# Curriculum Vitae

John M. Peters, PhD

Certified Consulting Meteorologist (CCM)

## Personal Information

**Current Affiliation and Positions**

The Pennsylvania State university – Department of Meteorology and Atmospheric Science
Assistant Professor

Peters Weather and Climate Consulting LLC
Meteorological Consultant

**Work Address**

The Pennsylvania State university
Department of Meteorology and Atmospheric Science
503 Walker Bldg 6
University Park, PA 16802

**Contact Information**

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## Education

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|---|---|
| **2015** | **Colorado State University, Ph.D. Atmospheric Science**<br>Advisor: Dr. Russ Schumacher |
| **2012** | **University of Wisconsin-Milwaukee, M.S. Mathematics,**<br>(Atmospheric Science Focus)<br>Co-Advisors: Dr. Paul Roebber, Dr. Sergey Kravtsov |
| **2010** | **University of Wisconsin-Milwaukee, B.S. Mathematics,**<br>(Atmospheric Science Focus)<br>Research Advisors: Dr. Paul Roebber, Dr. Sergey Kravtsov |

## Employment History

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|---|---|
| **2022-Present** | **Assistant Professor, Penn State University** |
| **2023-Present** | **Meteorological Consultant, Peters Weather and Climate Consulting LLC** |
| 2017-2022 | Assistant Professor, Naval Postgraduate School |
| 2015-2017 | NSF Postdoctoral Fellow, Colorado State University |
| 2012-2015 | Graduate Research Assistant, Colorado State University |

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| 2011-2012 | Graduate Research Assistant, University of Wisconsin-Milwaukee |
| 2010-2011 | Graduate Teaching Assistant, University of Wisconsin-Milwaukee |
| 2008-2012 | Forecaster, Innovative Weather |

## Expertise

**Cloud dynamics:** Cumulus, cumulonimbus, entrainment, vertical wind shear influences on clouds, supercells, tornadoes, squall lines, mesoscale convective systems, downdrafts

**Cumulus Parameterization:** Representation of deep convection in global models

**Moist thermodynamics:** Conserved variables, lapse rate equations, methods for computing convective available potential energy

**Weather Forecasting and weather data analysis**

## Research Tools

**Numerical modeling:** Cloud Model 1 (CM1), Common Community Physics Package (CCPP) Single Column Model (SCM), Weather Research and Forecasting (WRF) Model

**Pen-and-paper theory**

**Observations:** Radiosonde observations from field campaigns, reanalysis, aircraft observations, radar observations

## Publications

47 peer-review publications
1066 Citations, **h-index = 22**, **i-10 index = 30** (Google Scholar as of 3-24-24)

(47) Kirshbaum, D., J., Morrison, H., and **Peters, J. M.** (2024) Simplified approximations of direct cumulus entrainment and detrainment. *J. Atmos. Sci.*, *in. press.*

(46) Mulholland, J. P., Nowotarski, C. J., **Peters, J. M.**, Morrison, H, and Nielsen, E. R. (2024) How does vertical wind shear updraft characteristics and hydrometeor distributions in supercell thunderstorms? *M. Wea. Rev.*, *in. press.*

(45) Su, C.-Y., Wu, C.-M., Chen, W.-T., & **Peters, J. M.** (2024). Modulation of tropical convection-circulation interaction by aerosol indirect effects in convective self-aggregation simulations of a gray zone global model. *Journal of Geophysical Research: Atmospheres*, 129, e2023JD040190.

(44) Muehr, A. J., J. H. Ruppert, M. D. Flournoy, and **J. M. Peters**, (2024): The Influence of Midlevel Shear and Horizontal Rotors on Supercell Updraft Dynamics. *J. Atmos. Sci.*, **81**, 153–176.

(43) Morrison, H., N. Jeevanjee, D. Leaconet, and **J. M. Peters**, (2024): What controls the entrainment rate of dry buoyant thermals with varying initial aspect ratio? *J. Atmos. Sci.*, **80**, 2711–2728.

(42) Chavas, D. R. and **J. M. Peters**, (2023): Static energy deserves greater emphasis in the meteorology community, *Bul. Amer. Met. Socet*., **104**, E1918–E1927.

**(41) Peters, J. M.**, D. R. Chavas, C. Su, H. Morrison, and B. E. Coffer, (2023): An analytic formula for entraining CAPE in mid-latitude storm environments. *J. Atmos. Sci.*, **80**, 2165–2186.

(**40) Peters, J. M.**, Lebo, Z. J., Chavas, D. R., & Su, C.-Y. (2023). Entrainment makes pollution more likely to weaken deep convective updrafts than invigorate them. *Geo. Res. Lett.*, 50, e2023GL103314.

(39) Coffer, B. E., M. D. Parker, **J. M. Peters**, and A. R. Wade, (2023): Supercell Low-Level Mesocyclones: Origins of Inflow and Vorticity. *Mon. Wea. Rev.*, **151**, 2205–2232,

(38) Giangrande, S. E., Biscaro, T., and J. M. Peters**.** (2023): Seasonal Controls on Isolated Convective Storm Drafts, Precipitation Intensity, and Life Cycle As Observed During GoAmazon2014/5, *Atmos. Chem. Phys*, https://doi.org/10.5194/acp-23-5297-2023, 2022. 23, 5297–5316.

(37) Marquis, J. N., Feng, Z., Varble, A., Nelson, T. C., Houston, A., **Peters, J. M.**, Mulholland, J. P., & Hardin, J. (2023). Near-cloud atmospheric ingredients for deep convection initiation, *Mon. Wea. Rev.,* **151**, 1247–1267.

**(36) Peters, J. M.**, Coffer, B. E., Parker, M. D., Nowotarski, C. J., Mulholland, J. P., Nixon, C. J., & Allen, J. T. (2023). Disentangling the Influences of Storm-Relative Flow and Horizontal Streamwise Vorticity on Low-Level Mesocyclones in Supercells, *J. Atmos. Sci., **80*(1)**, 129-149.

(35) Nelson, T. C., J. N. Marquis, **J. M. Peters**, and K. Friedrich, 2022: Environmental controls on deep moist convection initiation occurring during RELAMPAGO. *J. Atmos. Sci.* **79(7)**. 1941-1964

**(34) Peters, J. M.**, H. Morrison, T. C. Nelson, J. N. Marquis, J. P Mulholland, and C. J. Nowotarski, 2022: The influence of shear on deep convection initiation. Part 2: Simulations. *J. Atmos. Sci.,* **79(6).** 1691-1711.

**(33) Peters, J. M.**, H. Morrison, T. C. Nelson, J. N. Marquis, J. P Mulholland, and C. J. Nowotarski, 2022: The influence of shear on deep convection initiation. Part 1: Theory. *J. Atmos. Sci.,* **79(6).** 1669-1690.

**(32) Peters, J. M.**, D. R. Chavis, and J. P. Mulholland, 2022: Generalized lapse rate formulas for use in entraining CAPE calculations. *J. Atmos. Sci.,* **79(3).** 815-836.

(31) H. Morrison, **J. M. Peters**, K. K. Chandrakar, and S. Sherwood, 2022: Influences of environmental relative humidity and horizontal scale of sub-cloud ascent on deep convective initiation. *J. Atmos. Sci.,* **79(2)**. 337-359.

(30) Brown, M. C., C. J. Nowotarski, A. R. Dean, B. T. Smith, R. L. Thompson, and **J. M. Peters**, 2021: The Early Evening Transition in Southeastern US Tornado Environment. *Wea. Forecasting,* **36.** 1431-1452.

(29) Mulholland, **J. M. Peters**, and H. M. Morrison, 2021: The influence of effective inflow layer depth on deep convective updraft width. *Geo. Res. Lett.,* 48, e2021GL093316.

**(28) Peters, J. M.**, D. R. Chavis, 2021: Evaluating the conservation of energy variables in simulations of deep moist convection. *J. Atmos. Sci.,***78.** 3229-3246.

(27) 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.

**(26) Peters, J. M.**, H. Morrison, G. Zhang, and S. W. Powell, 2021: Improving the physical basis for updraft dynamics in deep convection parameterizations. *J. Adv. Mod. Earth Sys.,* 13, e2020MS002282.

(25) Morrison, H, **J. M. Peters**, and S. C. Sherwood, 2021: Comparing the growth rates of simulated moist and dry convective thermals. *J. Atmos. Sci.,* **78.** 797-816.

**(24) Peters, J. M.**, H. M. 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.

(23) Nowotarski, C. J. and **J. M. Peters**, C. Nowotarski, and J. P. Mulholland, 2020: Evaluating the effective inflow layer of simulated supercell updrafts. *Mon. Wea. Rev.,* **148.** 3507–3532.

(22) Mulholland, J. P., S. W. Nesbitt, R. J. Trapp, and **J. M. Peters**, 2020: The influence of terrain on convective environment and associated convective morphology from an idealized modeling perspective. *J. Atmos. Sci.,* **77.** 3929–3949.

**(21) Peters, J. M.**, C. 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.

**(20) Peters, J. M.**, H. Morrison, W. M. Hannah, A. C. Varble, and S. E. Giangrande, 2020: Thermal chains in ascending moist updrafts, Part 2: Comparison of theory and fully dynamical simulations. *J. Atmos. Sci.,* **77.** 3661–3681.

(19) Morrison, H., **J. M. Peters**, W. M. Hannah, A. C. Varble, and S. E. Giangrande**,** 2020: Thermal chains in ascending moist updrafts, Part 1: Theoretical description. *J. Atmos. Sci.,* **77.** 3637–3660.

**(18) Peters, J. M.**, C. Nowotarski, and G. Mullendore, 2020: Are supercells resistant to entrainment because of their rotation? *J. Atmos. Sci.,* **77,** 1475-1495.

**(17) Peters, J. M.**, C. Nowotarski, and H. Morrison, 2019: The role of vertical wind shear in modulating maximum supercell updraft velocities. *J. Atmos. Sci.,* **76,** 3169-3189.

**(16) Peters, J. M.**, H. Morrison, and W. M. Hannah, 2019: The influence of vertical wind shear on the ascent rate of moist thermals. *J. Atmos. Sci.,* **76,** 1645–1659**.**

(15) Morrison, H. and **J. M. Peters**, 2018: Theoretical expressions for the ascent rate of moist deep convective thermals. *J. Atmos. Sci.,* **75.** 1699-1719.

**(14) Peters, J. M.**, E. R. Nielsen, M. D. Parker, S. M. Hitchcock, and R. S. Schumacher, 2017: The impact of low-level moisture errors on model forecasts of an MCS during PECAN. *Mon. Wea. Rev.,* **145.** 3599-3624.

(13) Schumacher, R. S. and **J. M. Peters**, 2017: Near-surface thermodynamic sensitivities in simulated extreme-rain-producing mesoscale convective systems. *Mon. Wea. Rev.,* **145.** 2177-2200.

(12) Nielsen, E. R., G. R. Herman, R. C. Tournay, **J. M. Peters**, and R. S. Schumacher, 2016: Reply to Comments on 'Double Impact: When Both Tornadoes and Flash Floods Threaten the Same Place at the Same Time.' *Wea. Forecasting,* **31.** 1723-1727.

**(11) Peters, J. M.**, 2016: The impact of effective buoyancy and dynamic pressure forcing on vertical velocities within 2 dimensional updrafts. *J. Atmos. Sci.,* **73.** 2531-2551.

**(10) Peters, J. M.** and R. S. Schumacher, 2016: Dynamics Governing a Simulated Mesoscale Convective System with a Training Convective Line. *J. Atmos. Sci.,* **73.** 2643-2664.

(9) Nielsen E. R., G. R. Herman, R. C. Tournay, **J. M. Peters,** and R. S. Schumacher, 2015: Double Impact: When both Tornadoes and Flash Floods Threaten the Same Place at the Same Time. *Wea. Forecasting,* **30.** 1673-1693.

**(8) Peters, J. M.** and R. S. Schumacher, 2015: The Simulated Structure and Evolution of a Quasi-Idealized Warm Season Convective System with a Training Convective Line. *J. Atmos. Sci.,* **72,** 1987-2010.

**(7) Peters, J. M.** and R. S. Schumacher, 2015: Mechanisms for Organization and Echo Training in a Flash-Flood-Producing Mesoscale Convective System. *Mon. Wea. Rev.*, **143,** 1058-1085.

**(6) Peters, J. M.** and P. J. Roebber, 2014: Synoptic Control of Heavy-Rain-Producing Convective Training Episodes. *Mon. Wea. Rev.*, **142**, 2464–2482.

**(5) Peters, J. M.** and R. S. Schumacher, 2014: Objective Categorization of Heavy-Rain-Producing MCS Synoptic Types by Rotated Principal Component Analysis. *Mon. Wea. Rev.*, **142**, 1716–1737.

(4) Wyatt, M. G. and **J. M. Peters,** 2012: A secularly varying hemispheric climate-signal propagation previously detected in instrumental and proxy data not detected in CMIP3 data base. *SpringerPlus.* **68**. 10.1186/2193-1801-1-68. Website: http://dx.doi.org/10.1186/2193-1801-1-68

**(3) Peters, J. M.** and S. Kravtsov, 2012: Origin of Non-Gaussian Regimes and Predictability in an Atmospheric Model. *J. Atmos. Sci.*, **69**, 2587-2599.

**(2) Peters, J. M.**, S. Kravtsov, and N. T. Schwartz, 2012: Predictability Associated with Nonlinear Regimes in an Atmospheric Model. *J. Atmos. Sci.*, **69**, 1137–1154.

(1) Kravtsov, S., I. Kamenkovich, A. M. Hogg, and **J. M. Peters,** 2011: On the mechanisms of late 20th century sea-surface temperature trends over the Antarctic Circumpolar Current. *J. Geophys. Res. Oceans*, **116**, C11034.

**Funding**

| ***Agency*** | ***Project Title*** | ***Role*** | ***Total Funds (PSU/NPS Funds)*** | ***Start*** | ***End*** | ***Status*** |
|---|---|---|---|---|---|---|
| NSF | Processes that regulate vertical accelerations in supercell updrafts | Co-PI | $630,000 | 10/1/19 | 12/31/24 | Currently Funded |
| DOE-ASR | Using ARM observations and large eddy simulations to understand downdrafts in deep convection | PI | $899,000 | 7/1/22 | 5/31/25 | Currently Funded |
| DOE-ASR | Improving Understanding of the Internal Structure and Dynamics of Deep Convection Using ARM Observations and Large Eddy Simulations | Co-PI | $608,918 | 10/1/19 | 12/31/24 | Currently Funded |
| DOE-ASR | AMF3 deployment: Coupled Observational-Modeling Studies of Land-Aerosol-Cloud Interactions in the Southeastern US | Co-I | $3,000,000 | 3/1/20 | 2/28/25 | Currently Funded |
| ONR | California Aircraft Littoral Investigation of Convection over Ocean (CALICO): Observing Shallow Cumuli and Boundary-Layer Interactions for COAMPS Physics Evaluation | Co-PI | $450,000 | 1/1/20 | 12/31/22 | Currently Funded |

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| NSF | Understanding downdrafts in deep convection | PI | $869,434 | 5/1/22 | 4/30/25 | Currently Funded |
| NOAA | Dependence of Simulated MJO Precipitation Maintenance on Convective Processes | Co-PI | $748,583 | 3/1/22 | 2/28/25 | Currently Funded |
| NSF | Improving our understanding of pressure perturbations in cumulus convection | PI | $300,000 | 5/1/19 | 4/30/22 | Past Funding |
| NAVAIR | Populating NOWCAD warfare simulations with atmospheric data, Year 2 | PI | $107,206 | 10/1/18 | 9/30/19 | Past Funding |
| NAVAIR | Populating NOWCAD warfare simulations with atmospheric data, Year 2 | PI | $150,000 | 10/1/19 | 9/30/20 | Past Funding |
| NAVAIR | Populating NOWCAD warfare simulations with atmospheric data, Year 2 | PI | $150,000 | 10/1/20 | 9/30/21 | Past funding |
| NSF | Daytime to Nocturnal Convective Transition in the Central United States | PI | $172,000 | 9/1/15 | 2/18/17 | Past Funding |

NSF: National Science Foundation
NPS: Naval Postgraduate School
NAVAIR: Naval Air Systems Command
DOE-ASR: Department of Energy Atmospheric System Research
ONR: Office of Naval Research
NOAA: National Oceanographic and Atmospheric Association

**Postdoctoral Advisees**

Chun-Yian Su (2022-Present)
Postdoctoral Fellow at PSU

Jake Mulholland (2019-2022) **(currently Assistant Professor at University of North Dakota)**
Initially contracted through the National Research Council (NRC) postdoctoral fellowship program, currently a Research Associate at NPS

**Graduate Student Advisees**

Samuel Brandt (M.S.)
Current PSU student

Laura Helock (M.S.)
Current PSU student

Quinlan Mulhern
Current PSU student

Michael Adamski (M.S.)
Graduated: December 2021
Thesis: Using radio occultation to estimate middle tropospheric moisture uncertainty in the tropics

Christopher Mortenson (M.S.)
Graduated: December 2021
Thesis: Understanding conditions that favor tropical cyclone tornado outbreaks

Allison Pelosi (M.S.)
Graduated: June 2020
Thesis: Comparison and Analysis of Radiation in the Near-Earth Space Environment

Aspen Bess (M.S.)
Graduated: June 2020
Thesis: Determining the relationship between cumulus cloud width and radar reflectivity echo size

Joshua Quinnett (M.S.)
Graduated: December 2019
Thesis: Observational characteristics of lightning events in coastal California

Alanna Youngblood (M.S.)
Anticipated Graduation: December 2019
Thesis: The influence of low-level shear on the upscale growth of supercells into squall lines

Nicholaas Verhoeven (M.S.)
Graduated: June 2019
Thesis: The effect of upper-level shear on entrainment and dilution in simulated squall lines

Sean Caulfield (M.S.)
Graduated: December 2018
Thesis: The response of low-level accelerations in supercell thunderstorms to simultaneous variations in low-level stability and shear

Kira Schlosberg (M.S.)
Graduated: December 2018
Thesis: Synoptic scale conditions leading to lightning events in coastal California

## Teaching Experience

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| Synoptic Meteorology (PSU) | 2023-Present |
| Dynamic Meteorology (NPS) | 2017-Present |
| Mesoscale Meteorology (NPS) | 2018-Present |
| Tropospheric and Stratospheric Meteorology (NPS) | 2018-Present |
| Atmospheric Prediction (NPS) | 2020-Present |

## Field Work and Weather Forecasting Experience

2022: California Aircraft Littoral Investigation of Convection over Ocean (CALICO): Observing Shallow Cumuli and Boundary-Layer

- Will direct Twin-Otter (aircraft) airborne observation missions of the planetary boundary layer in Monterey Bay, combined with ground-based Ka-band radar observations of cloud processes

2016: Verification of the Origins of Rotation in Tornadoes Experiment (VORTEX)-Southeast

- Conducted collaborative research to investigate the meteorological conditions associated with, and societal impacts of, combined tornado and flash flood threats in the southeastern United States

2015: Plains Elevated Convection at Night (PECAN)

- Participated in CSU mobile sounding operations

2014: Front Range Air Pollution and Photochemistry Experiment (FRAPPE)

- Provided nowcasts of Front Range convection for flight operations

2013: Mesoscale Predictability Experiment (MPEX)

- Participated in field operation briefings/forecasts
- Participated in CSU mobile sounding operations from 31 May to 14 June, in coordination with NSSL, Purdue, and Texas A&M mobile teams

2008-2012: Innovative Weather

- Provided short-to-medium range forecasts of severe weather, wind, snow, and rain for various clients in the Midwest
- Provided real-time, high-impact weather coverage for clients
- Mentored interns and employees

## Recent Invited Presentations and Seminars

**Peters, J. M.**, 2021: Controls on the width and rotation of supercell mesocyclones. *Invited seminar, 2021 University of California Davis.*

**Peters, J. M.**, 2021: Controls on the width and rotation of supercell mesocyclones. *Invited seminar, 2021 University of Nebraska.*

**Peters, J. M.**, 2021: What controls entrainment in thunderstorms? *Invited seminar, 2021 ASR Meeting.*

**Peters, J. M.**, 2020: Improving the physical basis for updraft dynamics in deep convection parameterizations. *Invited seminar, Texas A&M University.*

**Peters, J. M.**, 2020: Improving the physical basis for updraft dynamics in deep convection parameterizations. *Invited seminar, 2020 ASR Meeting.*

**Peters, J. M.**, 2019: What makes supercells more intense than ordinary updrafts? *Invited seminar, 18th Conference on Mesoscale Processes. July 2019.*

**Peters, J. M.**, 2019: What makes supercells more intense than ordinary updrafts? *Invited seminar, 99th Annual American Meteorological Society Meeting. January 2019.*

**Peters, J. M.**, 2018: The role of low-level inflow in modulating supercell width and intensity. *NCAR MMM Invited seminar. February 2018.*

**Peters, J. M.**, 2018: Pressure perturbations in cumulus clouds. *University of Utah invited seminar. February 2018.*

**Peters, J. M.**, 2017: Pressure perturbations in cumulus clouds. *Colorado State University Department of Atmospheric Science invited seminar. January 20, 2017.*

**Peters, J. M.**, 2016: Elevated quasi-stationary mesoscale convective systems. *Naval Postgraduate School invited seminar. June 21, 2016.*

**Peters, J. M.**, 2016: Observations of an Elevated MCS environment during the PECAN field campaign. *University of Hawaii at Manoa invited seminar. April 18, 2016.*

**Peters, J. M.**, 2016: Observations of an Elevated MCS environment during the PECAN field campaign. *Texas Tech University invited seminar. April 8, 2016.*

**Peters, J. M.**, 2016: Using relative buoyancy to refine theoretical expressions for 2-dimensional updrafts. *University of Utah invited seminar. February 17, 2016.*

**Peters, J. M.**, 2016: Using relative buoyancy to refine theoretical expressions for 2-dimensional updrafts. *Center for Multiscale Modeling of Atmospheric Processes (CMMAP) meeting, Boulder, CO. January 5, 2016.*

## Other Recent Activities

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| Meteorology Department Academic Associate | 2019-Present |
| NPS Academic Council Member | 2019-Present |
| Associate Editor, Journal of Atmospheric Science | 2021-Present |
| Associate Editor, Monthly Weather Review | 2017-2021 |