

# Matthew B. Wilson

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## Education

Ph.D Meteorology-Climatology (Anticipated May 2023), University of Nebraska-Lincoln,  
Lincoln, NE

M.S. Meteorology-Climatology (August 2019), University of Nebraska-Lincoln,  
Lincoln, NE

B.S Meteorology (May 2017), Valparaiso University, Valparaiso, IN  
Minors in Mathematics and Geographic Information Systems

## Professional Experience

### Research Experience

Graduate Research Assistant, University of Nebraska-Lincoln (Fall 2017-Present)

#### PhD Work (Fall 2019-Present)

- Research focus 1: Conducting a detailed case study of two supercells in close proximity observed by the Targeted Observations by Radars and UAS of Supercells (TORUS) field campaign on 8 June 2019 to examine why one storm was nontornadic and the other cyclically tornadic despite being in an ostensibly similar environment.
- Research focus 2: Determining whether assimilating mobile mesonet, radiosonde, and UAS observations from TORUS into a high-resolution WRF ensemble is useful in improving short-term ensemble forecasts of the 8 June 2019 supercells.

#### M. S. Work (Fall 2017-Summer 2019)

- Designed an automated algorithm to detect and track  $Z_{DR}$  arcs and  $K_{DP}$ - $Z_{DR}$  separation signatures in supercells, available at <https://github.com/mwilson14/ZDRArcAlgorithm>.
- Used this algorithm to examine whether trends in  $Z_{DR}$  arc characteristics and low-level rotation strength are related in a large sample of supercells.
- Compared the evolution of algorithm-detected  $Z_{DR}$  arc characteristics prior to tornadogenesis in tornadic supercells to arc evolution prior to peak strength in nontornadic storms.
- Examined how  $K_{DP}$ - $Z_{DR}$  separation and  $Z_{DR}$  arc characteristics vary with environmental parameters in a large sample of supercells.
- Extended the automated  $Z_{DR}$  arc algorithm to automatically detect other supercell polarimetric signatures, including  $Z_{DR}$  columns and areas of polarimetrically inferred hailfall. Code for the extended algorithm is available here: <https://github.com/mwilson14/SPORK-SPIN>.

#### Unidata Development Intern (Summer 2017)

- Added the capability to calculate a selection of derived indices from a sounding to the Meteorological Python (MetPy) module maintained by Unidata
- Modified the MetPy hodograph plotting code to allow hodograph segments to be colored according to different height levels
- Assisted in troubleshooting existing MetPy code

#### Hollings Intern at NWS Rapid City, SD (Summer 2016)

- Conducted research comparing radar and environmental attributes of tornado and false alarm events in the Rapid City CWA.
- Calculated ideal POD and FAR statistics for the Rapid City CWA after removing low rotational velocity tornadoes from the dataset and examined the geographical distribution of these tornadoes within the CWA.
- Wrote Python scripts to archive and display lightning data from AWIPS II.

#### Texas A&M ATMO Research Experience for Undergraduates (Summer 2015)

- Conducted research on the effectiveness of various aerosols as ice nuclei and the optical properties of the resulting ice crystals
- Used IDL programming for data analysis.
- Gained experience working with various types of field instrumentation during the weeklong REU Field Experience in Galveston, TX.

#### Teaching Experience

##### Instructor of Record for METR 140-Severe and Unusual Weather (UNL, Fall 2022)

- Developed and delivered lectures for a gen-ed class on severe and unusual weather.
- Wrote and graded assignments and exams.

##### 2020 AMS Student Conference Python Workshop Instructor (January 2020)

- Developed and edited educational materials for the workshop
- Taught students how to use basic Python modules, such as numpy, matplotlib, and cartopy, to map and visualize data.

##### Meteorological Computer Applications Lab Aide (VU, MET 330-Fall 2015, Fall 2016)

- Answered questions from students about Python and FORTRAN programming.
- Graded student assignments.

##### Weather Center Tutor (VU, August 2015-May 2016)

- Assisted students with problems in meteorology, math, and physics coursework.

##### Weather Technology Lab Aide (VU, MET 130-Spring 2015)

- Answered questions from students about GEMPAK and Linux computing.
- Graded student assignments.

### Fieldwork Experience

#### Targeted Observations by Radars and UAS of Supercells (TORUS) (May-June 2019 and 2022)

- Served as the mission lead for the Near Inflow UAS team, choosing launch sites and providing situational awareness for the team to collect vertical profiles in the near-inflow region of supercells using RAAVEN UASs and Windsondes.

#### Southern Great Plains (SGP) UAS Intercomparison Project (March-April 2021)

- Operated a UNL Mobile Mesonet (CoMET) vehicle in support of intercomparison flights for various UAS platforms at the Southern Great Plains ARM site in Lamont, OK.
- Contributed to software to quickly visualize and compare data from different UAS platforms.
- Kept careful records of each UNL UAS flight during the experiment.

#### Lower Atmosphere Process Studies at Elevation-a Remotely Piloted Aircraft Team Experiment (LAPSE-RATE) (July 2018)

- Helped the NSSL sounding team launch radiosondes for comparison with boundary-layer profiles collected by remotely-piloted aircraft.

#### National Robotics Institute Severe-storm Targeted Observation and Robotic Monitoring (STORM) Project (May-June 2018)

- Helped operate the UNL Mobile Mesonets (CoMETs) and provided weather support to the University of Colorado Unmanned Aircraft team during operations to collect observations around supercell thunderstorms.

### **Professional Society Memberships**

2015-Present	American Meteorological Society Student Member
2017-Present	University of Nebraska-Lincoln AMS Student Chapter Member
2013-2017	Northwest Indiana AMS/NWA Local Chapter Member

## Leadership

Graduate Student Representative at Earth and Atmospheric Sciences Faculty Meetings (Fall 2021-Spring 2022)

- Provided a graduate student perspective at department faculty meetings
- Kept grad students informed of planned changes in the department

University of Nebraska-Lincoln AMS Student Chapter

- President (August 2018-May 2019)
  - Organized and led chapter meetings and events

Chi Epsilon Pi Meteorology Honor Society-Valparaiso University Chapter

- President (August 2016-May 2017)
  - Led outreach events at local schools, ran organization operations.
- Vice President (August 2015-May 2016)
  - Organized Meteorology Field Day, a major outreach event for local K-12 students to visit Valparaiso University and learn about meteorology.

## Awards, Honors, Scholarships

2021	UNL Earth and Atmospheric Sciences Department Outstanding Graduate Student Award
2018	Nick Wiltgen Meteorology Award--UNL
2016	AMS Werner A. Baum Named Scholarship
2015	Chi Epsilon Pi Meteorology Honors
2015	NOAA Ernest F. Hollings Undergraduate Scholarship
2014	Alpha Lambda Delta Freshman Honors
2013	AMS Freshman Undergraduate Scholarship

## Publications

**Wilson, M. B.** and M.S. Van Den Broeke, 2021: An Automated Python Algorithm to Quantify  $Z_{DR}$  Arc and  $K_{DP}$ - $Z_{DR}$  Separation Signatures in Supercells. *JTECH.*, 38(2), 371-386.

Bunkers, M. J. , **M.B. Wilson**, M.S. Van Den Broeke, and D.J. Healey, 2022: Scan-by-Scan Storm Motion Deviations for Concurrent Tornadic and Nontornadic Supercells. *Weather*

*and Forecasting*, 37(5), 749-770.

**Wilson, M. B.** and M.S. Van Den Broeke: Using the Supercell Polarimetric Observation Research Kit (SPORK) to Examine a Large Sample of Pretornadic and Nontornadic Supercells. *Electronic Journal of Severe Storms Meteorology*, 17(2), 1–38.

### **Conference Presentations**

Wilson, M. B. and A. L. Houston, 2022: Assessing the Value of Assimilating TORUS Observations on Storm-Scale Ensemble Forecasts of Two Supercells on 8 June 2019. *31<sup>st</sup> Conference on Weather Analysis and Forecasting / 27<sup>th</sup> Conference on Numerical Weather Prediction*, Houston, TX (Remote), Amer. Meteor. Soc.,  
<https://ams.confex.com/ams/102ANNUAL/meetingapp.cgi/Paper/396719>

Wilson, M. B. and A. L. Houston, 2022: Environmental Controls on Close Proximity Supercells Observed by TORUS on 8 June 2019. *19<sup>th</sup> Conference on Mesoscale Processes Poster Session*, Houston, TX (Remote), Amer. Meteor. Soc.

Wilson, M. B., N. R. Humrich, and M.S. Van Den Broeke, 2020: The Supercell Polarimetric Observation Research Kit (SPORK): An Automated, Python-Based Algorithm for Examining Supercell Dual-Pol Signatures. *10<sup>th</sup> AMS Symposium on Advances in Modeling and Analysis Using Python*, Boston, MA, Amer. Meteor. Soc.,  
<https://ams.confex.com/ams/2020Annual/meetingapp.cgi/Paper/367028>

Wilson, M. B. and M.S. Van Den Broeke, 2020: An Analysis of ZDR Arc Characteristics in a Large Sample of Supercell Storms. *30<sup>th</sup> Conference on Weather Analysis and Forecasting / 26<sup>th</sup> Conference on Numerical Weather Prediction*, Boston, MA, Amer. Meteor. Soc., <https://ams.confex.com/ams/2020Annual/meetingapp.cgi/Paper/366974>

Wilson, M. B. and M.S. Van Den Broeke, 2019: Developing a Python-Based Algorithm to Identify and Track ZDR Arcs in Supercells. *9<sup>th</sup> AMS Symposium on Advances in Modeling and Analysis Using Python*, Phoenix, AZ, Amer. Meteor. Soc.,  
<https://ams.confex.com/ams/2019Annual/meetingapp.cgi/Paper/352849>

Wilson, M. B. and M.S. Van Den Broeke, 2018: How Well do Z<sub>DR</sub> Arc Metrics Indicate Potential for Strong Low-Level Rotation in Supercells? *29<sup>th</sup> AMS Conference on Severe*

*Local Storms Poster Session, Stowe, VT, Amer. Meteor. Soc.*

Wilson, M. B.; R. M. May; and J. R. Leeman, 2018: Bulk Shear, Supercell Composite, Precipitable Water and More: Exploring MetPy's New CAPE-abilities with an Interactive Sounding Plotter. *8<sup>th</sup> AMS Symposium on Advances in Modeling and Analysis Using Python Poster Session, Austin, TX, Amer. Meteor. Soc.*

Wilson, M. B. and M.J. Bunkers, 2016: Comparing Tornado and False Alarm Events in the Rapid City Forecast Area. *28th AMS Conference on Severe Local Storms Poster Session, Portland, OR, Amer. Meteor. Soc.*

Wilson, M. B., S.D. Brooks, G. Xu, J. Zenker, K. Collier, and the FIN Team, 2016: Examining Ice Nuclei Efficiency and Optical Properties of the Resulting Ice Crystals. *15th Annual American Meteorological Society Student Conference Poster Session, New Orleans, LA, Amer. Meteor. Soc.*