Anthony Meza
Ph.D. Candidate

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Research Interests

My thesis is focused on past and future changes in global ocean circulation, with an emphasis on identifying the driving mechanisms and evaluating their detectability in observational records. Beyond my thesis work, I am broadly interested in all research that combine models and observations to advance our understanding of Earth's global and regional climate systems, particularly problems involving ocean dynamics, climate variability, and long-term climate change.

Education

Massachusetts Institute of Technology & Woods Hole Oceanographic Institution — Cambridge & Woods Hole, MA
Ph.D. in Physical Oceanography — 2021–Present

- Advisor: Geoffrey Gebbie
- Thesis Committee: Henri Drake, Christopher Piecuch, Viviane de Menezes, Raffaele Ferrari

University of California, Irvine — Irvine, CA
B.S. in Mathematics, Concentration in Data Science — 2018–2021

Publications

- **Meza, A.**, & Gebbie, G. (2025). Wind-driven mid-depth Pacific cooling in a dynamically consistent ocean state estimate. *Journal of Geophysical Research: Oceans*, 130(10), e2025JC022462. doi.org/10.1029/2025JC022462

Research Experience

Woods Hole Oceanographic Institution — Sep 2021–Present
Advisor: Geoffrey Gebbie — Woods Hole, MA

- Explored causes of deep ocean cooling using MITgcm simulations, supporting NASA efforts of global ocean modeling and data assimilation.
- Analyzed 15TB+ of next-generation high-resolution coupled climate model output to understand the connections between ocean circulation and dissolved chemicals in the ocean.
- Produced written reports, posters and presentations to communicate findings to broader communities.

Woods Hole Oceanographic Institution — Sep 2021–Sep 2023
Advisor: Hyodae Seo — Woods Hole, MA

- Processed and analyzed 3TB+ of high-resolution climate data and found significant connections between near-shore sea surface temperature and extreme California precipitation events.
- Developed tools to analyze big climate data using Python and Julia.

Los Alamos National Laboratory — Jun 2021–Aug 2021
Advisor: Mark Petersen — Los Alamos, NM

- Implemented reduced-precision capabilities within the ocean component of the Energy Exascale Earth System Model.
- Found that reduced precision significantly reduced compute time but at cost of model skill.

Institute for Pure and Applied Mathematics — Jun 2020–Sep 2020
Advisor: Thomas Merkh — Los Angeles, CA

- Co-developed Q-learning and Deep Q-learning algorithms to improve satellite network communication efficiency for the Aerospace Corporation.
- Empirical models were built in Python primarily using PyTorch and NetworkX.

Presentations

- **A. Meza**, G. Gebbie. "Wind-driven mid-depth Pacific cooling in a dynamically consistent ocean state estimate" ECCO Summer School, 19–30 May 2025, Asilomar Conference Center, Monterey, CA. *Poster*.
- **A. Meza**, P. Bhuyan, Z. Zheng, G. Gebbie., M. Linz, J. Wenegrat. "Surface to Bottom Connections in Earth's Ocean" Tracer Mixing in Fluids Across Planetary Scales Summer School, 8–19 Jul 2024, Brin Mathematics Research Center, College Park, MD. *Talk*.
- **A. Meza**, H. Seo. "Associations Between Coastally Trapped Waves and Wintertime Precipitation in California" Ocean Sciences Meeting, 18–23 Feb 2024, New Orleans, LA. *Poster*.
- **A. Meza**, H. Seo. "Associations Between Coastally Trapped Waves and Wintertime Precipitation in California" Graduate Climate Conference, 1–3 Nov 2023, Marine Biological Laboratory, Woods Hole, MA. *Poster*.
- **A. Meza**, G. Gebbie. "Drivers of subsurface Pacific cooling in ECCOv4r4" ECCO Annual Meeting 2023, 25 Jan 2023, University of Washington, Seattle, WA. *Virtual Talk*.
- **A. Meza**, G. Gebbie. "Drivers of mid-depth Pacific cooling trends in an ocean reanalysis" AGU Fall Meeting 2022, 2–4 Nov 2023, Chicago, IL. *Poster*.
- **A. Meza**, G. Gebbie. "Drivers of mid-depth Pacific cooling trends in an ocean reanalysis" Graduate Climate Conference, 31 Oct 2022, University of Washington, Seattle, WA. *Poster*.
- C. Tran, **A. Meza**, H.L. Tung, H. Liu. "A Reinforcement Learning Approach to Packet Routing on a Dynamic Network" Joint Mathematics Meeting, 6–9 Jan 2021, Virtual. *Virtual Talk*.

Service and Leadership

- **Committee Member** *Nov 2024–Present*
  AMS Committee on Climate Variability and Change
- **Graduate Application Mentor** *Aug 2023–Present*
  Joint Program Applicant Support & Knowledgebase
- **Co-organizer and Instructor** *Oct 2024*
  High Performance Computing and Data Analysis Workshop
- **Conference Co-Organizer** *Jan 2023–Nov 2023*
  2023 Graduate Climate Conference
- **Calculus Instructor** *Jul 2024*
  MIT-WHOI Joint Program Summer Math Refresher
- **Physical Oceanography Representative** *2023–2024*
  WHOI Joint Program Student Representative
- **PDE Instructor** *Jul 2023*
  MIT-WHOI Joint Program Summer Math Refresher
- **At-Large Representative** *2022–2023*
  WHOI Joint Program Student Representative
- **Conference Co-Organizer** *2022*
  2022 First Generation Summit
- **Committee Member** *2020–2021*
  UC Irvine Mathematics Inclusive Excellence Committee

Workshops and Summer Schools Attended

- **CESM/MOM6 Regional Modeling Workshop** *May 2025*
  NCAR Mesa Laboratory, Boulder, CO
- **ECCO Summer School** *May 2025*
  Asilomar Conference Center, Monterey, CA
- **Tracer Mixing in Fluids Across Planetary Scales Summer School** *Jul 2024*
  Brin Mathematics Research Center, College Park, MD

Awards and Honors Received

- **GEM Fellowship** *2021*
  National Consortium of Graduate Degrees for Minorities in Engineers, MIT
- **Rose Hills Scholarship** *2020*
  Rose Hills Foundation, UC Irvine
- **Rose Hills Scholarship** *2019*
  Rose Hills Foundation, UC Irvine
- **Bellettini Scholarship** *2019*
  Maria Rebecca and Maureen Bellettini Fund, UC Irvine
- **SCE STEM Scholarship** *2019*
  Southern California Edison, UC Irvine

Technical Skills

Programming Languages: Python, Julia, MATLAB.
Developer Tools: Slurm, Linux/Unix, Git, Github, VS Code, Google Colab.