

Dr. Jake P. Mulholland CV

Assistant Professor, University of North Dakota, Department of Atmospheric Sciences
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EDUCATION

University of Illinois at Urbana-Champaign
Doctor of Philosophy Degree in Atmospheric Sciences

Graduation: 08/2019
08/2016-08/2019

- Advisors: Drs. Robert Trapp and Stephen Nesbitt
- Ph.D. Committee: Drs. Robert Trapp, Stephen Nesbitt, Robert Rauber, and Deanna Henc
- Dissertation Title: “How does terrain influence the upscale convective growth of orographic deep moist convection?”

University of Illinois at Urbana-Champaign
Master of Science Degree in Atmospheric Sciences

Graduation: 05/2016
08/2014-05/2016

- Advisor: Dr. Jeffrey Frame
- Thesis Title: “Observations of misovortices within the 7 January 2014 long lake-axis-parallel lake-effect snow band during the Ontario Winter Lake-effect Systems Project”

State University of New York (SUNY) College at Oswego, Oswego, NY
Bachelor of Science Degree in Meteorology (Cum laude)
Minor in Mathematics

Graduation: 05/2014
08/2010-05/2014

CURRENT PROPOSALS

Peters, J. M., H. Morrison, G. S. Elsaesser, and **J. P. Mulholland**, 2022: Using ARM observations and large eddy simulations to understand downdrafts in deep convection. *DOE*, Recommended for funding.

Peters, J. M., C. J. Nowotarski, G. S. Elsaesser, E. R. Nielsen, and **J. P. Mulholland**, 2021: Understanding downdrafts in deep convection. *NSF*, Recommended for funding.

PEER-REVIEWED PUBLICATIONS

Citations = 196; h-index = 8; i10-index = 8 (source: Google Scholar as of 08/22/2022)

Peters, J. M., **J. P. Mulholland**, and D. R. Chavas, 2022: The sensitivity of CAPE and CIN to assumptions about ascending parcel behavior. *J. Atmos. Sci.*, In preparation.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2022: Connections between convective updraft area and precipitation area: Insights from idealized simulations. *Mon. Wea. Rev.*, In preparation.

Naylor, J., and **J. P. Mulholland**, 2022: Interactions between squall lines and cities: Exploring the impact of vertical wind shear. *J. Geophys. Res. Atmos.*, Submitted.

Steiger, S. M., M. Lynne, **J. P. Mulholland**, K. A. Kosiba, and J. Wurman, 2022: Snowband characteristics associated with lake-effect misovortices during the OWLeS Project. *J. Geophys. Res. Atmos.*, Accepted.

Peters, J. M., B. E. Coffey, M. D. Parker, C. J. Nowotarski, **J. P. Mulholland**, C. J. Nixon, and J. T. Allen, 2022: Disentangling the influences of storm-relative flow and horizontal streamwise vorticity on low-level mesocyclones in supercells. *J. Atmos. Sci.*, In revision.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2021: How does LCL height influence deep convective updraft width? *Geophys. Res. Lett.*, **48**, 1–8, <https://doi.org/10.1029/2021GL093316>

Mulholland, J. P., J. M. Peters, and H. Morrison, 2021: How does vertical wind shear influence entrainment in squall lines? *J. Atmos. Sci.*, **78**, 1931–1946, <https://doi.org/10.1175/JAS-D-20-0299.1>

Peters, J. M., **J. P. Mulholland**, and D. R. Chavas, 2021: Generalized lapse rate formulas for use in entraining CAPE calculations. *J. Atmos. Sci.*, Accepted, <https://doi.org/10.1175/JAS-D-21-0118.1>

Peters, J. M., H. Morrison, T. C. Nelson, J. N. Marquis, **J. P. Mulholland**, and C. J. Nowotarski, 2021: The influence of shear on deep convection initiation. Part 2: Simulations. *J. Atmos. Sci.*, In revision.

Peters, J. M., H. Morrison, T. C. Nelson, J. N. Marquis, **J. P. Mulholland**, and C. J. Nowotarski, 2021: The influence of shear on deep convection initiation. Part 1: Theory. *J. Atmos. Sci.*, In revision.

Mulholland, J. P., S. W. Nesbitt, R. J. Trapp, and J. M. Peters, 2020: The influence of terrain on the convective environment and associated convective morphology from an idealized modeling perspective. *J. Atmos. Sci.*, **77**, 3929–3949, <https://doi.org/10.1175/JAS-D-19-0190.1>

Peters, J. M., H. Morrison, C. J. Nowotarski, and **J. P. Mulholland**, 2020: A formula for the maximum vertical velocity in supercell updrafts. *J. Atmos. Sci.*, **77**, 3747–3757, <https://doi.org/10.1175/JAS-D-20-0103.1>

Nowotarski, C. J., J. M. Peters, and **J. P. Mulholland**, 2020: Evaluating the effective inflow layer of simulated supercell updrafts. *Mon. Wea. Rev.*, **148**, 3507–3532, <https://doi.org/10.1175/MWR-D-20-0013.1>

Peters, J. M., C. J. Nowotarski, and **J. P. Mulholland**, 2020: The influences of effective inflow layer streamwise vorticity and storm-relative flow on supercell updraft properties. *J. Atmos. Sci.*, **77**, 3033–3057, <https://doi.org/10.1175/JAS-D-19-0355.1>

Mulholland, J. P., S. W. Nesbitt, and R. J. Trapp, 2019: A case study of terrain influences on upscale convective growth of a supercell. *Mon. Wea. Rev.*, **147**, 4305–4324, <https://doi.org/10.1175/MWR-D-19-0099.1>

Mulholland, J. P., S. W. Nesbitt, R. J. Trapp, K. L. Rasmussen, and P. V. Salio, 2018: Convective storm life cycle and environments near the Sierras de Córdoba, Argentina. *Mon. Wea. Rev.*, **146**, 2541–2557, <https://doi.org/10.1175/MWR-D-18-0081.1>

Mulholland, J. P., J. Frame, S. W. Nesbitt, S. M. Steiger, K. A. Kosiba, and J. Wurman, 2017: Observations of misovortices within a long-lake-axis-parallel lake-effect snowband during the OWLeS Project. *Mon. Wea. Rev.*, **145**, 3265–3291, <https://doi.org/10.1175/MWR-D-16-0430.1>

INVITED PRESENTATIONS

Mulholland, J. P. and J. M. Peters, 18 February 2020: Understanding the dynamics of supercell-to-MCS transitions. *Naval Postgraduate School* in Monterey, CA.

Mulholland, J. P., S. W. Nesbitt, and R. J. Trapp, 28 January 2019: Characterizing the deep convective storms of Argentina, South America. *Pacific Northwest National Laboratory* in Richland, WA.

Mulholland, J. P., 13 September 2019: Lessons learned as an early career atmospheric scientist. *State University of New York at Oswego* in Oswego, NY.

TEACHING EXPERIENCE

Assistant Professor, University of North Dakota

Starting: 07/2022

Teaching Assistant, SUNY Oswego Storm Forecasting and Observation Program

05/2022-06/2022

- Assisted students with their daily convective outlooks.
- Guided students on how to properly prepare and launch rawinsondes.
- Performed manual hand analyses of surface and upper-air charts on a daily basis.

Substitute Teacher, Mesoscale Meteorology (MR-4241)

02/2020-03/2020

- Substitute taught course for main professor.
- Presented own research results to class in an hour-long seminar style.
- Had students read peer-reviewed journal articles, present main findings of the articles, and discussed together as a class.

Teaching Assistant, SUNY Oswego Storm Forecasting and Observation Program

05/2017-06/2017

- Assisted students with their daily convective outlooks.
- Guided students on how to properly prepare and launch rawinsondes.
- Performed manual hand analyses of surface and upper-air charts on a daily basis.

Teaching Assistant, Introduction to Meteorology (ATMS-100) Lab

08/2016-05/2017

- Prepared and presented lectures for ~100–150 undergraduate students.
- Graded homework and lab assignments.
- Held hour-long review sessions before exams.

Teaching Assistant, University of Illinois at Urbana-Champaign Field Studies of Convection Program

05/2016-06/2016

- Assisted professor/students with twice-daily convective outlooks.

Teaching Assistant, Synoptic Weather Forecasting (ATMS-313)

01/2016-05/2016

- Graded weekly assignments, such as forecast discussions and manual hand analyses.
- Held hour-long review sessions before exams.
- Received the 2016 *student voted* University of Illinois Ogura's Teaching Assistant Award.

Teaching Assistant, University of Illinois at Urbana-Champaign Field Studies of Convection Program

06/2015

- Assisted professor/students with twice-daily convective outlooks.

Teaching Assistant, Introduction to Meteorology (ATMS-100) Lab

08/2014-12/2014

- Prepared and presented lectures for ~100–150 undergraduate students.
- Graded homework and lab assignments.
- Held hour-long review sessions before exams.

Teaching Assistant for SUNY Oswego Storm Forecasting and Observation Program

05/2014-06/2014

- Assisted students with their daily convective outlooks.
- Guided students on how to properly prepare and launch rawinsondes.
- Performed hand-analyses of surface and upper-air charts on a daily basis.

FIELD WORK AND PROFESSIONAL EXPERIENCE

Research Faculty Associate, Naval Postgraduate School

09/2020-Present

- Using theory, observations, and idealized numerical cloud model simulations to understand:
 - modulation of entrainment by vertical wind shear in squall lines
 - modulation of deep convective updraft width and intensity by lifting condensation level height
 - use of CAPE vs. ECAPE in predicting maximum vertical velocities across various convective modes

- Mobile Sounding Member, CALifornia Investigation of Clouds over Ocean (CALICO) Project *02/2022-03/2022*
- Launched rawinsondes in the field.
- Lead Forecaster, CALifornia Investigation of Clouds over Ocean (CALICO) Project *02/2022-03/2022*
- Wrote and presented forecast discussions to CALICO leads and participants.
- Co-Chair, 2022 AMS Annual Meeting (Mesoscale Conference) *01/2022*
- Introduced speakers for an oral presentation session
- Participant, 2021 NOAA Hazardous Weather Testbed “Spring Experiment” *05/2021*
- Worked with fellow researchers and National Weather Service forecasters to evaluate both operational and experimental model guidance for real-time severe weather events across the United States.
- National Research Council (NRC) Post-Doctoral Fellow, Naval Postgraduate School *08/2019-09/2020*
- Used archived radar data, reanalysis data, and idealized numerical cloud model simulations to understand the environmental and storm-scale attributes associated with upscale growth of deep convection into mesoscale convective systems.
- Mobile Sounding Member, Remote sensing of Electrification, Lighting, and Mesoscale/microscale Processes with Adaptive Ground Observations (RELAMPAGO) Project *11/2018-12/2018*
- Launched rawinsondes in the field.
- Student Lead Forecaster, Remote sensing of Electrification, Lighting, and Mesoscale/microscale Processes with Adaptive Ground Observations (RELAMPAGO) Project *11/2018-12/2018*
- Wrote and presented forecast discussions to RELAMPAGO leads and participants.
- NCAR ASP Summer Colloquium: Synthesis of Observations and Models in Studies of Shallow and Deep Clouds *06/2018*
- Combined observational and numerical model output to analyze a case study from the Plains Elevated Convection at Night (PECAN) Project.
 - Attended daily seminars by NCAR staff and professors from outside universities.
- Participant, UIUC Precipitation Physics Field Observation Course *01/2017-05/2017*
- Used the “System for Characterizing And Measuring Precipitation” (SCAMP) instrumentation truck.
 - Designed experiments to study precipitation-related processes from ground-based instruments.
 - Learned how to efficiently operate ground-based (vertically pointing) radar, particle spectrometers, disdrometer, precipitation gauge, aerosol counter, and a surface weather station.
- Research Assistant, Ontario Winter Lake-effect Systems (OWLeS) Project *08/2014-05/2016*
- Analyzed mobile radar (Doppler-on-Wheels) data from the OWLeS Project.
 - Manually edited mobile radar data and ran dual-Doppler analyses on the aforementioned edited data.
- Student Lead Forecaster, Ontario Winter Lake-effect Systems (OWLeS) Project *12/2013-01/2014*
- Prepared written forecast discussions and post-evaluations for OWLeS leads and participants.
 - Presented oral forecast discussions to OWLeS leads and participants.

Co-Director, Lake Effect Storm Prediction and Research Center (LESPaRC), SUNY Oswego 10/2013-04/2014

- Recruited potential clients such as school districts, colleges, transportations offices, and the New York State Department of Transportation (NYS DOT).
- Hired and trained student forecasters.
- Held weekly forecast discussions with the LESPaRC team.

Member, Lake Effect Storm Prediction and Research Center (LESPaRC), SUNY Oswego 10/2011-04/2014

- Submitted forecasts to our website and consulted school districts, colleges, transportations offices, and the New York State Department of Transportation (NYS DOT).
- Duties included: on-call forecasting during lake-effect snow events, maintaining a client website with a snowfall forecast map, and generating weekly forecast outlook products for the clients.

Co-President, Better Forecasting Bureau (BFB), SUNY Oswego 08/2012-05/2014

- Taught students of all majors' basics of weather forecasting.
- Presented PowerPoints at every meeting with a new forecasting topic.

Participant, SUNY Oswego Storm Forecasting and Observation Program 05/2013-06/2013

- Prepared daily convective outlooks.
- Launched rawinsondes in pre-convective environments.

Participant, SUNY Oswego/EAGER Grant Lake-Effect Snow Field Research Project 12/2010-01/2011

- Worked alongside a team of nine other undergraduate students to gather observations of lake-effect snow.
- Only freshman part of this field project.
- Operated the DOW (Doppler-on-Wheels) mobile radar.

PAST GRANTS RECEIVED

Conference Travel Grant Recipient, American Meteorological Society (\$300) 09/2016

- Received a \$300 travel grant to attend the American Meteorological Society's 28th *Conference on Severe Local Storms* in Portland, OR.

Conference Travel Grant Recipient, University of Illinois at Urbana-Champaign (\$250) 03/2015

- Received a \$250 travel grant to attend the American Meteorological Society's 16th *Conference on Mesoscale Processes* in Boston, MA.

Grant Recipient, "Optimizing the Numerical Simulations of Lake-Effect Snow Storms" (\$3200) 06/2013-08/2013

- Ran the Weather Research and Forecasting (WRF) Model on eight separate lake-effect events that occurred between 2008-2013.
- Tested different microphysical and planetary boundary layer schemes to see which performed best with lake-effect snow band placement and intensity.
- Created and presented a poster highlighting findings (SUNY Oswego Quest Day Conference).

PROFESSIONAL CONFERENCE PRESENTATIONS/PAPERS/POSTERS

Mulholland, J. P., J. M. Peters, and H. Morrison, 2022: Environmental factors regulating deep convective updraft width across a spectrum of convective modes. Preprints, *Understanding and Modeling Atmospheric Processes: Organization of Shallow and Deep Convection* in Monterey, CA, GEWEX PAN-GASS Meeting.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2022: Environmental factors regulating deep convective updraft width across a spectrum of convective modes. Preprints, *Advances in Cumulus Convection Measurements, Parameterization, and Modeling* held virtually, Amer. Meteor. Soc.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2021: Environmental factors regulating deep convective updraft width across a spectrum of convective modes. Preprints, *Atmospheric Convection: Processes, Dynamics, and Links to Weather and Climate* in New Orleans, LA, Amer. Geo. Union.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2021: Environmental factors regulating deep convective updraft width across a spectrum of convective modes. Preprints, *Student and Early Career Conference on Severe Local Storms Topics* held virtually, Amer. Meteor. Soc.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2021: Environmental factors regulating deep convective updraft width across a spectrum of convective modes. Preprints, *2021 Joint ARM User Facility and ASR PI Meeting* held virtually, Dept. of Energy.

Mulholland, J. P., J. M. Peters, and H. Morrison, 2021: How does vertical wind shear influence entrainment in squall lines? Preprints, *Mesoscale Processes Across Scales: Engaging with Communities in the Physical and Social Sciences* held virtually, Amer. Meteor. Soc.

Mulholland, J. P., S. W. Nesbitt, and R. J. Trapp, 2019: Terrain influences on Upscale Convective Growth of Orographic Supercells into Mesoscale Convective Systems. Preprints, *Mountains, Weather, and Climate: Advances from Observations, Theories, and Models* in San Francisco, CA, Amer. Geo. Union.

Mulholland, J. P. and J. M. Peters, 2019: Why do some supercells grow upscale at nightfall and others not? Preprints, *9th Annual Young Scientist Symposium on Atmospheric Science* in Fort Collins, CO.

Mulholland, J. P. and J. M. Peters, 2019: Why do some supercells grow upscale at nightfall and others not? Preprints, *10th Annual Great Lakes Atmospheric Science Symposium* in Oswego, NY.

Mulholland, J. P., S. W. Nesbitt, and R. J. Trapp, 2019: How does terrain impact upscale convective growth of orogenic deep moist convection? Preprints, *Special Symposium on Mesoscale Meteorological Extremes: Understanding, Prediction, and Projection* in Phoenix, AZ, Amer. Meteor. Soc.

Mulholland, J. P., S. W. Nesbitt, and R. J. Trapp, 2018: Upscale convective growth of an orogenic supercell into a mesoscale convective system in Argentina, South America. Preprints, *29th Conference on Severe Local Storms* in Stowe, VT, Amer. Meteor. Soc.

Mulholland, J. P., S. W. Nesbitt, R. J. Trapp, K. L. Rasmussen, and P. Salio, 2018: Convective storm life cycle and environments near the Sierras de Córdoba, Argentina. Preprints, *29th Conference on Severe Local Storms* in Stowe, VT, Amer. Meteor. Soc.

Mulholland, J. P., S. W. Nesbitt, R. J. Trapp, and K. L. Rasmussen, 2018: Factors controlling convective storm mode and heavy rainfall production near the Sierras de Córdoba, Argentina. Preprints, *32nd Conference on Hydrology*, Austin, TX, Amer. Meteor. Soc.

Mulholland, J. P., R. J. Trapp, and S. W. Nesbitt, 2017: Novel radar observations of convection near the Sierras de Córdoba, Argentina. Preprints, *8th Annual Great Lakes Atmospheric Science Symposium*, Oswego, NY, Oswego State College Chapter of Amer. Meteor. Soc.

Mulholland, J. P., R. J. Trapp, and S. W. Nesbitt, 2017: Novel radar observations of convection near the Sierras de Córdoba, Argentina. Preprints, *1st Midwest Student Conference on Atmospheric Research*, Urbana, IL, University of Illinois Chapter of Amer. Meteor. Soc.

Mulholland, J. P., R. J. Trapp, S. W. Nesbitt, P. Salio, L. Vidal, M. Runga, 2017: Novel polarimetric radar observations of upscale convective growth near the Sierras de Córdoba. Preprints, *38th Conference on Radar Meteorology*, Chicago, IL, Amer. Meteor. Soc.

Mulholland, J. P. and J. W. Frame, 2016: Misovortices within the 7 January 2014 long lake-axis-parallel lake-effect snow band during the Ontario Winter Lake-effect System Project. Preprints, *Symposium on Meteorological Observation and Instrumentation*, New Orleans, LA, Amer. Meteor. Soc.

Mulholland, J. P. and J. W. Frame, 2015: Misovortices and boundaries within the 7 January 2014 long lake-axis-parallel lake-effect snow band during the Ontario Winter Lake-effect Systems (OWLeS) Project. Preprints, *37th Conference on Radar Meteorology*, Norman, OK, Amer. Meteor. Soc.

Mulholland, J. P., J. W. Frame, and S. M. Steiger, 2015: A numerical investigation into the presence of veer-back-veer vertical wind profiles in supercell environments: A case study of 30 and 31 May 2013. Preprints, *16th Conference on Mesoscale Processes*, Boston, MA, Amer. Meteor. Soc.

Mulholland, J. P. and J. W. Frame, 2015: Misovortices and boundaries within the 7 January 2014 long lake-axis-parallel lake-effect snow band during the Ontario Winter Lake-effect Systems (OWLeS) Project. Preprints, *16th Conference on Mesoscale Processes*, Boston, MA, Amer. Meteor. Soc.

Mulholland, J. P., J. W. Frame, and S. M. Steiger, 2015: Misovortices and boundaries within long lake-axis-parallel (LLAP) lake-effect snow bands during the 2013-2014 Ontario Winter Lake-effect Systems (OWLeS) Project. Preprints, *Conference on Air-Sea Interaction*, Phoenix, AZ, Amer. Meteor. Soc.

Mulholland, J. P., J. Rabinowitz, and S. M. Steiger 2014: The causes and effects of outflow boundaries on lake-effect snow bands east of Lake Ontario during the OWLeS field campaign. *39th Annual Northeastern Storm Conference*, Rutland, VT, Lyndon State College Chapter of Amer. Meteor. Soc.

Mulholland, J. P., R. Schrom, and S. M. Steiger 2011: WRF verification of the 16 December 2010 event in comparison with the DOW and NEXRAD. Proceedings, *2nd Annual Great Lakes Atmospheric Science Symposium*, Oswego, NY, Oswego State College Chapter of Amer. Meteor. Soc.

Mulholland, J. P., R. Schrom, and S. M. Steiger 2011: WRF verification of the 16 December 2010 event in comparison with the DOW and NEXRAD. *36th Annual Northeastern Storm Conference*, Taunton, MA, Lyndon State College Chapter of Amer. Meteor. Soc.

PROFESSIONAL DUTIES

- Co-chair of the *19th Conference on Mesoscale Processes* at the *102nd American Meteorological Society Annual Meeting*
- Peer reviewer for: National Science Foundation (NSF), Journal of the Atmospheric Sciences (JAS), Monthly Weather Review (MWR), Weather and Forecasting (WAF), Journal of Atmospheric and Oceanic Technology (JTECH), and Journal of Geophysical Research – Atmospheres (JGR)

AWARDS/AFFILIATIONS/PROFESSIONAL MEMBERSHIPS

- American Geophysical Union (AGU) Member *07/2019-Present*
- University of Illinois Ogura's 2nd place Student Research Paper Award (*faculty voted*) *04/2020*
- University of Illinois SESE Research Review 3rd place poster winner *02/2018*
- University of Illinois MSCAR conference external affairs committee president *02/2018-Present*

- University of Illinois Ogura's Teaching Assistant Award (*student voted*) 04/2016
- American Meteorological Society (AMS) Member 09/2010-Present
- Outstanding Senior in Meteorology Award, SUNY Oswego Meteorology Dept. 04/2014
- Member of Sigma Xi, The Scientific Research Society 04/2014-Present
- Vice President, SUNY Oswego Meteorology Club 05/2013
- Taught MET 315 (Weather Disasters Course) for three days for Dr. Scott Steiger 11/2012

COMPUTATIONAL SKILLS

- Programming languages: Python, FORTRAN, JAVA, MATLAB, NCL, Linux/Unix
- Numerical weather modeling: Weather Research and Forecasting (WRF) Model, Cloud Model-1 (CM1)
- Radar: SOLO-II/III, dual-Doppler analyses
- Other: LaTeX, Microsoft Word/PowerPoint/Excel, Windows operating machines, GEneral Meteorological PACkage (GEMPAK), Global Atmospheric Research Program (GARP), Integrated Data Viewer (IDV), BUFKIT, The Universal RAwinsonde OBServation (RAOB) Program, NCAR's VAPOR software, WRF's Read-Interpolate-Plot (RIP) software, Python parcel trajectory code