

Zachary Espinosa

+1 (630) 544-7512 • zespino97@gmail.com • [website](#) • he/him/his

EDUCATION

University of Washington , Seattle, WA	Expected Jun 2025
PhD, Atmospheric and Climate Science Advanced Data Science Option	
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. "Record Low Antarctic Sea Ice in Austral Winter 2023: Mechanisms and Predictability." *Authorea Preprints* (2024). [10.22541/essoar.171466440.03718233/v1](https://doi.org/10.22541/essoar.171466440.03718233/v1)

[5] 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](https://doi.org/10.22541/essoar.172411232.25724214/v1)

[4] 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>

[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 <i>Livermore, CA</i> 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 <i>Richland, WA</i> Pacific Northwest National Laboratory	June 2021 – Sep 2021
• Studied the impact of climate change on annual precipitation in the Amazon Rainforest	
Graduate Research Assistant <i>Stanford, CA</i> 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 <i>Geophysical Research Letters</i> - Espinosa, Zachary I., et al (2022)	
Machine Learning Engineering Intern <i>Redwood City, CA</i> UnifyID	Apr 2020 – Jun 2020
• Developed in-house machine learning pipeline for research & development. Introduced pipeline testing	
Quantum Engineering Intern <i>Palo Alto, CA</i> 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

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, 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