Marie C. McGraw, PhD

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Current Position

07/2021 - present **Postdoctoral Research Associate**
Cooperative Institute for Research in the Atmosphere (CIRA), Colorado State University, Fort Collins, CO, USA
Research topics: machine learning and tropical cyclone prediction, uncertainty quantification for machine learning in geosciences

Education

10/2015 - 03/2019 **Ph.D., Atmospheric Science**, Colorado State University, Fort Collins, CO, USA
Advisor: Elizabeth Barnes
Dissertation: "A Causal Discovery-Based Approach to Understanding Arctic-Midlatitude Dynamics"

06/2013 - 10/2015 **M.S., Atmospheric Science**, Colorado State University, Fort Collins, CO, USA
Advisor: Elizabeth Barnes
Thesis: "Seasonal Sensitivity of the Eddy-Driven Jet Response to Tropospheric Heating in an Atmospheric General Circulation Model"

09/2008 - 06/2012 **B.Sc., Mechanical and Ocean Engineering**, Massachusetts Institute of Technology, Cambridge, MA, USA

Previous Research Experience

06/2019 - 06/2021 **Postdoctoral Research Associate**, University of Washington, Seattle, WA, USA
Department: Atmospheric Sciences
Research topics: sea ice forecasting, extreme sea ice loss
Advisor: Prof. Cecilia Bitz

06/2013 - 05/2019 **Graduate Research Assistant**, Colorado State University, Fort Collins, CO, USA
Department: Atmospheric Sciences
Research topics: atmospheric dynamics, climate modeling, causal discovery and atmospheric sciences, extratropical-polar climate variability
Advisor: Prof. Elizabeth Barnes

Publications

Peer-Reviewed

10. **McGraw, M.C.**, E. Blanchard-Wrigglesworth, R.P. Clancy, and C.M. Bitz (2022): Understanding the predictability of Arctic sea ice loss on subseasonal timescales. *J. Climate*, **35**, doi:10.1175/JCLI-D-21-0301.1.

9. Gonzalez, A.O., I. Ganguly, **M.C. McGraw**, and J. Larson (2022): Rapid dynamical evolution of ITCZ events over the east Pacific. *J. Climate*, **35**, doi:10.1175/JCLI-D-21-0216.1.

8. Clancy, R.P., C.M. Bitz, E. Blanchard-Wrigglesworth, **M.C. McGraw**, and S. M. Cavallo (2021): A cyclone-centered perspective on the drivers of asymmetric patterns in the atmosphere and sea ice during Arctic cyclones. *Journal of Climate*, doi:10.1175/JCLI-D-21-0093.1.

7. **McGraw, M.C.** and E.A. Barnes (2020): New Insights on Subseasonal Arctic-Midlatitude Causal Connections from a Regularized Regression Model. *Journal of Climate*, doi:10.1175/JCLI-D-19-0142.1.

6. **McGraw, M.C.**, C.F. Baggett, C. Liu, and B.D. Mundhenk (2019): Changes in Arctic moisture transport over the North Pacific associated with sea ice loss. *Climate Dynamics*, doi:10.1007/s00382-019-05011-9.

5. Samarasinghe, S., **M.C. McGraw**, E.A. Barnes, and I. Ebert-Uphoff (2019): A study of links between the Arctic and the midlatitude jet-streams using Granger and Pearl causality. *Environmetrics,* doi:10.1002/env.2540.

4. **McGraw, M.C.**, and E.A. Barnes (2018): Memory matters: A case for Granger causality in climate variability studies. *J. Climate*, **31,** doi:10.1175/JCLI-D-17-0334.1.

3. Woollings, T., E. Barnes, B. Hoskins, Y.-O. Kwon, R.W. Lee, C. Li, E. Madonna, **M. McGraw**, T. Parker, R. Rodrigues, C. Spensberger, K. Williams (2018): Daily to decadal modulation of jet variability. *J. Climate*, **31,** doi:10.1175/JCLI-D-17-0286.1.

2. **McGraw, M.C.**, E.A. Barnes, and C. Deser (2016): Reconciling the observed and modeled Southern Hemisphere circulation response to volcanic eruptions. *Geophys. Res. Lett.,* doi:10.1002/2016GL069835.

1. **McGraw, M.C.**, and E.A. Barnes (2016): Seasonal sensitivity of the eddy-driven jet to tropospheric heating in an idealized AGCM. *J. Climate*, **29,** doi:10.1175/JCLI-D-15-0723.1.

In Preparation

· Lagerquist, R., K. Haynes, **M. McGraw**, K. Musgrave, and I. Ebert-Uphoff: Uncertainty quantification for neural networks in the geosciences, to be submitted summer 2022.

Other

· Samarasinghe, S., **M. McGraw,** E. Barnes, and I. Ebert-Uphoff (2017): A study of causal links between the Arctic and the midlatitude jet-streams. *Proceedings of the Seventh International Workshop on Climate Informatics (CI 2017), NCAR Technical Note NCAR/TN-536+PROC.*

Selected Presentations

Invited

2022 **Seminar**, Data-Driven Atmospheric and Water Dynamics Group, University of Lausanne, Switzerland. *Machine learning and tropical cyclone forecasting.* **McGraw, M.C.**, K.D. Musgrave, and I. Ebert-Uphoff.

2019 **Seminar**, Department of Atmospheric Sciences, University of Washington, Seattle, WA. *Using causal discovery to explore Arctic-midlatitude dynamics.* **McGraw, M.C.**, and E.A. Barnes.

2018 **Seminar**, NCAR Climate Variability and Change group, Boulder, CO. *A causal discovery approach to Arctic-midlatitude dynamics.* **McGraw, M.C.**, and E.A. Barnes.

Submitted

2022 **35th AMS Conference on Hurricanes and Tropical Meteorology**, New Orleans, LA, USA. *What can machine learning tell us about the tropical cyclone intensity forecasting problem?* **McGraw, M.C.**, K.D. Musgrave, J.A. Knaff, C.J. Slocum, and I. Ebert-Uphoff.

2021 **34th AMS Conference on Hurricanes and Tropical Meteorology**, remote. *Causal links between eastern Pacific ITCZ shifts and boundary layer dynamics.* Gonzalez, A.O., I. Ganguly, and **M.C. McGraw**.

2020 **American Geophysical Union Annual Meeting**, remote. *Extreme sea ice loss on subseasonal timescales in S2S forecast models* (poster). **McGraw, M.C.**, E. Blanchard-Wrigglesworth, R.P. Clancy, and C.M. Bitz.

2019 **American Geophysical Union Annual Meeting**, San Francisco, CA. *Evaluating very rapid sea ice loss events in dynamical model forecasts* (poster). **McGraw, M.C.**, E. Blanchard-Wrigglesworth, R.P. Clancy, and C.M. Bitz.

2018 **American Geophysical Union Annual Meeting**, Washington, DC. *Using causal discovery to explore Arctic-midlatitude dynamics.* **McGraw, M.C.**, and E.A. Barnes.

NCAR Climate Variability and Change Working Group Meeting, Boulder, CO. *Causal discovery and midlatitude jet variability.* **McGraw, M.C.**, and E.A. Barnes.

2017 **American Geophysical Union Annual Meeting**, New Orleans, LA. *Revisiting causal links between the Arctic and midlatitudes.* **McGraw, M.C.**, and E.A. Barnes.

7th International Workshop on Climate Informatics, Boulder, CO. *A study of causal links between the Arctic and the midlatitude jet-streams* (spotlight presentation). Samarasinghe, S., **M.C. McGraw**, E.A. Barnes, and I. Ebert-Uphoff (co-first author with S. Samarasinghe).

21st AMS Conference on Atmospheric and Oceanic Fluid Dynamics, Portland, OR. *Causal links between the Arctic and the midlatitude jets.* **McGraw, M.C.**, and E.A. Barnes.

NCAR Climate Variability and Change Working Group Meeting, Boulder, CO. *Comparing lagged regression and Granger causality in climate science.* **McGraw, M.C.**, and E.A. Barnes.

2016 **SPARC Dynamical Variability Workshop**, Helsinki, Finland. *Understanding the forced response to volcanic eruptions in climate models within the context of internal variability.* **McGraw, M.C.**, and E.A. Barnes.

2015 **SPARC Storm Tracks Workshop**, Grindelwald, Switzerland. *Seasonal sensitivity of the eddy-driven jet to tropospheric heating in an idealized AGCM* (poster). **McGraw, M.C.**, and E.A. Barnes.

Teaching, Mentoring, Outreach, & Service

2022	Co-supervisor for NOAA Hollings Scholar Marshall Baldwin (University of Oklahoma)
	Guest lecturer, "Uncertainty Quantification and Machine Learning", AI2ES Summer School on Trustworthy AI
2019-2021	Postdoc representative, Department of Atmospheric Sciences Colloquium Committee, University of Washington
	Member, Diversity, Equity, and Inclusion Committee, University of Washington
2014-2018	Graduate teaching assistant, *Objective Analysis for Atmospheric Sciences*, spring 2018. Colorado State University
	Graduate teaching assistant, *Atmospheric Dynamics I*, fall 2015. Colorado State University
	Co-mentor for REU intern Julia Shates (now a Ph.D. student at the University of Wisconsin)

Workshops, Tutorials, & Summer Schools

2021	**3rd NOAA Workshop on Leveraging AI in Environmental Sciences**, virtual.
	Trustworthy Artificial Intelligence for Environmental Science Summer School, virtual.
2019	**CMIP6 Hackathon**, Boulder, CO. Travel funded.
2018	**8th International Workshop on Climate Informatics**, Boulder, CO.
	CESM Polar Modeling Workshop, Boulder, CO. Travel funded.
2017	**7th International Workshop on Climate Informatics**, Boulder, CO.
2016	**NCAR Community Earth System Model Tutorial**, Boulder, CO. Travel funded.
	SPARC Dynamical Variability Workshop, Helsinki, Finland. Travel funded.