Zachary Espinosa

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EDUCATION

University of Washington, Seattle, WA — Expected Jun 2025
PhD, Atmospheric and Climate Science | Data Science Specialty

Stanford University, Stanford, CA — Jun 2021
M.S. Applied and Engineering Physics, Schools of Arts and Science

Stanford University, Stanford, CA — Sep 2020
B.S. Computer Science, School of Engineering | Concentration: Artificial Intelligence

HONORS & FELLOWSHIPS

Department of Energy Computational Science Graduate Fellowship (DOE CSGF) — Apr 2022

Graduate Student Equity & Excellence Fellowship (GSEE Fellow) — Sep 2021

Achievement Rewards for College Scientists Foundation Scholar (ARCS Scholar) — Sep 2021

The GEM National Consortium Graduate Fellow (GEM Graduate Fellow) — Jan 2020

PUBLICATIONS

[7] **Espinosa, Zachary I.,** Lettie Roach, Cecilia M. Bitz, and Dirk Notz. "Sea Ice in Earth system models". *Sea Ice 4 (2025)*: *[in prep; chapter 10 of textbook]*

[6] **Espinosa, Zachary I.,** Edward Blanchard-Wrigglesworth, and Cecilia Bitz. "Understanding the drivers and predictability of record low Antarctic sea ice in austral winter 2023." *Nature Communications Earth & Environment* (2024). **https://doi.org/10.1038/s43247-024-01772-2**

[5] Cresswell-Clay, N., Liu, B., Durran, D., Liu, A., **Espinosa, Zachary I.,** Moreno, R., & Karlbauer, M. (2024). A Deep Learning Earth System Model for Stable and Efficient Simulation of the Current Climate. *arXiv preprint arXiv:2409.16247*.**https://doi.org/10.48550/arXiv.2409.16247**

[4] Schneider, D. P., Yin, Z., O'Connor, G. K., Blanchard-Wrigglesworth, E., Cast, Z. I., Datta, R., & **Espinosa, Zachary I.** (2024). Increasing Antarctic snowfall mitigates sea level rise less than projected due to meltwater influence on sea surface temperatures. *Authorea Preprints*. **10.22541/essoar.172411232.25724214/v1**

[3] **Espinosa, Zachary I.**, and Mark D. Zelinka. "The shortwave cloud-SST feedback amplifies multi-decadal Pacific sea surface temperature trends: Implications for observed cooling." *Geophysical Research Letters* 51.18 (2024): e2024GL111039. **https://doi.org/10.1029/2024GL111039**

[2] Blanchard-Wrigglesworth, E., Cox, T., **Espinosa, Zachary I.,** & Donohoe, A. (2023). The largest ever recorded heatwave—Characteristics and attribution of the Antarctic heatwave of March 2022. *Geophysical Research Letters*, *50*(17), e2023GL104910. **https://doi.org/10.1029/2023GL104910**

[1] **Espinosa, Zachary I.**, et al. "Machine learning gravity wave parameterization generalizes to capture the QBO and response to increased CO2." *Geophysical Research Letters* 49.8 (2022): e2022GL098174. **https://doi.org/10.1029/2022GL098174**

PROFESSIONAL EXPERIENCE

Research Intern, PhD | *Livermore, CA* | **Lawrence Livermore National Laboratory** — June 2023 – Sep 2023

• Studied the impact of marine boundary layer clouds on historical East Pacific Ocean cooling

Research Intern, PhD | *Richland, WA* | **Pacific Northwest National Laboratory** — June 2021 – Sep 2021

• Studied the impact of climate change on annual precipitation in the Amazon Rainforest

Graduate Research Assistant | *Stanford, CA* | **Stanford Earth Systems Science** — Sep 2019 – Sep 2021

• Developed a machine learning parameterization of gravity wave in a global climate model (Sheshadri Group)

• Publication in Geophysical Research Letters - Espinosa, Zachary I., et al (2022)

Machine Learning Engineering Intern | *Redwood City, CA* | **UnifyID** — Apr 2020 – Jun 2020

• Developed in-house machine learning pipeline for research & development. Introduced pipeline testing

Quantum Engineering Intern | *Palo Alto, CA* | **AT&T Foundry** — Jun 2019 – Sep 2019

• Built an open-source python framework for quantum networking (QN) simulations called netQuil, designed to support the implementation of canonical QN protocol (e.g. teleportation, superdense coding)

Software Engineering Intern | *Mountain View, CA* **| Smartcar, Inc.** Jan 2019 – Jun 2019

- Designed, built, and launched electric vehicle endpoints for Smartcar API
- Maintained python, node.js, and java SDKs. Contributed to OAuth2 pipeline.

Mobile Software Engineering Intern | *San Francisco, CA* | **OXO, Inc.** Apr 2018 – Sep 2018

- Built first iteration MVP mobile app for iOS and Android using React Native, Firebase, Heroku, and AWS RDS.

Web and Networking Engineering Intern | *Ashton, ID* | **Henry's Fork Foundation** Jun 2017 – Sep 2017

- Designed and built a data collection network for monitoring the Yellowstone watershed.

TEACHING, MENTORSHIP & SERVICE

Instructor & Mentor | AI Fellowship Program | *VeritasAI*	Jun 2024 – Present
Graduate Student Representative | UW Program on Climate Change | *Seattle, WA*	Sep 2022 – Sep 2024
Graduate President of UW American Meteorological Society Chapter | *Seattle, WA*	Sep 2021 – Sep 2023
Guest Lecturer | ATMS 220: Exploring the Atmospheric Sciences | *Seattle, WA*	Oct 2023
Guest Lecturer | ATMS 220: Exploring the Atmospheric Sciences | *Seattle, WA*	May 2023
Teaching Assistant | ATMS 101: Weather | *Seattle, WA*	Jan 2023 – Mar 2023

PRESENTATIONS

Talk | **Catalyst Project**| The Shortwave Cloud-SST Feedback Amplifies MultiDecadal Pacific SST Trends	Nov 2024
Poster | **CFMIP 2024** | The Impact of the Shortwave Cloud Feedback on East Pacific Multi-Decadal Variability	Jun 2024
Talk | **UW Climate Dynamics Seminar** | From Record Low Sea Ice to East Pacific Cooling: Unraveling SH Extremes	Apr 2024
Poster | **US CLIVAR Blocking and Extreme Weather Workshop** | The Physics of Antarctic Heatwaves	Mar 2024
Poster | **AGU Fall Meeting** | The Physics of Antarctic Heatwaves	Dec 2023
Poster | **Graduate Climate conference** | Drivers of Record Low Antarctic Sea Ice in Austral Winter 2023	Oct 2023
Poster | **DOE CSGF Annual Review**| The Physics of Antarctic Heatwaves	Jul 2023
Talk | **Scientific Committee on Antarctic Research** | The Physics of Summertime Antarctic Heatwaves	June 2023
Poster | **BEPSII Arctic Field School** | Drivers of Interannual Variability of Summer Sea Ice Extent	May 2022
Talk | **AGU Fall Meeting** | Machine Learning Emulation of Parameterized Gravity Wave Momentum	Dec 2021
Talk | **EGU General Assembly** | Machine Learning Emulation of Parameterized Gravity Wave Momentum	Apr 2021
Talk **| CalGFD |** A Data-Drive, Single column Gravity Wave Parameterization in an Idealized Model	Aug 2020
Poster **| Stanford Deep Learning Poster Session |** Distracted Driver Detection	Jun 2018
Poster **| Stanford Artificial Intelligence Post Session |** Tracking Schistosomiasis with Computer Vision	Mar 2018

ADDITIONAL INFORMATION

Tooling: Python, PyTorch, Tensorflow, Dask, Fortran, C, C++, Julia, Node.js, Express, Javascript, React Native, AWS, Postgres, SQL

Expertise: Climate modeling, Extreme Weather**,** Data Analytics**,** Deep Learning, Reinforcement Learning, Computer Vision