

Melissa L. Breeden
Research Physical Scientist
NOAA Physical Sciences Laboratory

325 Broadway
Boulder, CO 80305

(303) 497-4401
melissa.breeden@noaa.gov

Education

University of Wisconsin-Madison, Atmospheric & Oceanic Sciences	Ph.D. 2013-2018
University of Wisconsin-Madison, Atmospheric & Oceanic Sciences	B.S. 2009-2013

Research Appointments

Research Physical Scientist, NOAA Physical Sciences Laboratory, Boulder CO	09/2024 – Present
Research Scientist, Cooperative Institute for Research in the Environmental Sciences and NOAA Physical Sciences Laboratory, Boulder CO	01/2021 – 09/2024
NOAA Climate and Global Change Postdoctoral Fellow, NOAA Earth System Research Laboratory, Chemical Sciences Division, Boulder CO	08/2019 – 12/2020
Postdoctoral Research Associate, University of Wisconsin-Madison Space Science and Engineering Center, Madison, WI	05/2018 – 07/2019
Research Assistant, University of Wisconsin-Madison Department of Atmospheric and Oceanic Sciences, Madison, WI	08/2013 – 05/2018

Experience with Research-to-Applications Forecast Products

2021, developed an empirical dynamical modeling framework to produce subseasonal (weeks 2-6) outlooks of temperature and precipitation for the Famine Early Warning Systems Network.

2024, developed an empirical dynamical modeling framework to produce seasonal (months 1-18) outlooks of vapor pressure deficit and sea surface temperatures to inform fire danger outlooks.

Proposals

Awarded July 2023: ‘Disaster Relief Supplemental Appropriations Act: Experimental Subseasonal and Seasonal Predictions of Wildfire Indicators over the United States using Machine Learning Techniques’,

Role: PI

Solicitation: NOAA-OAR-CIPO-2023-2007633 Coop Institutes 2023-CIESRDS-Sup Disaster Relief Supplemental Act (DRSA).

Awarded August 2023: 'IJA / BIL: Wildland Fire Potential Research to Inform Extended Range Resource Planning

Role: PI

Solicitation: Award: NA23OAR4050186I

Publications

Breedon, M. L., Hoell, A., Worsnop, R. P., Albers, J. R., Hobbins, M. T., Robinson, R. M., and Vimont, D. J.: Seasonal Predictability of Vapor Pressure Deficit in the western United States, submitted to *Wea. And Clim. Dyn. preprint*:

<https://egusphere.copernicus.org/preprints/2025/egusphere-2025-115/>

Breedon, M. L., Hoell, A., Albers, J. R., and Slinksi, K.: The monthly evolution of precipitation and warm conveyor belts during the central southwest Asia wet season, *Weather Clim. Dynam.*, 4, 963–980, <https://doi.org/10.5194/wcd-4-963-2023>, 2023.

Hoell, A., Robinson, R., Agel, L., Barlow, **M., Breedon, M.**, Eischeid, J., McNally, A., Slinksi, K., & Quan, X.: Changes to Middle East and Southwest Asia Compound Drought and Heat Since 1999. *Journal of Climate* (published online ahead of print 2023) <https://doi.org/10.1175/JCLI-D-23-0194.1>.

Elsbury, D., Butler, A. H., Albers, J. R., **Breedon, M. L.**, and Langford, A. O.: The response of the North Pacific jet and stratosphere-to-troposphere transport of ozone over western North America to RCP8.5 climate forcing, *Atmos. Chem. Phys.*, 23, 5101–5117, <https://doi.org/10.5194/acp-23-5101-2023>, 2023.

Breedon, M. L., Albers, J. R., A. Hoell: Subseasonal precipitation forecasts of opportunity over southwest Asia, *Wea. Clim. Dynam.*, 3, 1183–1197, <https://doi.org/10.5194/wcd-3-1183-2022>, 2022.

Albers, J. R., Newman, M., Hoell, A., **Breedon, M. L.**, Wang, Y., and Lou, J.: The February 2021 Cold Air Outbreak in the United States: A Subseasonal Forecast of Opportunity, *Bulletin of the American Meteorological Society*, 103(12), E2887-E2904, 2022.

Breedon, M. L., Albers, J. R., Butler, A. H., and Newman, M.: The Spring Minimum in Subseasonal 2-m Temperature Forecast Skill over North America, *Monthly Weather Review*, 150(10), 2617-2628, 2022.

Albers, J. R., Butler, A. H., Langford, A. O., Elsbury, D., **Breedon, M. L.**: Dynamics of ENSO-driven stratosphere-to-troposphere transport of ozone over North America, *Atmos. Chem. Phys.*, 22, 13035–13048, 2022, <https://doi.org/10.5194/acp-22-13035-2022>.

Pettersen, C., Henderson, S. A., Mattingly, K. S., Bennartz, R., and **Breeden, M. L.**: The critical role of Euro-Atlantic blocking in promoting snowfall in central Greenland. *Journal of Geophysical Research: Atmospheres*, *127*, e2021JD035776. <https://doi.org/10.1029/2021JD035776>, 2022.

Larson, S. M., Okumura, Y., Bellomo, K., and **Breeden, M. L.**: Destructive Interference of ENSO on North Pacific SST and North American Precipitation Associated with Aleutian Low Variability, *Journal of Climate*, *35*(11), 3567-3585, 2022.

Albers, J. R., Butler, A. H., **Breeden, M. L.**, Langford, A. O., and G. N. Kiladis, 2021: Subseasonal prediction of springtime Pacific–North American transport using upper-level wind forecasts, *Weather Clim. Dynam.*, *2*, 433–452, <https://doi.org/10.5194/wcd-2-433-2021>.

Breeden, M. L., A. H. Butler, J. R. Albers, M. Sprenger and A. O. Langford, 2021: The Spring Transition of the North Pacific Jet and its Relation to Deep Stratosphere-to-Troposphere Mass Transport over Western North America, *Atmos. Chem. Phys.*, *21*, 2781–2794, <https://doi.org/10.5194/acp-21-2781-2021>.

Breeden, M. L., R. Clare, J. E. Martin, and A. R. Desai, 2020: Diagnosing the Influence of a Receding Snow Boundary on Simulated Midlatitude Cyclones Using Piecewise Potential Vorticity Inversion. *Mon. Wea. Rev.*, **148**, 4479–4495, <https://doi.org/10.1175/MWR-D-20-0056.1>.

Breeden, M. L., B. T. Hoover, M. Newman, and D. J. Vimont, 2020: Optimal North Pacific Blocking Precursors and Their Deterministic Subseasonal Evolution during Boreal Winter. *Mon. Wea. Rev.*, **148**, 739–761, <https://doi.org/10.1175/MWR-D-19-0273.1>.

Breeden, M. L. and J. E. Martin, 2019: Evidence for Nonlinear Processes in fostering a North Pacific Jet Retraction, *Quart. J. Roy. Meteor. Soc.*, **145**, 1559-1570. doi:10.1002/qj.3512.

Breeden, M. L. and J. E. Martin, 2018: Analysis of the onset of an extreme North Pacific Jet Retraction using Piecewise Tendency Diagnosis, *Quart. J. Roy. Meteor. Soc.*, **144**, 1895-1913. doi: 10.1002/qj.3388.

Breeden, M. L. and G. A. McKinley, 2016: Climate Impacts on Multidecadal North Atlantic pCO₂ Variability: 1948-2009. *Biogeosciences*, **13**, 3387-3396. doi:10.5194/bg-13-3387-2016.

Awards

- + NOAA Climate and Global Change Postdoctoral Fellowship, 2019
- + Waves to Weather travel award to attend the Cyclone Workshop, 2019

- + Third Place Poster Presentation, 28th Conference on Climate Variability and Change, AMS Annual Meeting, January 2016
- + Colloquium Student Service Award, Department of Atmospheric & Oceanic Sciences, April 2016
- + Best Student Presentation, 18th Conference on Middle Atmosphere, AMS Annual Meeting, January 2015
- + UW-AOS Department Travel Award to attend AMS Annual Meeting: 2014-2017

Selected Invited Presentations

‘The spring minimum in subseasonal 2-meter temperature forecast skill over North America’, United Forecast System Subseasonal-to-seasonal Applications Team Webinar, November 2023.

‘Impact of the MJO on Subseasonal Precipitation Forecasts of Opportunity over Southwest Asia’, AMS Annual Meeting, Denver Co, January 2023.

‘Anticipating Subseasonal Forecasts of Opportunity with a Linear Inverse Model’, Department of Earth and Atmospheric Sciences, University of Nebraska Lincoln, October 2022.

‘Subseasonal Precipitation Forecasts of Opportunity over Southwest Asia’, NOAA Climate and Global Change Summer Institute, Steamboat Springs, CO, July 2022.

‘Exploring Seasonal Changes in 2-meter Temperature Forecasts of Opportunity over North America’, Atmospheric and Oceanic Sciences Department, University of Colorado Boulder, Boulder, Colorado, February 2022.

‘Subseasonal Stratosphere-to-Troposphere Mass Transport Variability over the Pacific-North American region during boreal spring’, American Meteorological Society Annual Meeting, Virtual, January 2022.

‘The Spring Transition of the North Pacific Jet and its Relation to Deep Stratosphere-to-Troposphere Mass Transport over Western North America’, School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Virtual, March 2021.

Recent Conference, Workshop, and Other Presentations

‘Examining Flow-Dependent 2-meter Temperature Forecasts of Opportunity over North America’, NOAA Physical Sciences Laboratory Seminar, Virtual, November 2021.

‘Identifying skillful subseasonal precipitation forecasts over southwest Asia’, NOAA Climate Prediction Center Climate Diagnostics and Prediction Workshop, Virtual, October 2021.

‘The Spring Transition of the North Pacific Jet and its Relation to Deep Stratosphere-to-Troposphere Mass Transport over Western North America’, NOAA Chemical Sciences Laboratory Seminar, Virtual, November 2020.

Professional Activities and Service

November 2023	Mentor , PROGRESS mentorship program
2023 – Present	Science Committee Member , US CLIVAR Blocking Workshop
2022	Mentor , CIRES Research Experience for Community College Students Mentorship Program
2021 – Present	Member , NOAA Physical Sciences Laboratory Seminar Committee
2021 – 2022	Mentor , CU Boulder ATOC Mentorship Program
2021 – 2022	Proposal Reviewer , National Science Foundation
2021 – 2022	Member , various PSL hiring committees
2021	Member , Science Committee, Waves2Weather Blocking Workshop
2021	Panelist , NCAR ASP Panel on the Interviewing Process
2020 – 2021	Founding Member and DEI sub-committee Chair , American Geophysical Union Atmospheric Sciences Early Career Committee
2018 – Present	Journal Article Reviewer , <i>Journal of Climate</i> , <i>Geophysical Research Letters</i> , <i>Environmental Research Letters</i> , <i>Journal of the Atmospheric Sciences</i> and others
2018	Sponsored Participant , American Geophysical Union Geoscience Congressional Visits Day, Washington D.C.
2018	Selected Attendee , Earth Science Women’s Network Leadership Development Workshop, Boulder, CO
2018 – 2019	Member , 19 th Cyclone Workshop Science Committee
2015 – 2017	Local Manager , University of Wisconsin-Madison, WxChallenge National Weather Forecasting Competition
2017	Attendee , Bias Training Workshop, Department of Educational Sciences, University of Wisconsin-Madison
2014 – Present	Member , American Meteorological Society and American Geophysical Union
2014-2017	Chair , Graduate Student Association Welcome Committee, UW-Madison

Additional Experience

Instructor , Wisconsin Center for Academically Talented Youth Advanced Learning Program, UW-Madison	06/2017 - 07/2017
Sponsored Participant , AMS Summer Policy Colloquium, Washington, D.C.	06/2017
Graduate Teaching Assistant , UW-Madison Course: The Frontal Cyclone (AOS452)	Fall 2015 Fall 2016
Graduate Teaching Assistant , UW-Madison Course: Atmospheric & Oceanic Dynamics II (AOS311)	Spring 2015
Electronics Assistant , University of Wisconsin-Madison Department of Physics	02/2010- 05/2013