Andrew Mahre

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Advanced Radar Research Center (ARRC)
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EDUCATION

University of Oklahoma, Norman, OK

Doctor of Philosophy, Meteorology — 05/20 (expected)
Research focus: Experimental radar technology applications — *GPA: 3.75*
Dissertation focus: Optimizing the implementation of radar scanning strategies to improve rapid-scan data quality and assess tradeoffs using developed simulators

Master of Science, Electrical and Computer Engineering (ECE) — 05/18
Coursework focus: Weather radar theory/applications, radar signal processing, digital signal processing, digital image processing

Master of Science, Meteorology — 08/16
Thesis focus: High-resolution radar data analysis of cold front structure

University of Texas at Austin, Austin, TX

Bachelor of Science, Honors Physics, *cum laude* — 05/14
B.S. thesis focus: Development of computational model of friction at the atomic level — *GPA: 3.80*

RESEARCH EXPERIENCE

University of Oklahoma, Norman, OK

Graduate Research Assistant: Doctoral Research, Department of Meteorology — 08/16 – Present

- Quantify the benefits of various scan and data processing techniques for a phased array, rapid-scan weather radar
- Analyze the data quality impact of multiple radar scan techniques while improving temporal resolution
- Create/modify multiple radar simulators (C/C++ and MATLAB-based) to test scanning strategies
- Present oral and written quarterly status reports on research progress for funding sponsors

AIR Convective Field Project: Researcher, Driver, & Radar Engineer — 01/15 – Present

- Process and analyze rapid-scan weather radar data for publications, with emphasis on tornado dynamics and radar signatures
- Troubleshoot/operate the radar and provide forecast input via written and oral discussions
- Set up, repair, and maintain RAIDs and Network Attached Storage (NAS) for data storage and processing (total of 148TB across 5 RAIDs)
- Collaborate with researchers from other universities and organizations

Graduate Research Assistant: Master's Research, Department of Meteorology — 08/14 – 08/16

- Obtained data from cold fronts and outflow boundaries using the Atmospheric Imaging Radar (AIR) at high spatial and temporal resolution and analyzed data in MATLAB
- Wrote MATLAB scripts to perform calibration, pulse compression, digital beamforming, and quality control (QC) on raw radar data

- Wrote and successfully defended master's thesis: "Observations of Cold Front Features at High Spatiotemporal Resolution Using the Atmospheric Imaging Radar"

NOAA National Severe Storms Laboratory (NSSL), Norman, OK

Research Experiences for Undergraduates (REU) Intern 05/13 – 07/13

- Used spectral analysis techniques to determine ideal sampling rate for sonic anemometers
- Created quality control algorithm to identify sections of data which could contain instrument error
- Created data analysis program in R and data logging/analysis program in Python

University of Texas at Austin, Austin, TX

Undergraduate Research Assistant: Thesis Research, Department of Physics 08/13 – 05/14

- Created Python-based simulation to model friction at the atomic level to calculate friction coefficients
- Developed graphical user interface (GUI) for simulation using VPython
- Performed statistical analysis of data in R

Undergraduate Research Assistant, Department of Physics 01/11 – 01/13

- Created thin depositions of permalloy and superconducting samples for NMR Force Microscopy
- Repaired and maintained laboratory test equipment, including Electron Gun, Ultra-High Vacuum (UHV) chamber, and NMR spectrometer
- Advised and mentored 8-10 incoming students to Freshman Research Initiative (FRI) program

SKILLS AND PROGRAMMING LANGUAGES

- Research experience in spectral analysis, bistatic/multistatic radar, error analysis and quantification, mathematical optimization, Monte Carlo simulations, parallel computing, time-series analysis, and signal processing algorithms (e.g., digital beamforming, morphological image processing)
- Proficient in MATLAB, Python, R, Linux/Unix (bash), LaTeX, and Microsoft Office
- Experience with C/C++, Fortran, Weather Research and Forecasting (WRF) model, Shell (batch scripting), Github (git), SQL, HTML, CSS, Mathematica, Apache Spark (PySpark API), and VHDL
- Experience in working with large datasets (Big Data) from radar output and computer models, as well as data in .mat, NetCDF, and grib and grib2 formats
- Completed *Introduction to Big Data* and *Scalable Machine Learning* through edX
- Extensive technical writing & presentation experience (15 lead-author conference presentations)
- Conversational level of Spanish

TEACHING/MENTORING EXPERIENCE

- Advisor/mentor for undergraduate student in 2019 REU Internship Program 05/19 – 07/19
- Grader for graduate-level radar theory course 08/17 – 12/17
- Designed hands-on signal processing assignments for graduate-level radar theory course 10/16
- Graduate Teaching Assistant for junior-level Thermodynamics 08/14 – 12/14
- Graduate Teaching Assistant for Orientation to Professional Meteorology 08/14 – 12/14

HONORS AND DISTINCTIONS

- Bullard Dissertation Completion Fellowship 08/19 – 05/20
- 2019 Weathernews (WNI) Scholarship 10/19
- ARRC Student Conference Paper Award 09/19
- 3rd place, AMS Int'l Conf. on Radar Meteorology Student Competition 09/19
- OU Graduate College Robberson Award 12/18
- AMS Phased Array Radar Symposium Travel Award 11/18
- ARRC Student Journal Paper Award (2x) 04/17 & 05/18
- OU Gallogly College of Engineering Conference Grant 02/18
- 1st place, AMS EIPT Student Presentation Competition 01/18
- 1st place, OU Graduate Student Research & Creativity Day 03/16
- Undergraduate degree received with cum laude equivalent 05/14
- Dean's Scholars Honors Program for College of Natural Sciences 08/10 – 05/14
- College of Natural Sciences College Scholar 08/11 – 05/14
- University Honors Distinction 01/11 – 12/13

ACADEMIC SERVICE

- Reviewer, *IEEE Geoscience & Remote Sensing Letters*
- Reviewer, *2019 IEEE Radar Conference*
- Reviewer, *Atmospheric Science Letters*
- Selection Committee Member, *OU REU Internship Program (2019 & 2020)*
- Planning Committee Member, *19th Annual AMS Student Conference*
- Student Competition Judge, *18th Annual AMS Student Conference*
- Student Volunteer/Assistant, *37th AMS Radar Conference*
- Student Volunteer/Assistant, *4th International Symposium on Earth-Science Challenges*

MEMBERSHIPS & COMMUNITY SERVICE

- Institute of Electrical and Electronics Engineers (IEEE), *Student Member* 2016 – Present
- American Meteorological Society (AMS), *Student Member* 2013 – Present
- Country Roads Animal Rescue Society, *Volunteer Dog Foster* 2018
- Society of Physics Students (SPS), *University of Texas Chapter* 2011 – 2014
- Freshman Leadership Organization, *Community Service Committee* 2010 – 2011

PEER-REVIEWED PUBLICATIONS

***Cover/featured article*

Griffin, C. B., D. J. Bodine, J. M. Kurdzo, **A. Mahre**, and R. D. Palmer, 2019: High-temporal Resolution Observations of the 27 May 2015 Canadian, Texas, Tornado Using the Atmospheric Imaging Radar. *Monthly Weather Review*, **147** (3), 873-891.

Mahre, A., J. M. Kurdzo, D. J. Bodine, C. B. Griffin, R. D. Palmer, and T.-Y. Yu, 2018: Analysis of the 16 May 2015 Tipton, Oklahoma, EF-3 Tornado at High Spatiotemporal Resolution Using the Atmospheric Imaging Radar. *Monthly Weather Review*, **146** (7), 2103-2124.

Mahre, A., T.-Y. Yu, R. D. Palmer, and J. M. Kurdzo, 2017: Observations of a Cold Front at High Spatiotemporal Resolution Using an X-Band Phased Array Imaging Radar. *Atmosphere*, **8** (2), 30.

Kurdzo, J. M., F. Nai, D. J. Bodine, T. A. Bonin, R. D. Palmer, B. L. Cheong, J. Lujan, **A. Mahre, and A. D. Byrd, 2017: Observations of Severe Local Storms and Tornadoes with the Atmospheric Imaging Radar. *Bulletin of the American Meteorological Society*, **98** (5), 915-935.

Manuscripts in review:

Mahre, A., T.-Y. Yu, and D. J. Bodine, 2020: A Comparison of Scan Speedup Strategies and Their Effect on Rapid-Scan Weather Radar Data Quality. *Journal of Atmospheric and Oceanic Technology*, **in review**.

Shapiro, A., J. G. Gebauer, N. A. Dahl, D. J. Bodine, **A. Mahre**, and C. K. Potvin, 2020: Spatially Variable Advection Correction of Doppler Radial Velocity Data. *Journal of Atmospheric Science*, **in review**.

Huang, Y., X. Wang, C. Kerr, **A. Mahre**, T.-Y. Yu, and D. Bodine, 2020: Impact of Assimilating Clear-Air Radial Velocity Observations from Phased Array Radar on the Forecasting of Supercell Thunderstorm: An Observing System Simulation Experiment Study. *Monthly Weather Review*, **in review**.

Manuscripts in preparation:

Mahre, A., T.-Y. Yu, D. J. Bodine, and L. Orf, 2020: Assessing the Benefits of a Simulated Rapid-Scan Weather Radar for Severe Storm Observations. *Journal of Atmospheric and Oceanic Technology*, **to be submitted in Spring 2020**.

Mahre, A., T.-Y. Yu, and D. J. Bodine, 2020: An Assessment of Adaptive Scanning for a Simulated Rapid-Scan Weather Radar. *Journal of Atmospheric and Oceanic Technology*, **to be submitted in Spring 2020**.

CONFERENCE PRESENTATIONS

†*Award won*

Mahre, A., T.-Y. Yu, and D. J. Bodine, 2020: A Comparison of Scan Speedup Strategies and their Effect on Rapid-Scan Weather Radar Data Quality. *36^{th} Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Boston, MA, USA, **9B.1**.

Mahre, A., T.-Y. Yu, and D. J. Bodine, 2020: Quantifying the Benefits of a Simulated Rapid-Scan Weather Radar for Severe Storm Observations. *36^{th} Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Boston, MA, USA, **1043**.

Pittman, K., **A. Mahre**, C. B. Griffin, and D. J. Bodine, 2020: Analysis of Tornadogenesis Failure Using Rapid-Scan Data from the Atmospheric Imaging Radar. *Severe Local Storms Symposium, AMS Annual Meeting,* Boston, MA, USA **919**.

Griffin, C. B., D. J. Bodine, **A. Mahre**, and R. D. Palmer, 2020: High-Temporal Resolution Observations of Tornadogenesis Using the Atmospheric Imaging Radar. *Severe Local Storms Symposium, AMS Annual Meeting,* Boston, MA, USA, **918**.

Huang, Y., X. Wang, C. Kerr, **A. Mahre**, T. Y. Yu, and D. J. Bodine, 2020: Impact of Assimilating Clear-Air Radial Velocity Observations on the Forecasting of Supercell Thunderstorm: An Observing System Simulation Experiment Study. *30th Conference on Weather Analysis and Forecasting, AMS Annual Meeting,* Boston, MA, USA, **7A.3**.

†**Mahre, A.**, T.-Y. Yu, and D. J. Bodine, 2019: Assessing the Benefits of a Rapid-Scanning Phased Array Weather Radar. *39th International Conference on Radar Meteorology,* Nara, Japan, **P2.08**.

Griffin, C. B., D. J. Bodine, **A. Mahre**, J. Lujan, J. M. Kurdzo, and R. D. Palmer, 2019: High-Temporal Resolution Observations of Tornadogenesis Using the Atmospheric Imaging Radar. *39th International Conference on Radar Meteorology,* Nara, Japan, **12A.02**.

Shapiro, A., J. G. Gebauer, N. A. Dahl, D. J. Bodine, **A. Mahre**, and C. K. Potvin, 2019: Spatially Variable Advection Correction of Doppler Radial Velocity Data. *39th International Conference on Radar Meteorology,* Nara, Japan, **17A.03**.

Gebauer, J. G., A. Shapiro, C. Potvin, N. Dahl, D. Bodine, **A. Mahre**, M. Biggerstaff, and A. Alford, 2019: Impact of Rapid-Scan Radar Data on Vertical Velocity Retrievals from Dual-Doppler Analysis. *39th International Conference on Radar Meteorology,* Nara, Japan, **P3.51**.

Yu, T.-Y., **A. Mahre**, and D. J. Bodine, 2019: Assessing the Benefits of Rapid Scan for Severe Storm Warning with Multifunction Radar. *41st Photonics and Electromagnetics Research Symposium (PIERS),* Rome, Italy, **3A1.5**.

Mahre, A., T.-Y. Yu, and D. J. Bodine, 2019: Assessment of the Benefits of Rapid Scanning for an MPAR/SENSR System. *35th Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Phoenix, AZ, USA, **7A.2**.

Mahre, A., C. B. Griffin, D. J. Bodine, J. M. Kurdzo, R. D. Palmer, and T.-Y. Yu, 2019: Using the Atmospheric Imaging Radar to Study Vortex Dynamics and Debris Processes. *Phased Array Radar Symposium, AMS Annual Meeting,* Phoenix, AZ, USA, **740**.

Mahre, A., C. B. Griffin, Z. B. Wienhoff, H. B. Bluestein, J. L. Houser, J. C. Snyder, and D. J. Bodine, 2019: A Study on Oscillations in Low-Level Tornado Couplet Intensity. *35th Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Phoenix, AZ, USA, **825**.

Bodine, D. J., J. M. Kurdzo, C. B. Griffin, **A. Mahre**, J. Lujan Jr., R. D. Palmer, T.-Y. Yu, and B. M. Isom, 2019: Overview of the Atmospheric Imaging Radar and Seven Years of Phased Array Radar Field Experiments. *Phased Array Radar Symposium, AMS Annual Meeting,* Phoenix, AZ, USA, **1.5**.

Griffin, C. B., D. J. Bodine, **A. Mahre**, J. M. Kurdzo, J. Lujan Jr., and R. D. Palmer, 2019: High-Temporal Resolution Observations of Tornadogenesis and Tornado Decay Using the Atmospheric Imaging Radar. *Phased Array Radar Symposium, AMS Annual Meeting,* Phoenix, AZ, USA, **736**.

†**Mahre, A.**, T.-Y. Yu, and D. J. Bodine, 2018: Development of Scanning Strategies to Meet Operational Needs of the Multimission Phased Array Radar. *34th Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Austin, TX, USA, **857**.

Mahre, A., J. M. Kurdzo, D. J. Bodine, C. B. Griffin, R. D. Palmer, and T.-Y. Yu, 2018: Analysis of the 16 May 2015 Tipton, Oklahoma EF-3 Tornado at High Spatiotemporal Resolution Using the Atmospheric Imaging Radar. *34th Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Austin, TX, USA, **12.4**.

Griffin, C. B., D. J. Bodine, J. Lujan, **A. Mahre**, J. M. Kurdzo, and R. D. Palmer, 2018: High-Temporal

Resolution Observations from the 2017 Atmospheric Imaging Radar Field Campaign. *19th Symposium on Meteorological Observation and Instrumentation, AMS Annual Meeting,* Austin, TX, USA, **9.7**.

Griffin, C. B., D. J. Bodine, J. M. Kurdzo, **A. Mahre**, and R. D. Palmer, 2018: High-Temporal Resolution Observations from the 27 May 2015 Canadian, Texas, Tornado Using the Atmospheric Imaging Radar. *34th Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Austin, TX, USA, **12.5**.

Mahre, A., J. M. Kurdzo, D. J. Bodine, C. B. Griffin, R. D. Palmer, and T.-Y. Yu, 2017: Analysis of the 16 May 2015 Tipton, Oklahoma EF-3 Tornado at High Spatiotemporal Resolution Using the Atmospheric Imaging Radar. *College of Atmospheric and Geographic Sciences Research Fair,* Norman, OK, USA, **18**.

Mahre, A., J. M. Kurdzo, D. J. Bodine, C. B. Griffin, R. D. Palmer, and T.-Y. Yu, 2017: Analysis of the 16 May 2015 Tipton, Oklahoma EF-3 Tornado at High Spatiotemporal Resolution Using the Atmospheric Imaging Radar. *38th Conference on Radar Meteorology,* Chicago, IL, USA, **142**.

Griffin, C. B., D. J. Bodine, J. M. Kurdzo, **A. Mahre**, and R. D. Palmer, 2017: High-Temporal Resolution Observations of the 27 May 2015 Canadian, Texas Tornado Using the Atmospheric Imaging Radar. *38th Conference on Radar Meteorology,* Chicago, IL, USA, **139**.

Mahre, A., T.-Y. Yu, R. D. Palmer, and J. M. Kurdzo, 2017: Observations of a Cold Front at High Spatiotemporal Resolution Using an X-Band Phased Array Imaging Radar. *33rd Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* Seattle, WA, USA, **8A.1**.

Griffin, C., D. J. Bodine, J. M. Kurdzo, **A. Mahre**, R. D. Palmer, J. Lujan, and A. D. Byrd, 2017: High-Temporal Resolution Observations of Severe Convective Storms Using the Atmospheric Imaging Radar. *Special Symposium on Severe Local Storms: Observation Needs to Advance Research, Prediction, and Communication, AMS Annual Meeting,* Seattle, WA, USA, **929**.

Kurdzo, J. M., D. J. Bodine, **A. Mahre**, F. Nai, C. Griffin, and R. D. Palmer, 2017: Filling the Vertical Gap in Severe Local Storms Research: New Opportunities Using Vertically Continuous Radar Imaging. *Special Symposium on Severe Local Storms: Observation Needs to Advance Research, Prediction, and Communication, AMS Annual Meeting,* Seattle, WA, USA, **925**.

Kurdzo, J. M., **A. Mahre**, D. J. Bodine, R. D. Palmer, and T.-Y. Yu, 2016: X-Band Radar Observations of the 16 May 2015 Tipton, Oklahoma EF3 Tornado using the Atmospheric Imaging Radar. *28th Conference on Severe Local Storms,* Portland, OR, USA, **154**.

Griffin, C. B., D. J. Bodine, J. M. Kurdzo, **A. Mahre**, R. D. Palmer, J. Lujan, and A. D. Byrd, 2016: High-Temporal Resolution Observations of Severe Convective Storms Using the Atmospheric Imaging Radar. *28th Conference on Severe Local Storms,* Portland, OR, USA, **156**.

†**Mahre, A.**, T.-Y. Yu, R. Palmer, and J. Kurdzo, 2016: Observations of Kelvin-Helmholtz Instabilities Behind a Cold Front at High Spatiotemporal Resolution. *OU Graduate Student Research and Creativity Day,* Norman, OK, USA.

Mahre, A., T.-Y. Yu, R. D. Palmer, and J. M. Kurdzo, 2016: A Study of High Temporal and Spatial Resolution RHIs Through Outflow Boundaries and Squall Lines Using the Atmospheric Imaging Radar. *32nd Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* New Orleans, LA, USA, **533**.

Kurdzo, J. M., F. Nai, D. J. Bodine, R. D. Palmer, B. L. Cheong, J. Lujan, **A. Mahre**, and A. D. Byrd, 2016: High-Resolution X-band Volumetric Observations of Spring 2015 Tornadoes with the Atmospheric Imaging Radar. *32nd Conference on Environmental Information Processing Techniques, AMS Annual Meeting,* New

Orleans, LA, USA, **12A.5**.

Kurdzo, J. M., F. Nai, D. J. Bodine, R. D. Palmer, B. L. Cheong, J. Lujan, **A. Mahre**, and A. D. Byrd, 2015: High Temporal and Spatial Resolution X-band Observations of Tornadoes with the Atmospheric Imaging Radar. *4th International Symposium on Earth-Science Challenges (ISEC),* Norman, OK, USA.

Mahre, A., and G. Creager, 2014: Determining the Optimal Sampling Rate of a Sonic Anemometer Based on the Shannon-Nyquist Sampling Theorem. *13th Annual Student Conference, AMS Annual Meeting,* Atlanta, GA, USA, **S164**.

Mahre, A., S. Young, I. Manzanera, and J. T. Markert, 2012: Electron-Beam Deposition of Permalloy onto Cantilevers. *2012 Undergraduate Research Forum,* Austin, TX, USA.