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

Publications

- Giannakis D., **Valva, C**. (2025). Physics-informed spectral approximation of Koopman operators, *Physica D: Nonlinear Phenomena* 10.1016/j.physd.2025.134835
- **C. Valva**, 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 Institute) — 2022
National Science Foundation Graduate Research Fellowship — 2020
Departmental honors in mathematics, geophysical sciences, University of Chicago — 2020
Deans Fund Recipient for research-related travel, University of Chicago — 2018

Service and Outreach

Organizer of *Data-driven Methods for Extreme Events and Climate Inference* Minisympoisum, SIAM Conference on Mathematics of Planet Earth — 2026
Grant review panelist, National Science Foundation, Geosciences Directorate — 2026
Reviewer for *Quarterly Journal of the Royal Meteorological Society*, *Journal of Nonlinear Sciences*, *Mathematical Reviews (MathSciNet)*, *EGU: Atmospheric Chemistry and Physics*, *Journal of Geophysical Research: Atmospheres*, *IEEE Signal Processing Letters* — 2023 – present
Proposal Reviewer, Caltech Summer Undergraduate Research Fellowships (SURF) — 2026
Atmosphere-Ocean Science colloquium speaker lunch organizer — 2022, 2024 – present
Courant Diversity Equity and Inclusion (DEI) journal club discussion leader — 2021 – 2024
Speculating the Environment Pratt Institute STEAMplant workshop speaker, link. — Fall 2022

Mentoring

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

Visiting graduate student: Amane Kubo (The University of Tokyo) — Caltech, 2026
Project: Model calibration with dynamical and spectral data, co-advised with Oliver R. A. Dunbar

Teaching

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

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

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). for undergraduate calculus sequence — University of Chicago, Fall 2017

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.
- Ice Floes as Lagrangian-like Sensors: observability and contrastive learning for ocean flow Inference. *SIAM Conference on Mathematics of Planet Earth*, 2026, (session organizer).
- 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

- 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.
- Consistent Spectral Approximation of Koopman Operators: Applications to Climate Dynamics. *SIAM Conference on Mathematics of Planet Earth*, 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.