

# Theodore MacMillan

Palo Alto, CA | (908) 868-3712 | tmacmill@stanford.edu | theodoremacmillan.github.io

## Education

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**Stanford University**, Stanford, CA Fall 2021 – Present  
Ph.D. Candidate, Environmental Engineering  
Minor: Computer Science  
GPA: 4.11 / 4.30

**University of Notre Dame**, Notre Dame, IN Fall 2017 – Spring 2021  
B.S. in Mechanical Engineering  
GPA: 3.99 / 4.00

## Research Experience

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**Stanford University — Environmental Complexity Lab** Fall 2021 – Present  
Graduate Researcher

- Mechanistic interpretability for data-driven weather models [1]
- Theory of correlations in randomly filtered time series [2]
- Representations of coherent structures in geophysical turbulence [4,6]

**University of Notre Dame — Richter Lab** Fall 2018 – Spring 2021  
Undergraduate Researcher

- Simulations of turbulence, cloud microphysics, and cloud formation in marine boundary layers [5]

## Industry & Consulting Experience

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**Cascade Trading** Spring 2024 – Winter 2025  
Machine Learning Consultant

- Developed physics-informed ML models for wind and solar power forecasting
- Engineered cloud-based data pipelines for ingesting weather forecasts, backtesting trading strategies, and online deployment of predictive models

## Selected Publications

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1. MacMillan, T., Ouellette, N.T. (2025). *Towards mechanistic understanding in a data-driven weather model: internal activations reveal interpretable physical features*. arXiv.
  2. MacMillan, T., Hilditch, J., Ouellette, N.T. (2025). *Expected correlation in time-series analysis*. Physical Review E (Editors' Suggestion).
  3. MacMillan, T., Ouellette, N.T. (2024). *Spectral energy transfer on complex networks*. Scientific Reports.
  4. MacMillan, T., Ouellette, N.T. (2022). *Lagrangian scale decomposition via the graph Fourier transform*. Physical Review Fluids.
  5. MacMillan, T., Shaw, R., Cantrell, W., Richter, D.H. (2022). *Direct numerical simulation of turbulence and microphysics in the Pi Chamber*. Physical Review Fluids.
  6. MacMillan, T., Ouellette, N.T., Richter, D.H. (2020). *Detection of evolving Lagrangian coherent structures*. Physical Review Fluids.

## Technical Skills

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**Programming & ML:** Python (PyTorch, Jax, PySpark, xarray), Matlab, SQL

**Visualization:** Matplotlib, Plotly, Cartopy

**Cloud & Tools:** Google Cloud Platform

## Honors and Awards

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| • Stanford Graduate Fellowship                             | 2021 – Present |
| • National Science Foundation Graduate Research Fellowship | 2021 – Present |
| • Barry Goldwater Scholarship                              | 2020           |