Kelsey Malloy

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PUBLICATIONS

Malloy, K. and Tippett, M.K. (2023). ENSO and MJO Modulation of U.S. Cloud-to-ground Lightning Activity. *J. Climate*, in prep.

Malloy, K. and Kirtman, B.P. (2023). Subseasonal Great Plains Rainfall via Remote Extratropical Teleconnections: Regional Application of Theory-guided Causal Networks. *JGR: Atmospheres*, https://doi.org/10.1029/2022JD037795.

Malloy, K. and Kirtman, B.P. (2022). The summer Asia–North America teleconnection and its modulation by ENSO in Community Atmosphere Model, version 5 (CAM5). *Climate Dynamics*, https://doi.org/10.1007/s00382-022-06205-4.

Malloy, K. and Kirtman, B.P. (2020). Predictability of Midsummer Great Plains Low-Level Jet and Associated Precipitation. *Wea. Forecasting*, 35, 215–235, https://doi.org/10.1175/WAF-D-19-0103.1.

Mahoney, K., Swales, D., Mueller, M.J., Alexander, M., Hughes, M., and Malloy, K. (2018). An Examination of an Inland-Penetrating Atmospheric River Flood Event under Potential Future Thermodynamic Conditions. *J. Climate*, 31, 6281–6297, https://doi.org/10.1175/JCLI-D-18-0118.1.

INVITED TALKS

Subseasonal Great Plains Rainfall via Remote Extratropical Teleconnections: Regional Application of Theory-guided Causal Networks | AGU Early Career Science Seminar | March 2023

Predictability of U.S. Great Plains Summer Hydroclimate via Extratropical Teleconnections | Lamont-Doherty Earth Observatory (LDEO) Ocean and Climate Physics (OCP) Seminar | February 2023

Subseasonal Great Plains Rainfall via Remote Extratropical Teleconnections: Application of Theory-guided Causal Networks | AGU Annual Meeting Session on S2S Prediction | December 2022

Predictability of U.S. Great Plains Summer Hydroclimate via East Asian Monsoon-forced Teleconnection | NASA GMAO Seasonal Prediction Group | June 2022

Predictability of the Great Plains Low-level Jet and its Associated Precipitation | NMME Monthly Meeting | February 2020

EDUCATION

Doctor of Philosophy: University of Miami Rosenstiel School of Marine & Atmospheric Science May 2022
Thesis: Predictability of U.S. Great Plains Summer Hydroclimate via Extratropical Teleconnections
Advisor: Dr. Ben Kirtman

Bachelor of Science: University of Maryland - College Park, Honors College
2017

Atmospheric & Oceanic Science, Departmental Honors GPA: 3.82
Minor: Geography-Remote Sensing of Environmental Change

RESEARCH EXPERIENCE

Postdoctoral Research Scientist, Columbia University August 2022-Present
Supervisor: Michael K. Tippett

- Subseasonal-to-seasonal predictability of severe convective storm activity
- Developed statistical model for cloud-to-ground lightning activity based on large-scale environment
    - Assess subseasonal-to-seasonal modulation of lightning activity
- Constructed a submonthly tornado outbreak index that predicts probability of outbreak-level tornado given environment
    - Assess subseasonal-to-seasonal modulation of tornado outbreak activity
- High-level experience writing python code for the development of empirical models, evaluating the model performance, investigating links with climate variability
    - Specific modeling techniques include (but not limited to): linear regression, Poisson Regression, logistic regression, random forests, artificial neural networks
    - Skilled in data preprocessing, feature selection, and model evaluation techniques to ensure the robustness and reliability of statistical models
    - Proficient with Python libraries for staticial modeling and machine learning prediction, including (but not limited to): scikit-learn, statsmodels, tensorflow
- Oral presentation at 2023 European Conference on Severe Storms
- Poster presentation at 2023 European Conference on Severe Storms

Graduate Research Assistant, Univ. Miami Rosenstiel School Fall 2017-Present
Ph.D. Committee: Drs. Ben Kirtman, Amy Clement, Emily Becker, Brian Mapes, Hosmay Lopez

- Predictability of summer U.S. hydroclimate on subseasonal-to-seasonal (S2S) and interannual timescales via understanding of large-scale circulation responses and interactions between teleconnections
- High-level spatiotemporal data analysis on:
    - Reanalysis and observational datasets (ERA5, MERRA-2, ERSST, NCEP/NCAR, etc.)
    - Community Climate System Model, v4 (CCSM4) forecast output
    - Dry nonlinear baroclinic atmospheric general circulation model (AGCM) output
    - Community Atmospheric Model, v5 (CAM5) output
- Community Earth System Model (CESM1.2) and CAM5 setup, build, & conducted four different prescribed sea surface temperature experiments, and mentored other graduate students on CESM process
- Setup, write code for monsoon forcing, developed, and conducted idealized forcing experiments with a dry nonlinear baroclinic AGCM; created documentation, and mentored other graduate students; created scripts/functions for reading model output used by other graduate students
- Build linear QG model that generates an upper-level mid-latitude response given a mean state (jet stream climatology) and forcing
- Build causal effect network (CEN) and causal maps using causal discovery algorithms via tigramite package (https://github.com/jakobrunge/tigramite) for estimating causal links between boreal summer intraseasonal oscillation, North Pacific wave patterns, and Great Plains LLJ/rainfall
- High-level Python skills, including creating shareable Jupyter notebooks for reading and visualizing data
- Communication of this work via many seminars and presentations:
    - Doctoral dissertation defense in May 2022
    - Oral presentation for 2022 AMS annual meeting

- 1-hour Seminar for Dept. of Atmospheric Science at Rosenstiel School in November 2021
- Oral presentation at 2021 AMS annual meeting
- Oral presentation at Rosenstiel School Student Seminar series in 2019, 2020, 2021
- Invited presentation at North American Multi-Model Ensemble (NMME) monthly meeting in February 2020
- Poster presentation at 2020 AMS annual meeting

Collaborator, PyWR, Weather Typing and S2S Sources of Predictability Summer 2021-Present
Projects Leads: Ángel Muñoz and Andrew Robertson

- Project in collaboration with participants of NCAR Advanced Study Program "The Science of S2S Prediction" PyWR and Weather Typing group and International Research Institute/Lamont-Doherty Earth Observatory (IRI/LDEO) scientists
- Applying weather typing via *k*-means clustering to explore summertime predictability of North Atlantic circulation and associated precipitation
  - Primary contribution – boreal summer intraseasonal oscillation and East Asian monsoon as a source of predictability for summer weather types
- Poster presentation at 2022 AMS annual meeting

Intern, NOAA Climate and Weather Prediction Center, Ocean Prediction Center Fall 2016-Spring 2017
Advisers: Drs. Michael Folmer and Joseph Sienkiewicz, and LT Joseph Phillips

- Building case study analysis of stratospheric air intrusion events and improving hurricane-force wind forecasts of extratropical cyclones in Atlantic Ocean using satellite imagery and global reanalysis
  - Serve as instructional kits to Alaskan Weather Forecast Offices and Ocean and Weather Prediction Centers (NOAA/NCEP/NCWCP)
- Research defended for senior thesis:
  - Written thesis completed in Spring 2017
  - Poster presentation in Spring 2017
  - Oral prospectus defense in Fall 2016
- Invited presentation at Ocean Prediction Center in July 2017
- Poster presentation at 2017 AMS Annual Meeting

Intern, NOAA Earth System Research Lab Physical Sciences Division (ESRL/PSD) Summer 2016
Advisers: Drs. Michael Alexander and Kelly Mahoney

- Diagnosed case study of atmospheric river event by comparing "present-day" precipitation and moisture transport over western US with simulated "future" case using pseudo-global warming approach
- High-level spatiotemporal analysis on Weather and Research Forecasting (WRF) output
- Oral presentation at NOAA Hollings Research Symposium
- Poster presentation at 2017 AMS Annual Meeting

Intern, UC San Diego Scripps Undergraduate Research Fellowship (SURF) Summer 2015
Adviser: Dr. Jennifer Haase

- Compared vertical profiles of Feb. 6th 2015 atmospheric river event using NCEP/NCAR Final Reanalysis model and dropsonde data
- Poster presentation at Scripps Institute of Oceanography SURF Student Symposium
- Poster presentation at 2016 AMS Annual Meeting

RELEVENT GRADUATE EXTRACURRICULARS

Founder, Writer, Editor, *Seasoned Chaos* blog about subseasonal-to-seasonal forecasting Present

- https://seasonedchaos.github.io

Lead Coordinator, Students for Students Outreach 2020-2022
Mentor, Rosenstiel School Graduate-Undergraduate Mentoring program 2021-2022
Rosenstiel School Climate Group 2017-2022
Rosenstiel School Marine Science Graduate Student Organization's Sustainability Initiative 2019-2021
Rosenstiel School Marine Science Graduate Student Organization's Earth Week Committee 2019-2021
Creator, Rosenstiel School Seas by Degrees Video Seminar Series March 2021

- On YouTube as *Opening a Climate Scientist's Toolbox: What is a Climate Model?*

Rosenstiel School New Student Orientation Committee Fall 2020
Rosenstiel School Student Seminar Committee 2019-2020
Presenter/Collaborator, Rosenstiel School *Lunch Bytes* Seminar Series Spring 2019
Student Ambassador, Rosenstiel School Atmospheric Science Dept. 2018-2019

TEACHING EXPERIENCE

Tutor for high school students, mostly math and science 2017-2022
Teaching Assistant for Data Analysis Methods (graduate course) Spring 2020
Teaching Assistant for Weather Forecasting Spring 2019
Teaching Assistant for Large-scale Atmospheric & Oceanic Dynamics Spring 2017
Teaching Assistant for Atmospheric Thermodynamics Fall 2016

SKILLS & AWARDS

- Proficient in a wide range of modeling techniques, including:
  - Running state-of-the-art climate models to assess representation of climate dynamics/circulation and analyze long-term trends and large-scale climate variability
  - Building or running idealized climate models and designing experiments to investigate specific aspects of climate systems
  - Applying data-driven, empirical models to analyze and interpret climate data, identify patterns, and make predictions
- Excellent writing skills and overall science communication skills (by medium of oral presentations, writing, video-making, interviews)
- Involvement in many extracurricular and community organizations, including taking on leadership positions
- Experience in reviewing journal articles (https://orcid.org/0000-0002-1989-7490)
- Tutoring and teaching experience from middle school to graduate level
- Participated in 2022 AMS Short Course on Machine Learning for Environmental Sciences
- Participated and attended the 2021 NCAR Advanced Summer Program "The Science of Subseasonal-to-Seasonal Predictions" Colloquium and Workshop
- Finalist for Rosenstiel School Outstanding Outreach Award
- Runner-up for 2020-2021 Rosenstiel School Student Seminar *Best Presentation Skills* award
- Experience in following programming languages: Python, Matlab, Fortran, Shell, Git Bash, Markdown/HTML, NCAR Command Language (NCL), C
  - Includes experience with Tensorflow, Keras, and Scikit-learn Python packages
- Experience in following software/operating Systems: Linux/Unix, Git Bash, Microsoft Office (Word, Excel, Powerpoint, etc.)
- Accepted into 2020 Swiss Climate Summer School (canceled because of COVID-19)
- Participated in Summer 2018 Weather and Climate Extremes NCAR Tutorial/Workshop
- 2017 University of Maryland Undergraduate Researcher of the Year

- 2017 University of Maryland Philip Merrill Presidential Scholar
- 2015-2016 NOAA Ernest F. Hollings Scholar