

Maria J. Molina, Ph.D.

Project Scientist I

Climate and Global Dynamics Laboratory | National Center for Atmospheric Research
Mesa Laboratory, 1850 Table Mesa Drive, Boulder, CO 80305

Email: molina@ucar.edu

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, Boulder, CO.
- 2020 **FRONTIER DEVELOPMENT LAB RESEARCHER**
SETI Institute in partnership with the National Aeronautics and Space Administration (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, National Center for Atmospheric Research, Boulder, CO.
- 2016 – 2019 **GRADUATE RESEARCH ASSISTANT**
Central Michigan University, Mount Pleasant, MI.
- 2015 **SUMMER RESEARCH PROJECT**
Lamont-Doherty Earth Observatory, Columbia University, Earth Institute, Palisades, NY.
- 2006 – 2008 **UNDERGRADUATE RESEARCH PROJECT, HONORS IN THE MAJOR**
Florida State University, Tallahassee, FL.

PUBLICATIONS

UNDER REVIEW OR SUBMITTED

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

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

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

PEER-REVIEWED RESEARCH ARTICLES

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*, Accepted.

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.

PEER-REVIEWED CONFERENCE PAPERS AND 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 BER Earth and Environmental Systems Science Division (EESSD), 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.

PROFESSIONAL MEETINGS

(T) for talk, (P) for poster, *upcoming, and (I) for invited.

CONFERENCE PRESENTATIONS (AS LEAD)

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| 2021 | Core Science Keynote: How Python and Machine Learning Enable Advances in Earth Science. American Meteorological Society Annual Meeting. (T, I) |
| 2021 | Interpretability Challenges with a Convolutional Neural Network used for a Climate Study. American Meteorological Society Annual Meeting. (T) |
| 2021 | Short-term Prediction of Severe Thunderstorm Hazards with Machine Learning and the Geostationary Lightning Mapper. American Meteorological Society Annual Meeting. (T) |
| 2020 | Challenges with Machine Learning Interpretability as shown by a Climate Study. American Geophysical Union Fall Meeting. (T) |
| 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. (P) |
| 2020 | Visualizing Hidden Layers of a Deep Convolutional Neural Network in Atmospheric Science Applications. Scientific Computing with Python Virtual Conference, SciPy2020. (P and short talk) |
| 2020 | The Future of Severe Thunderstorms in the U.S. – Insights from Combining Deep Learning and High-Resolution Modeling. American Meteorological Society Annual Meeting, Boston, MA. (T) |

- 2020 Sensitivity of a Winter Tornado Outbreak to Upstream SSTs. American Meteorological Society Annual Meeting, Boston, MA. (T)
- 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. (P)
- 2019 Moisture Attribution and Sensitivity Analysis of a Winter Tornado Outbreak. European Conference on Severe Storms, Krakow, Poland. (P)
- 2018 Severe convective storms in the United States: Where does the moisture come from? American Geophysical Union Fall Meeting, Washington, D.C. (T)
- 2018 A Lagrangian technique for moisture attribution of winter and spring severe local storms over the contiguous United States. American Meteorological Society Conference on Severe Local Storms, Stowe, VT. (T)
- 2018 Winter significant tornado variability in relation to ENSO and the Gulf of Mexico. American Meteorological Society Conference on Severe Local Storms, Stowe, VT. (P)

WORKSHOP, SYMPOSIUM, AND WEBINAR PRESENTATIONS (AS LEAD)

- 2021 *US CLIVAR Data Science Working Group Webinar Series, US CLIVAR Working Group on Emerging Data Science Tools for Climate Variability and Predictability. (T, I) *Upcoming April.
- 2020 Convection Classification in a Future Climate: What did Deep Learning Really Learn? 2nd NOAA Workshop on Leveraging AI in the Environmental Sciences. (P)
- 2020 Artificial Intelligence and Machine Learning -- The Value Chain in Data Services, American Meteorological Society Webinar hosted by the Committee on Open Environmental Information Services and Committee on Artificial Intelligence to Environmental Science, Virtual. (T, I)
- 2020 Explaining Deep Learning Classification of Future Convective Storms, Workshop on Knowledge Guided Machine Learning: A Framework for Accelerating Scientific Discovery, National Science Foundation: Harnessing the Data Revolution, Weather and Climate Session, Virtual. (T, I)
- 2020 Machine Learning for Analysis of Extreme Convection in a Future Climate, National Center for Atmospheric Research Water System Retreat, Boulder, CO. (T, I)
- 2019 Cluster Analysis of the Moisture Sources of Regionalized Tornadoes, Deep Learning for Science School, Lawrence Berkeley National Laboratory, Berkeley, CA. (P)

- 2018 Where does moisture for tornado producing thunderstorms come from? Southeast Michigan Postdoctoral Symposium, University of Michigan, Ann Arbor, MI. (T)
- 2017 Gulf of Mexico influence on sub-seasonal and seasonal severe thunderstorm frequency. NOAA Annual Climate Diagnostics and Prediction Workshop, Norman, OK. (T)
- 2017 Gulf of Mexico influence on spring severe thunderstorms. Southeastern Coastal and Atmospheric Processes Symposium, University of South Alabama, Mobile, AL. (T, I)
- 2016 Can the Gulf of Mexico help predict seasonal severe weather? Severe Convection and Climate Workshop, Columbia University, New York, NY. (P)

SEMINARS

- 2021 *Department of Atmospheric Science Colloquia and Special Seminar Series, Colorado State University, Fort Collins, CO. (T, I) *Upcoming March.
- 2020 Cornell Earth and Atmospheric Science Seminar Series, Cornell University, Ithaca, NY. (T, I)
- 2020 Ocean and Climate Physics Seminar Series, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY. (T, I)
- 2020 Barnes and Ebert-Uphoff Machine Learning Group, Colorado State University, Fort Collins, CO. (T, I)
- 2020 Department of Earth and Atmospheric Sciences Seminar, University of Northern Colorado, Greeley, CO. (T, I)
- 2018 Mesoscale and Microscale Meteorology Laboratory Seminar Series, National Center for Atmospheric Research Foothills Laboratory, Boulder, CO. (T)
- 2018 NOAA Air Resources Laboratory, NOAA Center for Weather and Climate Prediction, College Park, MD. (T, I)
- 2018 American Meteorological Society and National Weather Association Southwest Michigan Seminar Series, Grand Rapids, MI. (T, I)
- 2017 American Meteorological Society and National Weather Association Southwest Michigan Seminar Series, Grand Rapids, MI. (T, I)

GRANTS AND FELLOWSHIPS

- 2019 Advanced Study Program Postdoctoral Fellowship, National Center for Atmospheric Research.
- 2019 Travel Grant, Deep Learning for Science School, Lawrence Berkeley National Laboratory.

- 2019 Graduate Student Small-Allocation Computing Grant (Cheyenne and Casper), National Center for Atmospheric Research.
- 2018 Travel Grant, American Geophysical Union 2018 Fall Meeting.
- 2018 Graduate Presentation Grant, Office of Research and Graduate Studies, Central Michigan University.
- 2017, 2018 Travel Grant, Earth and Ecosystem Science Doctoral Program, Central Michigan University.
- 2017, 2018 Travel Grant, College of Science and Engineering, Central Michigan University.
- 2018 Travel Grant, National Science Foundation and American Meteorological Society Summer Policy Colloquium.
- 2016 Travel Grant, American Meteorological Society 28th Conference on Severe Local Storms.

AWARDS AND HONORS

- 2018 Student Best Oral Presentation Award, American Meteorological Society 29th Conference on Severe Local Storms.
- 2011 Certified Broadcast Meteorologist, American Meteorological Society.
- 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 ASP Postdoc Selection Committee, National Center for Atmospheric Research.
- 2020 – Academia Ambassador, AMS Committee for Hispanic and Latinx Advancement, American Meteorological Society.
- 2019 – Early Career Leadership Academy Planning Committee, Member, American Meteorological Society.
- 2019 – Early Career Scientist Assembly Steering Committee, Postdoctoral Researcher Representative, Member and Web Manager, National Center for Atmospheric Research.
- 2020 Machine Learning Scientist Hiring Committee, Computational and Information Systems Lab, National Center for Atmospheric Research.

- 2020 Distinguished Journalism Award Committee, American Meteorological Society.
- 2019 – 2020 Advanced Study Program Research Reviews Committee, Member, National Center for Atmospheric Research.

PEER REVIEW

Funding Agencies: National Science Foundation, National Aeronautics and Space Administration.

Journals: Geophysical Research Letters, Weather and Forecasting, Journal of Atmospheric and Oceanic Technology, Meteorological Applications, IEEE Transactions on Geoscience and Remote Sensing, Data Science, Remote Sensing, Advances in Space Research.

Certifications: Spanish Language Applications for the American Meteorological Society Certified Broadcast Meteorologist designation.

CONFERENCE ORGANIZATION

- 2021 Session Co-Chair, Artificial Intelligence for Climate Applications and Artificial Intelligence for Seasonal-to-Subseasonal (S2S) Prediction, American Meteorological Society Annual Meeting.
- 2020 Session Co-Chair, Machine Learning for Subseasonal-to-Seasonal Prediction, American Meteorological Society Annual Meeting.

CONFERENCE JUDGING

- 2020 Student Oral and Poster Presentation Judge, American Meteorological Society Conference on Artificial Intelligence for Environmental Science, Boston, MA.
- 2020 Student Oral Presentation Judge, American Meteorological Society, Conference on Weather Analysis and Forecasting / Conference on Numerical Weather Prediction, Boston, MA.
- 2020 Student Poster Presentation Judge, American Meteorological Society Student Conference, Boston, MA.
- 2019 Student Poster Judge, Annual Earth System and Space Science Poster Conference, University of Colorado Boulder, Boulder, CO.

PROFESSIONAL DEVELOPMENT AND TRAINING

- 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, National Center for Atmospheric Research, Boulder, CO.
- 2019 FORTRAN Workshop Series, National Center for Atmospheric Research, 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, National Center for Atmospheric Research, Boulder, CO.
- 2018 Weather Research and Forecasting (WRF) Model Tutorial, National Center for Atmospheric Research, Boulder, CO.
- 2018 American Meteorological Society Science Policy Colloquium, Washington, D.C.
- 2017 HYSPLIT Workshop, NOAA Air Resources Laboratory, College Park, MD.

COMMUNITY OUTREACH

- 2021 *Seminar Speaker, Lunch Break Science Event, Science Museum of Virginia, Richmond, VA. *Upcoming April.
- 2021 *What's Brewing in Weather and Climate Event, local AMS chapter at Colorado State University (FORTCAST), Fort Collins, Colorado. *Upcoming March.
- 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, National Center for Atmospheric Research 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 American Meteorological Society 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 COVERAGE AND EXPERIENCE

- 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.

TEACHING EXPERIENCE

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.

PROFESSIONAL MEMBERSHIPS

American Meteorological Society, American Geophysical Union, American Meteorological Society Denver | Boulder Local Chapter, Association for Women Geoscientists, Homeward

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

PROFESSIONAL SKILLS

Computational skills: High-performance computing experience on NCAR systems, knowledge of UNIX operating systems (including shell scripts), and computer programming and data visualization proficiency in Python (e.g., Keras, Scikit-learn, PySPLIT, Xarray, Pandas). Also experienced with Latex and have previously used FORTRAN, NCAR Command Language (NCL), MATLAB, and R.

Modeling skills: 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).