

# ELENA MARIA FERNÁNDEZ

Atmospheric Science | Machine Learning & Geospatial Data Science

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Department of Atmospheric and Environmental Sciences, University at Albany, SUNY

1400 Washington Ave, ETEC 496, Albany, NY, 12222

Phone: 516-695-8827 | Email: [emfernandez@albany.edu](mailto:emfernandez@albany.edu) | Website: <https://github.com/emf98>

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## EDUCATION

2026

**Doctor of Philosophy**, *University at Albany, SUNY – Albany, NY*

Major: Atmospheric Science

Dissertation: “*Applications of Machine Learning for Evaluating Downward-Coupled Stratosphere-Troposphere Interactions and Subseasonal Forecasts of Opportunity*”

Candidacy Achieved on March 15, 2024

Dissertation Successfully Defended on April 10, 2026

2022

**Master of Science**, *University at Albany, SUNY – Albany, NY*

Major: Atmospheric Science

Thesis: “*Examining the Impact of Stratospheric Polar Vortex Variability on US Surface Temperature*”

2020

**Bachelor of Science**, *Cornell University – Ithaca, NY*

Major: Earth and Atmospheric Sciences, Concentration in Atmospheric Science

Minor: Biometry and Statistics

*Honors in Research*

## FELLOWSHIPS

2025 – 2026

**NOAA Weather Program Office (WPO) Innovation for Next Generation Scientists (WINGS) Dissertation Fellowship**

*Awarded through the University Corporation for Atmospheric Research (UCAR)*

*Cooperative Program for the Advancement of Earth System Science (CPAESS)*

## RESEARCH EXPERIENCE

2020 – Present

**Graduate Research Assistant and WINGS Dissertation Fellow**

*Co-Advised: Andrea Lopez Lang and Zheng Wu*

*Dept. of Atmospheric and Environmental Science | University at Albany – Albany, NY.*

- Designed and conducted machine learning experiments to evaluate predictive skill across lead times, atmospheric regimes, and spatial domains.
- Built scalable data pipelines by integrating and quality-controlling large-scale geophysical datasets (reanalysis, NWP outputs, and observations) using HPC and cloud workflows.
- Developed interpretable machine learning and deep learning models for probabilistic forecasting of subseasonal (3–4 week) surface temperature anomalies.
- Engineered physically informed and spatially resolved features from large-scale atmospheric dynamics (e.g., stratospheric variability) to extract predictive signals and characterize region-dependent predictability.
- Quantified predictive uncertainty and diagnosed systematic biases in reforecast model outputs (e.g., UFS).

2019 – 2020

**Undergraduate Research Assistant, Northeast Regional Climate Center**

*Advisor: Arthur DeGaetano*

*Dept. of Earth and Atmospheric Science | Cornell University – Ithaca, NY.*

- Developed a 60-year climatology and workflow to analyze streamflow patterns for waterways in New York State.

### TECHNICAL SKILLS

- *Coding Languages*: Python, R
- *Frameworks/Libraries*: TensorFlow, PyTorch, Keras, Scikit-Learn, Numpy, Pandas, Xarray
- *Tools*: AWS, GitHub, HPC
- *Machine Learning Methodologies*: supervised/unsupervised learning (e.g., neural networks, clustering, ensemble and deep learning models), probabilistic modeling, uncertainty quantification, feature attribution, eXplainable AI (e.g., SHAP, LRP), computer vision-ready ML workflows (image-based pattern extraction)
- *Domain Expertise (Weather & Climate Signals)*: feature engineering, large-scale gridded and Earth system datasets (NetCDF, GRIB), atmospheric dynamics, synoptic meteorology, stratosphere-troposphere dynamics, atmospheric teleconnections, subseasonal-to-seasonal forecasting
- *Geospatial & Earth System Data Analysis*: ERA5/ERA-I, MERRA-2, MODIS, ECMWF and UFS reforecast

### MANUSCRIPTS & PUBLICATIONS

- **E. Fernández**, A. L. Lang, H. E. Attard, 2026: “Stratospheric Polar Vortex Ellipse Diagnostics for S2S Forecast Analyses.” *Accepted (in press), Journal of Applied Meteorology and Climatology.*
- **E. Fernández**, Z. W. Wu, A. L. Lang, 2026: “Identifying and Explaining Stratospheric Subseasonal Forecasts of Opportunity, Part 1: A Comparison of Machine Learning Methods.” *In preparation, Journal of Artificial Intelligence for the Earth Systems.*
- **E. Fernández**, Z. W. Wu, A. L. Lang, 2026: “Identifying and Explaining Stratospheric Subseasonal Forecasts of Opportunity, Part 2: Using Random Forests to Predict Regional Northern Hemisphere Temperature Anomalies.” *In preparation, Journal of Artificial Intelligence for the Earth Systems.*

### EXTENDED ABSTRACTS

- **E. Fernández**, A. L. Lang, Z. W. Wu, 2024: “Identifying Subseasonal Forecasts of Opportunity for Wintertime Surface Temperature Extremes Through ML Applications of Stratospheric Variability.” *ESS Open Archive.* DOI: 10.22541/essoar.173482233.37385111/v1

### INVITED PRESENTATIONS

- **E. Fernández**, Z. W. Wu, A. L. Lang, M. Olsen: *Evaluating the Representation of the Stratospheric Polar Vortex in UFS Coupled Model Prototypes.* NOAA WPO WINGS in Flight, **March 2026.**
- **E. Fernández**, A. L. Lang: *Steps toward using metrics of stratospheric variability for tropospheric temperature forecasts.* NOAA CPC AI in Earth Science Seminar Series, **April 2025** and Commodity Weather Group Webinar Series, **October 2025.**

### CONFERENCE PRESENTATIONS

- **E. Fernández**, Z. Wu, A. L. Lang, 2026: *A Comparison of Using Different Machine Learning Methods for Identifying Subseasonal Forecasts of Opportunity.* 106<sup>th</sup> American Meteorological Society Annual Meeting 2026, Houston, TX. (Oral) \***Awarded Outstanding Student Presentation Award (3<sup>rd</sup> Place)\***
- **E. Fernández**, Z. Wu, A. L. Lang, 2026: *Implementing Stratospheric Polar Vortex Geometries in Identifying Subseasonal Forecasts of Opportunity for Northern Hemisphere Temperature Extremes.* 106<sup>th</sup> American Meteorological Society Annual Meeting 2026, Houston, TX. (Poster)
- **E. Fernández**, A. L. Lang, 2024: *Examining the S2S Predictability of Northern Hemisphere Winter Surface Temperature Extremes through ML Applications of Stratospheric Variability.* American Geophysical Union Annual Meeting 2024, Washington, D.C. (Oral)
- **E. Fernández**, A. L. Lang, 2024: *Connecting Stratospheric Polar Vortex Geometries to Subseasonal Forecasts of Wintertime Tropospheric Temperature Anomaly.* 22<sup>nd</sup> American Meteorological Society Conference on the Middle Atmosphere, Burlington, VT. (Poster)
- **E. Fernández**, A. L. Lang, 2024: *Applying Stratospheric Polar Vortex Geometry to Subseasonal Forecasts.* 104<sup>th</sup> American Meteorological Society Annual Meeting, Baltimore, MD. (Poster)
- **E. Fernández**, A. Lang, 2023: *The Potential of Stratospheric Vortex Geometry in Forecasting.* 32<sup>nd</sup> AMS Conference on Weather Analysis and Forecasting, American Meteorological Society Collective Madison Meeting, Madison, WI. (Poster)

- **E. Fernández**, A. Lang, 2022: *Examining the Impact of Stratospheric Vortex Variability on US Surface Temperatures*. 17<sup>th</sup> AMS Conference on Polar Meteorology and Oceanography, American Meteorological Society Collective Madison Meeting, Madison, WI. (Oral)
- **E. Fernández**, A. Lang, 2022: *Examining the Impact of Stratospheric Vortex Variability on US Surface Temperatures*. 21<sup>st</sup> AMS Conference on the Middle Atmosphere, 102<sup>nd</sup> American Meteorological Society Annual Meeting, Remote. (Oral)
- **E. Fernández**, A. DeGaetano, 2020: *Examining the Hydroclimatological Extremes of New York State Waterways Over the Past 60 Years*. 100<sup>th</sup> American Meteorological Society Annual Meeting, 19<sup>th</sup> Annual Student Conference, Boston, MA. (Poster)
- **E. Fernández**, L. Aviles, 2019: *Streamflow Associated with Northeast Tropical Cyclones in the Connecticut River Watershed: Wet Antecedent Conditions and Hurricane Irene Case Study*. 99<sup>th</sup> American Meteorological Society Annual Meeting, 18<sup>th</sup> Annual Student Conference, Phoenix, AZ. (Poster)

### **SCHOLARSHIPS AND AWARDS**

2026	<i>Outstanding Student Presentation Award, 3<sup>rd</sup> Place</i> AMS Conference on Probability and Statistics
2025	<i>Department of Atmospheric and Environmental Science Distinguished Service Award</i> University at Albany, SUNY – Albany, NY
2020	<i>Michael W. Mitchell Memorial Scholarship</i> Cornell University – Ithaca, NY

### **SERVICE AND LEADERSHIP EXPERIENCE**

#### **University at Albany, SUNY – Dept. of Atmospheric and Environmental Science:**

2024 – Present	Graduate Program Committee
2024 – 2025	DAES Mentorship Program
2024 – 2025	Co-Chair, DAES Graduate Student Recruitment
2021 – 2025	Co-Chair, Outreach Committee
2021 – 2023	Undergraduate Tutoring

#### **American Meteorological Society:**

2025 – Present	Student Member, Committee on Artificial Intelligence Applications to Environmental Science
2019 – 2025	Student Conference Planning Committee for the American Meteorological Society Annual Meeting
2020 – 2025	Conference Session Chair
2023 – 2025	Co-Chair and Member, Board on Student Affairs; Specialty Meeting Events Committee
2022 – 2024	Student Member, Commission on the Weather, Water, and Climate Enterprise (CWWCE)

### **PROFESSIONAL SOCIETIES**

2019 – Present	American Meteorological Society (AMS)
2024 – Present	American Geophysical Union (AGU)

### **REFERENCES**

- Dr. Andrea Lopez Lang* | [andrea.lopez.lang@wisc.edu](mailto:andrea.lopez.lang@wisc.edu)  
Dept. of Atmospheric and Oceanic Sciences | University of Wisconsin-Madison – Madison, WI
- Dr. Zheng Wu* | [zwu26@albany.edu](mailto:zwu26@albany.edu)  
Dept. of Atmospheric and Environmental Science | University at Albany, SUNY – Albany, NY
- Dr. Cameron Paquette* | [cameron.r.paquette.ctr@us.navy.mil](mailto:cameron.r.paquette.ctr@us.navy.mil)  
US Naval Research Laboratory – Monterey, CA