

Claire Valva

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Positions

California Institute of Technology

Postdoctoral Scholar in Computing & Mathematical Sciences

Mentor: Andrew M. Stuart

Pasadena, CA

2025 – present

Woods Hole Oceanographic Institution, Geophysical Fluid Dynamics Program

PhD student fellow, Mentor: Jeremy P. Parker, Peter Schmid

Staff member

Woods Hole, MA

2022

2025

Education

Courant Institute of Mathematical Sciences, New York University

PhD student in Atmosphere Ocean Science and Mathematics

Advisor: Edwin P. Gerber and Dimitrios Giannakis

New York, NY

2020 – 2025

University of Chicago

BS in Geophysical Sciences, Mathematics

Chicago, IL

2016 – 2020

Publications

* denotes alphabetical author ordering

- **Valva, C.**, E. P. Gerber (2026) A more predictable Madden-Julian Oscillation index from Koopman spectral analysis. *arXiv:2609.19435*
- *Giannakis D., **Valva, C.** (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. Elmsstrom (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

Service

Organizer of <i>Data-driven Methods for Extreme Events and Climate Inference</i> Minisymposium, SIAM Conference on Mathematics of Planet Earth	2026
Grant review panelist, National Science Foundation, Geosciences Directorate	2026
Reviewer for <i>Quarterly Journal of the Royal Meteorological Society</i> , <i>Journal of Nonlinear Sciences</i> , <i>Mathematical Reviews (MathSciNet)</i> , <i>EGU: Atmospheric Chemistry and Physics</i> , <i>Journal of Geophysical Research: Atmospheres</i> , <i>IEEE Signal Processing Letters</i>	2023 – present

Proposal Reviewer, Caltech Summer Undergraduate Research Fellowships (SURF)	2026
NYU Atmosphere-Ocean Science colloquium student coordinator	2022, 2024, 2025
Courant Diversity Equity and Inclusion (DEI) journal club discussion leader	2021 – 2024

Mentoring

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

Teaching

<i>Instructor of record.</i> Advanced Topics in Applied and Computational Mathematics: Data-driven methods for dynamical systems	Caltech, Spring 2026
<i>Recitation leader.</i> Introduction to Mathematical Modeling	New York University, Spring 2025
<i>Recitation leader.</i> Ordinary Differential equations	New York University, Spring 2024
<i>Recitation leader.</i> Real Analysis	New York University, Fall 2023
<i>Recitation leader.</i> Intro to Mathematical Simulation	New York University, Spring 2023
<i>Teaching assistant.</i> Summer Immersion Program in Mathematics	Columbia University, Summer 2021
<i>Course assistant (VCA).</i> for 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.	
Pratt Institutes Speculating the Environment seminar	Fall 2022
Discussing atmospheric science and environmental visualization with art and design students, link.	

Skills

Fluent in Julia, Python, MATLAB, Markdown, and $\text{\LaTeX}$.

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.