Martin A. Fernandez

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EMPLOYMENT

2024 –	Research Scientist	Department of Atmospheric Science, CSU
2023 - 2024	Postdoctoral Fellow	Department of Atmospheric Science, CSU

EDUCATION

2023	PhD in Physics	University of California Riverside
2018	M.S. in Physics	University of California Riverside
2017	B.S. in Physics	Western Washington University

CURRENT RESEARCH

Using interpretable and/or explainable (posthoc XAI) machine learning methods to improve climate and weather prediction:

- Probabilistic machine learning methods for forecasting tropical cyclone track and intensity error. *With Dr. Elizabeth Barnes and Dr. Mark DeMaria.*
- Multi-year to decadal climate prediction using machine-learning assisted model-analogs. *With Dr. Elizabeth Barnes.*
- Novel methods to separate the forced response from internal variability in observations. *ForceSMIP collaboration.*
- Machine learning for climate change attribution.

RECENT PRESENTATIONS & WORKSHOPS

AMS Annual Meeting — Jan 2025 (New Orleans)
Multi-Year-to-Decadal Temperature Prediction using Machine Learning Model-Analogs

Earth System Predictability Across Timescales — April 2024 (NCAR)
Multi-Year to Decadal Analog Forecasting using Machine Learning Derived Masks

Confronting Earth System Models with Observations — March 2024 (NCAR)
Ranking Earth System Models using Observations and Machine Learning Analog Forecasting

AMS Annual Meeting — Jan/Feb 2024 (Baltimore)
Predicting Tropical Cyclone Track Forecast Errors Using a Probabilistic Neural Network

ForceSMIP Hackathon — Aug 2023 (NCAR)
Developing Methods for Separating the Forced Response from Internal Variability

OUTREACH AND MENTORSHIP

Mentor for REU student	2024
Organizer for CSU/CIRA Research Staff Events	2023 –
Co-mentor for REU student	2023
Co-mentor for undergraduate summer research project	2023
UCR Physics Organization for Women and the UnderRepresented	2018 – 2020
WWU Public Night Sky Observing host	2015 – 2017
WWU Women in Physics	2015 – 2017

PROGRAMMING SKILLS

expert: Python, LaTeX, and High-performance computing.
familiar: C, C++, Mathematica, IDL, and HTML/CSS.

AWARDS

NSF GRFP (Graduate Research Fellowship Program)	2019 – 2023
UCR Chancellor's Distinguished Fellowship	2017
WWU Alumni Association Leader Scholarship	2016

PAST RESEARCH

2018 – 2023: Using cosmological simulations and machine learning to explore beyond-standard-model physics and constrain cosmological & astrophysical parameters. *With Dr. Simeon Bird (University of California Riverside).*

2016 – 2017: Theory & modeling of guided wave plasmon polariton modes on novel waveguide architectures, with applications to solar cells and medical devices. *With Dr. Brad Johnson (Western Washington University).*

2015 – 2017: Identifying & characterizing pre-main sequence double-lined spectroscopic binaries in young star forming environments. *With Dr. Kevin Covey (Western Washington University).*

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FIRST AUTHOR PUBLICATIONS

Fernandez, M. A. and Barnes, E. A., *Multi-Year to Decadal Climate Prediction using Observationally Trained Masks in a Model-Analog Framework*, **submitted to Machine Learning: Earth**, arXiv: 2502.17583.

Fernandez, M. A., Barnes, E. A., Barnes, R. J., DeMaria, M., McGraw, M., Chirokova, G., and Lu, L., *Predicting Tropical Cyclone Track Forecast Errors using a Probabilistic Neural Network*, **accepted, AIES**, arXiv: 2503.09840.

Fernandez, M. A., Bird, S., and Ho, M.-F,*Cosmological Constraints from the eBOSS Lyman-α Forest using the PRIYA Simulations*, **JCAP**. arXiv: 2309.03943.

Fernandez, M. A., Ho M.-F., and Bird, S., *A Multi-fidelity Emulator for the Lyman-α Forest Flux Power Spectrum*, **MNRAS**. arXiv: 2207.06445.

Fernandez, M. A., Bird, S., and Upton Sanderbeck, P., *Effect of separate initial conditions on the Lyman-α forest in simulations*, **MNRAS**. arXiv: 2009.09119.

Fernandez, M. A., Bird, S., and Cui, Y., *Cosmic Filaments from Cosmic Strings*, **Phys. Rev. D**. arXiv: 2004.13752.

Fernandez, M. A., Covey, K. R., De Lee, N., et al., *Identification and Radial Velocity Extraction for 100+ Double-Lined Spectroscopic Binaries in the APOGEE/IN-SYNC Fields*, **PASP**. arXiv: 1706.01161.

CO-AUTHOR PUBLICATIONS

Wills, R. J., Deser, C., McKinnon, K., Phillips, A., Po-Chedley, S., ..., Fernandez, M., et al., *A community estimate of the multi-variate forced climate response from observations*, **in preparation**.

Ennis, K. E., Barnes, E. A., Arcoda, M. C., Fernandez, M. A., Maloney, E. D., *Heatwaves Been Freakin' Me Out: Evaluating 2-m Temperature Forecast Errors in the UFS GEFS and AI Weather Prediction Models*, **in preparation**.

Keys, P., Fernandez, M. A., DesRosiers, A., Connolly, C., Hueholt, D., Hughes, A.-C, et al., *Decarbonization In SCenariOs (DISCO)*, **in preparation**.

Wills, R. J., Deser, C., McKinnon, K., Phillips, A., Po-Chedley, S., ..., Fernandez, M., et al., *Forced Component Estimation Statistical Method Intercomparison Project (ForceSMIP)*, **in preparation**.

Rader, J. K., Connolly, C., Fernandez, M. A., and Gordon, E. M., *Attribution of the record-high 2023 SST using a deep-learning framework*, **submitted to ERC**.

Tohfa, H., Bird, S., Ho, M.-F, Qezlou, M., and Fernandez, M., *Forecast Cosmological Constraints with the 1D Wavelet Scattering Transform and the Lyman-α forest*, **Phys. Rev. Letters**. arXiv: 2310.06010.

Bird, S., Fernandez, M., Ho, M.-F, Qezlou, M., Monadi, R., et al., *PRIYA: A New Suite of Lyman-α Forest Simulations for Cosmology*, **JCAP**. arXiv: 2306.05471.

Ho, M.-F, Bird, S., Fernandez, M., and Shelton, C. R., *MF-Box: Multi-fidelity and multi-scale emulation for the matter power spectrum*, **MNRAS**. arXiv: 2306.03144.

Troup, N. W., Nidever, D. L., De Lee, N., Carlberg, J., Majewski S. R., Fernandez, M., et al., *Companions to APOGEE Stars. I. A Milky Way-spanning Catalog of Stellar and Substellar Companion Candidates and Their Diverse Hosts*, **AJ**. arXiv: 1601.00688.