# TIMOTHY BROWN HIGGINS

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PhD Candidate in Atmospheric and Ocean Sciences at the University of Colorado Boulder with a strong focus on enhancing severe weather forecasting through machine learning and advancing the understanding of hydrological cycle changes in future climates. Desired future work includes the application of cutting-edge research to address pressing challenges in climate science and improving predictive capabilities.

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## EDUCATION

**University of Miami** **Aug. 2016 – May 2020**
Coral Gables, FL
Bachelor of Science, Atmospheric Sciences and Meteorology, Mathematics (applied)

**University of Colorado** **Aug. 2020 – present**
Boulder, CO
PhD Candidate, Atmospheric and Oceanic Sciences
*Advisor*: Aneesh Subramanian, Ph.D.

## PUBLICATIONS

**Higgins, T. B.,** Subramanian, A. C., Watson, P. A. G., & Sparrow, S. (2025). Changes to Atmospheric River Related Extremes Over the United States West Coast Under Anthropogenic Warming. *Geophysical Research Letters*, *52*(5), e2024GL112237. https://doi.org/10.1029/2024GL112237

**Higgins, T. B.,** Subramanian, A. C., Chapman, W. E., Lavers, D. A., & Winters, A. C. (2024). Subseasonal Potential Predictability of Horizontal Water Vapor Transport and Precipitation Extremes in the North Pacific. *Weather and Forecasting*, *39*(6), 833–846. https://doi.org/10.1175/WAF-D-23-0170.1

**Higgins, T. B.,** Subramanian, A. C., Graubner, A., Kapp-Schwoerer, L., Watson, P. A. G., Sparrow, S., et al. (2023). Using Deep Learning for an Analysis of Atmospheric Rivers in a High-Resolution Large Ensemble Climate Data Set. *Journal of Advances in Modeling Earth Systems*, *15*(4), e2022MS003495. https://doi.org/10.1029/2022MS003495

Zheng, M., Delle Monache, L., Cornuelle, B. D., Ralph, F. M., Tallapragada, V. S., Subramanian, A., Haase, J. S., Zhan, Z., Wu, X., Murphy, M. J., **Higgins, T. B.,** Dehaan, L., (2021): Improved Forecast Skill through the Assimilation of Dropsonde Observations from the Atmospheric River Reconnaissance Program. *Journal of Geophysical Research: Atmospheres*: e2021JD034967. https://doi.org/10.1029/2021JD034967

# FELLOWSHIPS

ATOC University Fellowship Fund

George Aiken Fellowship Award

# TEACHING EXPERIENCE

**Graduate Teaching Assistant** **January 2023 – May 2023**
University of Colorado – Boulder, Boulder, CO

Teaching the weather lab for undergraduate students to learn how to collect data in science experiments.

**Grader**
University of Colorado – Boulder, Boulder, CO **January 2022 – present**

Grading homework and exams for graduate students taking Geophysical Fluid Dynamics and Chaos and Predictability.

**SOARS mentor**
University of Colorado – Boulder, Boulder, CO **June 2021 – August 2021**

Mentored an undergraduate intern for an analysis of several extreme weather events

**Undergraduate Student Athlete Tutor** **August 2018 – December 2018**
University of Miami, Coral Gables, FL

Tutored NCAA Division I football players for Introduction to Weather and Climate

# WORKSHOPS AND SUMMER SCHOOLS

**NCAR ASP Graduate Student Visitor Program** **March 2024 – September 2024**
*Mentor:* Will Chapman, Ph.D.
Boulder, CO

**ECMWF AR Reconnaissance Workshop** **June 2023**
Reading, UK

**CW3E FIRO Workshop** **July 2022**
La Jolla, CA

**NCAR ASP S2S Summer School** **July 2021 - August 2021, July 2022**
Boulder, CO
Project – Using various machine learning approaches to predict 2-m temperatures at the S2S scale and finding sources of skill with layer wise-relevance propagation

**NOAA AI in Environmental Sciences Workshop** **September 2021**
Boulder, CO

# PRESENTATIONS

**2024 Annual American Geophysical Union Meeting Oral Presentation – December 2024**
Washington, D.C.
Diffusion Ensemble Generation of West-WRF Integrated Vapor Transport Forecasts

**Weeks 3-4/S2S Webinar by OAR/WPO S2S Program and NWS/OSTI-Modeling Distinguished Speaker Oral Presentation – July 2024**
Boulder, CO
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the jet stream over the North Pacific

**CESM Climate Variability and Change Working Group Meeting Oral Presentation– March 2024**
Boulder, CO
The impact of climate change on atmospheric river extremes from a unique large-ensemble atmospheric model output

**CESM Earth System Prediction Working Group Meeting Oral Presentation– March 2024**
Boulder, CO
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the jet stream over the North Pacific

**2023 Annual American Geophysical Union Meeting Poster Presentation – December 2023**
San Francisco, CA
The impact of climate change on atmospheric river extremes from a unique large-ensemble atmospheric model output

**World Climate Research Program Open Science Conference Poster Presentation– October 2023**
Kigali, Rwanda
The impact of climate change on atmospheric river extremes from a unique large-ensemble atmospheric model output

**University of Reading S2S Summit Poster Presentation – June 2023**
Reading, UK
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the jet stream over the North Pacific

**ECMWF Atmospheric Rivers Reconnaissance Workshop Oral Presentation – June 2023**
Reading, UK
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the jet stream over the North Pacific

**103rd Annual American Meteorological Society Meeting Poster Presentation – January 2023**
Denver, CO
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the jet stream over the North Pacific

**ESSS Poster Conference Poster Presentation – December 2022**
Boulder, CO
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the jet stream over the North Pacific

**International Atmospheric Rivers Conference 2022 Oral Presentation – October 2022**
Santiago, Chile
The impact of climate change on atmospheric river extremes from a unique large-ensemble atmospheric model output

**CW3E Annual Meeting Poster Presentation – June 2022**
La Jolla, CA
An analysis of differences in predictability of precipitation and IVT extremes in S2S forecasts and their connection to the MJO and PNA.

**European Geophysical Union General Assembly 2022 Oral Presentation – May 2022**
Vienna, Austria
Discussion of the speed and effectiveness of using deep learning to track atmospheric rivers in a large ensemble high-resolution climate dataset

**University of Colorado – Boulder Hydrologic Sciences Symposium Oral Presentation – April 2022**
Boulder, CO
Discussion of the speed and effectiveness of using deep learning to track atmospheric rivers in a large ensemble high-resolution climate dataset

**NOAA AI in Environmental Sciences Workshop Oral Presentation – September 2021**
Boulder, CO
Discussion of the speed and effectiveness of using deep learning to track atmospheric rivers in a large ensemble high-resolution climate dataset

**19th Annual AMS Student Conference Poster Presentation – January 2020**
Boston, MA
Case study of the effect of assimilated dropsonde data on the accuracy of WRF model output

**FIRO Conference Poster Presentation – August 2019**
La Jolla, CA
Analysis of the effect of assimilated dropsonde data on the accuracy of WRF model output for an Atmospheric River event that occurred on February 3rd, 2018

# COMPUTING SKILLS AND EXPERIENCE

**Programming languages:**
MATLAB, Python

**Technical skills:**
Linux (HPC, bash scripting), Git, Parallel computing

**Machine learning skills:**
Diffusion, Convolutional Neural Networks, Self-organizing maps

**Tools and libraries:**
PyTorch, TensorFlow, SciPy, NumPy, Pandas, xarray

**Data types:**
NetCDF, GRIB2

**Models worked with:**
CESM2, HadAM4, ERA5, ECMWF, West-WRF, MERRA-2

**Models run:**
CESM2

**Soft skills:**
Teaching, communication, collaboration, creativity, problem-solving