Dr. Maria J. Molina

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Education

2019 — Ph.D. | Earth and Ecosystem Science Doctoral Program, Department of Earth and Atmospheric Sciences, Central Michigan University, Mount Pleasant, MI.

2015 — M.A. | Climate and Society, Columbia University, New York, NY.

2008 — B.S. | Meteorology, Minors in Mathematics and Communications, Florida State University, Tallahassee, FL.

Research Experience

2020 – — Project Scientist I | Climate Change Research Section, Climate and Global Dynamics Laboratory, National Center for Atmospheric Research (NCAR), Boulder, CO.

2020 — Frontier Development Lab Researcher | SETI Institute in partnership with the NASA Ames Research Center, Mountain View, CA.

2019 – 2020 — Advanced Study Program Postdoctoral Fellow | Computational and Information Systems Laboratory and Mesoscale and Microscale Meteorology Laboratory, NCAR, Boulder, CO.

2016 – 2019 — Graduate Research Assistant | Central Michigan University, Mt. Pleasant, MI.

2015 — Summer Graduate Research | Lamont-Doherty Earth Observatory, Columbia University, Earth Institute, Palisades, NY.

2006 – 2008 — Undergraduate Research, Honors in the Major | Florida State University, Tallahassee, FL.

Grants and Fellowships

2021 — NCAR Early Career Faculty Innovator Program. What's Up With All The Bias In The Air: Mitigating AI Bias in Pollution, Weather, and Disaster Preparation Data. PI: Amy Yeboah (Howard University), Co-Is: F. Lacey, **M. J. Molina,** C. Walker.

2021 — University Corporation for Atmospheric Research (UCAR) President's Strategic Initiative Fund, Administrative Opportunity Fund: Creating a cross-institution strategy to effectively engage with Latinx/Hispanic Communities. PI: L. Medina

Luna; Co-PIs: R. Hornbrook, **M. J. Molina**, A. Rockwell, E. Snode-Brenneman, V. Vincente, D. Russi, J. Malmberg.

2019 Advanced Study Program (ASP) Postdoctoral Fellowship, NCAR.

Student Advising and Mentoring Experience

2021 Kiara Roberson, California State University, Chico, CA; NCAR Earth System Science Internship (NESSI).

2021 Erin Evans, Ohio University, Athens, OH; Community Mentor, UCAR Significant Opportunities in Atmospheric Research and Science (SOARS).

Peer-Reviewed Research Articles

Molina, M. J., A. Hu, G. A. Meehl (under review): Response of Global SSTs and ENSO to the Atlantic and Pacific Meridional Overturning Circulations. Journal of Climate.

Venzor-Cardenas, I., **M. J. Molina,** M. Slipski, N. Ahmed, M. Cheung, C. Tillier, S. Edgington, and G. Renard (under review): Severe weather prediction using the Geostationary Lightning Mapper and a time series model. Neural Computing and Applications.

Molina, M. J., D. J. Gagne, and A. F. Prein (under review): Deep learning classification of potentially severe convective storms in a changing climate. Earth and Space Science.

Poujol, B., A. F. Prein, **M. J. Molina**, and C. Muller, 2021: Dynamic and thermodynamic impacts of climate change on organized convection in Alaska. Climate Dynamics, 1-25.

Molina, M. J., J. T. Allen, and A. F. Prein, 2020: Moisture attribution and sensitivity analysis of a winter tornado outbreak. Weather and Forecasting, 35, 1263–1288.

Molina, M. J., and J. T. Allen, 2020: Regionally-stratified tornadoes: Moisture source physical reasoning and climate trends. Weather and Climate Extremes, 28, 100244.

Molina, M. J., and J. T. Allen, 2019: On the moisture origins of tornadic thunderstorms. Journal of Climate, 32, 4321-4346.

Molina, M. J., J. T. Allen, and V. A. Gensini, 2018: The Gulf of Mexico and ENSO influence on subseasonal and seasonal CONUS winter tornado variability. Journal of Applied Meteorology and Climatology, 57, 2439-2463.

Allen, J. T., **M. J. Molina**, and V. A. Gensini, 2018: Modulation of annual cycle of tornadoes by El Niño–Southern Oscillation. Geophysical Research Letters, 45, 5708-5717.

Molina, M. J., R. P. Timmer, and J. T. Allen, 2016: Importance of the Gulf of Mexico as a climate driver for US severe thunderstorm activity. Geophysical Research Letters, 43, 12295-12304.

Technical Papers

Dagon, K., **M. J. Molina**, G. A. Meehl, J. H. Richter, E. A. Barnes, J. Berner, J. M. Caron, W. Chapman, G. Danabasoglu, D. J. Gagne, S. Glanville, S. E. Haupt, A. Hu, Z. Martin, K. Mayer, K. Pegion, K. Raeder, I. Simpson, A. Subramanian, and S. Yeager, 2021: Machine learning to extend and understand the sources and limits of water cycle predictability on subseasonal-to-decadal timescales in the Earth system. DOE White Papers to Advance an Integrative Artificial Intelligence Framework for Earth System Predictability: AI4ESP.

Ahmed, N., M. Slipski, I. Venzor-Cardenas, **M. J. Molina,** G. Senay, M. Cheung, C. Tillier, S. Edgington, and G. Renard, 2020: Leveraging Lightning with Convolutional Recurrent AutoEncoder and ROCKET for Severe Weather Detection. Thirty-fourth Conference on Neural Information Processing Systems (NeurIPS 2020), AI for Earth Sciences Workshop (Conference Paper).

Slipski, M, I. Venzor-Cardenas, **M. J. Molina,** N. Ahmed, M. Cheung, C. Tillier, S. Edgington, and G. Renard, 2020: Predicting severe thunderstorms with machine learning and the Geostationary Lightning Mapper. Frontier Development Lab Technical Memorandum.

Molina, M. J., J. T. Allen, and V. A. Gensini, 2018: Gulf of Mexico influence on sub-seasonal and seasonal severe thunderstorm frequency. Climate prediction S&T digest: National Weather Service science & technology infusion climate bulletin supplement, 42-45. doi:10.7289/V5/CDPW-NWS-42nd-2018.

Awards

2019 Travel Award, Deep Learning for Science School, Lawrence Berkeley National Laboratory.

2019 Graduate Student Small-Allocation Computing Award, NCAR.

2018 Student Best Oral Presentation Award, AMS 29th Conference on Severe Local Storms.

2018 Travel Award, AGU 2018 Fall Meeting.

2018 Graduate Presentation Award, Office of Research and Graduate Studies, Central Michigan University.

2018 Travel Award, NSF and AMS Summer Policy Colloquium.

2017, 2018 Travel Award, Earth and Ecosystem Science Doctoral Program, Central Michigan University.

2017, 2018 Travel Award, College of Science and Engineering, Central Michigan University.

2016 Travel Award, AMS 28th Conference on Severe Local Storms.

2011 Certified Broadcast Meteorologist (CBM), AMS.

2008 Honors in the Major, Meteorology, Florida State University.

2008 Cum Laude, Bachelor of Science, Florida State University.

2005 – 2008 Florida Academic Scholar, Bright Futures Scholarship Program.

2007 Chi Epsilon Pi Meteorology Honor Society, Florida State University.

Professional Service

Boards and Committees

2021 – Scientific Appointment Modernization Co-Design Team, NCAR.

2021 ASP Postdoc Selection Committee, NCAR.

2020 – Academia Ambassador, AMS Committee for Hispanic and Latinx Advancement, AMS.

2020 Machine Learning Scientist Hiring Committee, Computational and Information Systems Lab, NCAR.

2020 Distinguished Journalism Award Committee, AMS.

2019 – Early Career Leadership Academy Planning Committee, Member, AMS.

2019 – Early Career Scientist Assembly Steering Committee, Postdoctoral Researcher Representative, Member and Web Manager, NCAR.

2019 – 2020 ASP Research Reviews Committee, Member, NCAR.

Conference and Workshop Organization

2021 Session Co-Chair, Artificial Intelligence for Climate Applications and Artificial Intelligence for Seasonal-to-Subseasonal (S2S) Prediction, AMS Annual Meeting.

2020 Session Co-Chair, Machine Learning for Subseasonal-to-Seasonal Prediction, AMS Annual Meeting.

Conference Judging

2020 AMS Conference on AI for Environmental Science, Boston, MA.

2020	AMS Conference on Weather Analysis and Forecasting / Conference on Numerical Weather Prediction, Boston, MA.
2020	AMS Student Conference, Boston, MA.
2019	Annual Earth System and Space Science Poster Conference, University of Colorado Boulder, Boulder, CO.

Peer-review

Editorships:	Associate Editor, Weather and Forecasting.
Funding:	NSF, NASA.
Certifications:	AMS Certified Broadcast Meteorologist designation.
Journals:	Climate Dynamics, Geophysical Research Letters, Monthly Weather Review, Weather and Forecasting, Journal of Applied Meteorology and Climatology, Journal of Atmospheric and Oceanic Technology, Meteorological Applications, IEEE Transactions on Geoscience and Remote Sensing, Advances in Space Research.

Professional Meetings

Conference Presentations (as lead)

2021	Core Science Keynote: How Python and Machine Learning Enable Advances in Earth Science. American Meteorological Society (AMS) Annual Meeting. (Talk, Invited)
2021	Interpretability Challenges with a Convolutional Neural Network used for a Climate Study. AMS Annual Meeting. (Talk)
2021	Short-term Prediction of Severe Thunderstorm Hazards with Machine Learning and the Geostationary Lightning Mapper. AMS Annual Meeting. (Talk)
2020	Challenges with Machine Learning Interpretability as shown by a Climate Study. American Geophysical Union (AGU) Fall Meeting. (Talk)
2020	On the Ability of Deep Learning to Classify Convective Storms of a Future Climate. Tenth International Conference on Climate Informatics, University of Oxford, United Kingdom, Virtual. (Poster)
2020	Visualizing Hidden Layers of a Deep Convolutional Neural Network in Atmospheric Science Applications. Scientific Computing with Python Virtual Conference, SciPy2020. (Poster and short talk)
2020	The Future of Severe Thunderstorms in the U.S. – Insights from Combining Deep Learning and High-Resolution Modeling. AMS Annual Meeting, Boston, MA. (Talk)

2020 Sensitivity of a Winter Tornado Outbreak to Upstream SSTs. AMS Annual Meeting, Boston, MA. (Talk)

2019 Testing the Sensitivity of a Tornado Outbreak to Upstream SSTs. Annual Earth System and Space Science Poster Conference, University of Colorado in Boulder, Boulder, CO. (Poster)

2019 Moisture Attribution and Sensitivity Analysis of a Winter Tornado Outbreak. European Conference on Severe Storms, Krakow, Poland. (Poster)

2018 Severe convective storms in the United States: Where does the moisture come from? AGU Fall Meeting, Washington, D.C. (Talk)

2018 A Lagrangian technique for moisture attribution of winter and spring severe local storms over the contiguous United States. AMS Conference on Severe Local Storms, Stowe, VT. (Talk)

2018 Winter significant tornado variability in relation to ENSO and the Gulf of Mexico. AMS Conference on Severe Local Storms, Stowe, VT. (Poster)

Workshop, Symposium, and Webinar Presentations (as lead)

2021 *Upcoming June: Overcoming and Detecting Model Predictability Limits using Machine Learning, Predictability Limits Arising from Model and Prediction System Challenges, US Climate Modeling Summit: Pre-Summit Workshop. (Talk, Invited)

2021 Uncovering and Predicting Patterns in Large Climate Data, US CLIVAR (Climate Variability and Predictability Program) Data Science Working Group Webinar Series, US CLIVAR Working Group on Emerging Data Science Tools for Climate Variability and Predictability. (Talk, Invited)

2020 Convection Classification in a Future Climate: What did Deep Learning Really Learn? 2nd NOAA Workshop on Leveraging Artificial Intelligence in the Environmental Sciences. (Poster)

2020 Artificial Intelligence and Machine Learning -- The Value Chain in Data Services, AMS Webinar hosted by the Committee on Open Environmental Information Services and Committee on Artificial Intelligence to Environmental Science, Virtual. (Talk, Invited)

2020 Explaining Deep Learning Classification of Future Convective Storms, Workshop on Knowledge Guided Machine Learning: A Framework for Accelerating Scientific Discovery, National Science Foundation (NSF): Harnessing the Data Revolution, Weather and Climate Session, Virtual. (Talk, Invited)

2020 Machine Learning for Analysis of Extreme Convection in a Future Climate, NCAR Water System Retreat, Boulder, CO. (Talk, Invited)

2019 Cluster Analysis of the Moisture Sources of Regionalized Tornadoes, Deep Learning for Science School, Lawrence Berkeley National Laboratory, Berkeley, CA. (Poster)

2018 Where does moisture for tornado producing thunderstorms come from? Southeast Michigan Postdoctoral Symposium, University of Michigan, Ann Arbor, MI. (Talk)

2017 Gulf of Mexico influence on sub-seasonal and seasonal severe thunderstorm frequency. NOAA Annual Climate Diagnostics and Prediction Workshop, Norman, OK. (Talk)

2017 Gulf of Mexico influence on spring severe thunderstorms. Southeastern Coastal and Atmospheric Processes Symposium, University of South Alabama, Mobile, AL. (Talk, Invited)

2016 Can the Gulf of Mexico help predict seasonal severe weather? Severe Convection and Climate Workshop, Columbia University, New York, NY. (Poster)

Seminars (as lead)

2021 Department of Atmospheric Science Colloquia and Special Seminar Series, Colorado State University, Fort Collins, CO. (Talk, Invited)

2020 Cornell Earth and Atmospheric Science Seminar Series, Cornell University, Ithaca, NY. (Talk, Invited)

2020 Ocean and Climate Physics Seminar Series, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY. (Talk, Invited)

2020 Barnes and Ebert-Uphoff Machine Learning Group, Colorado State University, Fort Collins, CO. (Talk, Invited)

2020 Department of Earth and Atmospheric Sciences Seminar, University of Northern Colorado, Greeley, CO. (Talk, Invited)

2018 Mesoscale and Microscale Meteorology Laboratory Seminar Series, NCAR Foothills Laboratory, Boulder, CO. (Talk)

2018 NOAA Air Resources Laboratory Visitor Seminar, NOAA Center for Weather and Climate Prediction, College Park, MD. (Talk, Invited)

2018 AMS and National Weather Association Southwest Michigan Seminar Series, Grand Rapids, MI. (Talk, Invited)

2017 AMS and National Weather Association Southwest Michigan Seminar Series, Grand Rapids, MI. (Talk, Invited)

Teaching Experience

Workshops

2021 *Upcoming July: "Physics, Robustness and Explanations," Trustworthy AI for Environmental Science Virtual Summer School, NCAR and NSF AI Institute for Research on Trustworthy AI in Weather, Climate, and Coastal Oceanography.

Course Lectures

2018 Atmospheric Thermodynamics, Equations of State and Gas Laws, Central Michigan University.

2018 Mesoscale Meteorology, Hodographs, Central Michigan University.

2018 Severe and Unusual Weather, Clouds, Central Michigan University.

2017 Dangerous Planet, Tropical Cyclones, Central Michigan University.

K-12

2008 – 2009 Earth and Space Science Teacher, North Broward Academy of Excellence, North Lauderdale, Florida.

Community Outreach

2021 Machine Learning for Climate, Seminar Speaker, Lunch Break Science Event, Science Museum of Virginia, Richmond, VA.

2021 What's Brewing in Weather and Climate Event, AMS chapter at Colorado State University (FORTCAST), Fort Collins, CO.

2020 Artificial Intelligence Panelist, Lunch Break Science Event, Science Museum of Virginia, Richmond, VA.

2020 Latinx Heritage Month: Latinx STEM Faculty/Industry Professionals Panelist; Navigating life during and after graduate studies as a Latina/o, CLaSP GUStO (Climate and Space Sciences and Engineering Graduate and Undergraduate Student Organization) and SHPE Grad (Society of Hispanic Professional Engineers Graduate Chapter), University of Michigan, MI.

2020 Scientific Communication and Career Preparation Podcast (Interviewee), Earth and Ecosystem Science Doctoral Program, Central Michigan University, MI.

2020 Spanish Language Outreach Materials, NCAR Field Campaign Exhibit, Mesa Lab, Boulder, CO.

2020 Columbia University Alumni Panelist, Post-graduation Career Path and Advice on Next Steps, Applications in Climate and Society, New York, NY.

2019 AMS and National Weather Association Southwest Michigan Chapter Seminar, From Broadcasting to Research: Perspectives on Career Evolution and Women in STEM, Grand Rapids, MI.

2018 5th Annual Great Lakes Science and Policy Symposium Panelist, Great Lakes Scientists and Training the Next Generation, Central Michigan University, Mount Pleasant, MI.

2017 Women, Technology, and Leadership Conference Panelist, Central Michigan University, Mount Pleasant, MI.

2017 Scholarship Fundraiser Gala Host, Center for Latino and Latin American Studies, Wayne State University, Detroit, MI.

2016 Alliance for Women in Media Seminar, A Career in Broadcast Meteorology, Central Michigan University, Mount Pleasant, MI.

Media

2021 Alaska could see more dangerous thunderstorms as Arctic sea ice melts and evaporation increases, Anchorage Daily News, Interviewee, February 23.

2020 Abnormally warm Gulf of Mexico could intensify the upcoming tornado and hurricane seasons, Washington Post, Interviewee, March 31.

2016 – 2017 Broadcast Meteorologist, WJBK FOX2-TV, Detroit, Michigan.

2010 – 2016 Broadcast Meteorologist, FOX News Channel, New York, New York.

2009 – 2010 Broadcast Meteorologist, AccuWeather, State College, Pennsylvania.

Professional Development

2021 *Upcoming August, CESM Tutorial, NCAR, Boulder, CO.

2020 GIT Tutorial, University of Colorado Boulder, Boulder, CO.

2020 UNEION, UCAR|NCAR Equity & inclusION training series, Boulder, CO.

2019 Engaged Scientist Workshop: Communication Tools for Effective Outreach, CIRES Education and Outreach, University of Colorado, Boulder, CO.

2019 CMIP6 Hackathon, NCAR, Boulder, CO.

2019 FORTRAN Workshop Series, NCAR, Computational and Information Systems Laboratory, Boulder, CO.

2019 Deep Learning for Science School, Lawrence Berkeley National Laboratory, Berkeley, CA.

2019 Multivariable Logistic Regression Workshop, Statistical Consulting Center, Department of Mathematics, Central Michigan University, Mount Pleasant, MI.

2018 Model for Prediction Across Scales (MPAS) Tutorial, NCAR, Boulder, CO.

2018 Weather Research and Forecasting (WRF) Model Tutorial, NCAR, Boulder, CO.

2018 AMS Science Policy Colloquium, Washington, D.C.

2017 HYSPLIT Workshop, NOAA Air Resources Laboratory, College Park, MD.

Professional Memberships

AMS, AGU, Homeward Bound (Women in STEM), Women in Mathematics, Science, and Engineering (WIMSE) Organization Florida State Alumni.

Professional Skills

Computational: High-performance computing, Python, Latex, FORTRAN, NCAR Command Language (NCL), MATLAB, and R.

Modeling: Weather Research and Forecasting Model (WRF) at convection-permitting scales, Model for Prediction Across Scales (MPAS), and Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT).