagrangian data assimilation

Teaching

Instructor of record. Advanced Topics in Applied and Computational Mathematics: Caltech, Spring 2026
Data-driven methods for dynamical systems

Recitation leader. Introduction to Mathematical Modeling New York University, Spring 2025

Recitation leader. Ordinary Differential equations New York University, Spring 2024

Recitation leader. Real Analysis New York University, Fall 2023

Recitation leader. Intro to Mathematical Simulation New York University, Spring 2023

Teaching assistant. Summer Immersion Program in Mathematics Columbia University, Summer 2021

Course assistant (VCA). Undergraduate calculus sequence University of Chicago, Fall 2017

Outreach

Elementary school STEM outreach: Beach Elementary School Fall 2023, 2025
Gave interactive presentation to 4th- and 5th-grade students about the work of a mathematician.

"Speculating the Environment," Pratt Institute STEAMplant workshop Fall 2022
Discussed heat waves and the visualization of climate dynamics with art and design students, link.

Skills

Fluent in Julia, Python, MATLAB, Markdown, and LaTeX.

Presentations

Invited Presentations

- Tropical Climate Variability and Forecasting through Koopman Operator Methods. *Operator approaches to dynamics: New connections*, Isaac Newton Institute for Mathematical Sciences, 2026.
- Koopman operator methods for analysis of tropical climate variability. *Mathematics and Machine Learning for Earth System Simulation*, Institute for Pure & Applied Mathematics (IPAM), 2026.
- Consistent Spectral Approximations of Koopman Operators and an Application to the Quasi-biennial Oscillation. *Geophysical Fluid Dynamics Summer School, Woods Hole Oceanographic Institution*, 2025.
- Physics-Informed Spectral Approximation of Koopman Operators. *SIAM Conference on Applied Dynamical Systems*, 2025.
- Consistent Spectral Approximation of Koopman Operators: Applications to Climate Dynamics. *Dartmouth Applied and Computational Mathematics Seminar, 2024*.
- Consistent Spectral Approximation of Koopman Operators: Applications to Climate Dynamics. *SIAM Conference on Mathematics of Planet Earth*, 2024.
- Data-driven methods for consistent spectral approximation of Koopman operators. *Rising stars in computational and data sciences, Oden Institute*, 2024.
- Consistent Spectral Approximation of Koopman Operators Using Resolvent Compactification. *SIAM Conference on Applied Linear Algebra*, 2024.
- Consistent Spectral Approximation of Koopman Operators Using Resolvent Compactification. *SIAM Conference on Dynamical Systems*, 2023.
- Consistent Spectral Approximation of Koopman Operators Using Resolvent Compactification. *Dartmouth College functional analysis seminar*, 2023.

- A data-driven analysis of the Quasi-Biennial Oscillation with Koopman modes. *NOAA Physical Sciences Laboratory: Atmosphere-Ocean Processes and Predictability Seminar*, 2022.
- Data-driven spectral analysis of Koopman operators using resolvent compactification. *SIAM Conference on Mathematics of Data Science*

Contributed Presentations

- Ocean flow observability from ice floe motion. *California Geophysical Fluid Dynamics Conference (CalGFD)*, 2026.
- Ice Floes as Lagrangian-like Sensors: Observability and contrastive learning for ocean flow inference. *SIAM Conference on Mathematics of Planet Earth*, 2026. *(session organizer)*
- Coherent Feature Extraction via Consistent Spectral Approximations of Koopman Operators. *Dynamics Days US*, 2026.
- Consistent Spectral Approximation of Koopman Operators Using Resolvent Compactification. *XLIV Dynamics Days Europe, Bremen*, 2024.
- Capturing tropical climate oscillations with data-driven Koopman modes. *24th Conference on Atmospheric and Oceanic Fluid Dynamics*, 2024 — Received outstanding student poster presentation award.
- The QBO, the annual cycle, and their interactions: Isolating periodic modes with Koopman analysis. *Joint session of 24th Conference on Atmospheric and Oceanic Fluid Dynamics and 22nd Conference on Middle Atmosphere*, 2024.
- Finding invariant tori in chaos using dynamical mode decomposition. *APS Annual Meeting of the Division of Fluid Dynamics*, 2022.
- A data-driven analysis of the Quasi-Biennial Oscillation with Koopman modes. *Institute for Mathematical and Scientific Innovation: Confronting Global Climate Change*, 2022.
- A data-driven analysis of the Quasi-Biennial Oscillation with Koopman modes. *(SPARC) Stratosphere-Troposphere Processes and their Role in Climate General Assembly*, 2022.
- Dynamical mode decomposition for detection of invariant 2-tori in turbulent flows. *Geophysical Fluid Dynamics Program at Woods Hole Oceanographic Institute*, 2022.
- What Controls the Local Wave Activity Distribution in the Midlatitudes? *American Geophysical Union Fall Meeting*, 2019.
- Extreme Events as Atmospheric Rogue Waves. *American Geophysical Union Fall Meeting*, 2018.