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Matthew A. Miller

Research Focus

I conduct research related to clouds and precipitation. I specialize in mining large remote sensing datasets (100s of TB) to distill new insights impacting weather and climate. I have specialized experience in a variety of skills used in analysis of geospatial remote sensing data including image segmentation, computer vision, self-organizing maps, time series analysis, spectral analysis, feature tracking, and machine learning.

Education

2010	Ph.D.	North Carolina State University	Marine, Earth, and Atmospheric Sciences Dissertation Title: *Satellite observations of low marine clouds*
2008		North Carolina State University	Graduate Certificate in Geographic Information Systems
2007	M.S.	North Carolina State University	Marine, Earth, and Atmospheric Sciences Thesis title: *Evaluation of TRMM satellite precipitation retrievals and satellite-observed characteristics of marine shallow clouds*
2004	B.S.	North Carolina State University	Meteorology Magna Cum Laude Minor: Graphic Communications

Employment

2016-	Senior Research Scholar	North Carolina State University	Raleigh, NC
2011-2016	Postdoc. Research Scholar	North Carolina State University	Raleigh, NC
2010-2010	Research & Lab. Specialist	North Carolina State University	Raleigh, NC
2006-2010	Research Assistant	North Carolina State University	Raleigh, NC
2005-2006	Forecaster	North American Plant Disease Forecast Center	Raleigh, NC

Field Research Experience

2014-	Instrument Supervisor (Multi-angle Snowflake Camera (MASC), Micro Rain Radar (MRR), Snow Pixel, Ceilometers, Sun Scout, surface met.) *NSF sponsored data collection at Stony Brook University; Plymouth, NC*
2019-2023	Mission Scientist, P-3 aircraft scientist, ER-2 aircraft scientist *NASA IMPACTS*
2014	Supervisor and Radar Operator *Radar Observations of Storms for Education*
2008	Ship Doppler Radar Scientist *VAMOS Ocean Cloud Atmosphere Land Study*

Awards and Fellowships

2007-2010 NASA Earth and Space Science Fellowship

Peer-Reviewed Publications

Allen, L. R., S. E. Yuter, M. A. Miller, and L. M. Tomkins, 2023: Objective identification of pressure wave events from networks of 1-Hz high-precision sensors. Submitted to Atmos. Meas. Tech., 7/2023.

Tomkins, L. M., S. E. Yuter, M. A. Miller, and L. R. Allen, 2022: Image muting of mixed precipitation to improve identification of regions of heavy snow in radar data. Atmos. Meas. Tech., DOI: 10.5194/amt-15-5515-2022

Hueholt, D. M., S. E. Yuter, and M. A. Miller, 2022: Revisiting diagrams of ice growth environments. Bull. Amer. Meteor. Soc., DOI: 10.1175/BAMS-D-21-0271.1

Miller, M. A., S.E. Yuter, N. P. Hoban, L. M. Tomkins, and B. A. Colle, 2022: Detecting wave features in Doppler radial velocity radar observations, Atmos. Meas. Tech., DOI: 10.5194/amt-15-1689-2022.

Patel, R. N., S. E. Yuter, M. A. Miller, S. R. Rhodes, L. Bain, and T. Peele, 2021: The Diurnal Cycle of Winter Season Temperature Errors in the Operational Global Forecast System (GFS). Geophys. Res. Lett., DOI: 10.1029/2021GL095101.

Perry, L. Baker, S. E. Yuter, T. Matthews, P. Wagnon, A. Khadka, D. Aryal, D. Shrestha, A. Tait, M. A. Miller, Alex O'Neill, S. R. Rhodes, I. Koch, T. G. Sherpa, S. Tuladhar, S. K. Baidya, S. Elvin, A. C. Elmore, A. Gajurel, P. A. Mayewski, 2020: Direct Observations of a Mt. Everest Snowstorm from the World's Highest Surface-Based Radar Observations, Weather, DOI: 10.1002/wea.3854.

Yuter, S. E., J. D. Hader, M. A. Miller, D. B. Mechem, 2018: Abrupt cloud clearing of marine stratocumulus in the subtropical southeast Atlantic, Science, DOI: 10.1126/science.aar5836.

Mechem, D. B., C. S. Wittman, M. A. Miller, S. E. Yuter, and S. P. deSzoeke, 2018: Joint synoptic and cloud variability over the northeast Atlantic near the Azores. J. Appl. Meteor. Clim., 57, 1273-1290, DOI: 10.1175/JAMC-D-17-0211.1.Wilbanks, M., S. E. Yuter, S. P. deSzoeke, W. A. Brewer, M. A. Miller, A. M. Hall, and C. D. Burleyson, 2015: Near-surface density currents observed in the southeast Pacific stratocumulus-topped marine boundary layer, Mon. Wea. Rev., 143, 3532–3555, doi: 10.1175/MWR-D-14-00359.1.

Wilbanks, M. C., S. E. Yuter, S. P. deSzoeke, W. A. Brewer, M. A. Miller, A. M. Hall, and C. D. Burleyson 2015: Near-surface density currents observed in the southeast Pacific stratocumulus-topped marine boundary layer. Mon. Wea. Rev., 143, 3532-3555.

Wood, R., M. Wyant, C. S. Bretherton, J. Rémillard, P.Kollias, J. Fletcher, J. Stemmler, S. deSzoeke, S. Yuter, M. Miller, D. Mechem, G. Tselioudis, C. Chiu, J. Mann, E. O'Connor, R. Hogan, X. Dong, M. Miller, V. Ghate, A. Jefferson, Q. Min, P.Minnis, R. Palinkonda, B. Albrecht, E. Luke, C. Hannay, Y. Lin, 2015: Clouds, aerosol, and precipitation in the marine boundary layer: An ARM Mobile Facility deployment, Bull. Amer. Met. Soc., 96, 419-440.

Miller, M. A. and S. E. Yuter, 2013: Detection and characterization of drizzle cells within marine stratocumulus using AMSR-E 89 GHz passive microwave measurements. Atmos. Meas. Tech., 6, 1-13, doi:10.5194/amt-6-1-2013.

Yuter, S. E., M. A. Miller, M. D. Parker, P. M. Markowski, Y. Richardson, H.Brooks, and J. M. Straka, 2013:Comment on "Why do tornadoes rest on weekends?" by D. Rosenfeld and T. Bell. J. Geophys. Res., doi:10.1029/2012JD018622.

Miller, M. A., and S. E. Yuter, 2008: Lack of correlation between chlorophyll a and cloud droplet effective radius in shallow marine clouds. Geophys. Res. Lett., 35, L13807, doi:10.1029/2008GL034354.

Conference Presentations, Posters, and Abstracts

Hueholt, D. M., S. E. Yuter, and M. A. Miller, 2024: Diagrams of Ice Growth Diagrams Designed for Educational Use. Abstracts, AMS First Symposium on Cloud Physics, January 2024, Baltimore, MD

Allen, L., S. E. Yuter, M. A. Miller, and L. M. Tomkins, 2023: Characteristics of Observed Surface Pressure Waves (gravity waves) in the Contexts of Storm Structure and Reflectivity Features. Abstracts, AMS 20th Conference on Mesoscale Processes, July 2023, Madison, WI.

Tomkins, L. M., S. E. Yuter and M. A. Miller, 2023: 3D Characteristics of Snow Bands and Implications for Surface Snowfall in Northeast Winter Storms. Abstracts, AMS 20th Conference on Mesoscale Processes, July 2023, Madison, WI.

Miller, M. A., S. E. Yuter, and L. M. Tomkins, 2023: Passive Microwave Observations of Mesoscale Snow Bands from NASA IMPACTS. Abstracts, AMS 20th Conference on Mesoscale Processes, July 2023, Madison, WI.

Kennedy, R., S. E. Yuter and M. A. Miller, 2023: Assessing the Meteorological Skill of the Navy Weather Model (COAMPS). Abstracts, AMS 28th Conference on Numerical Weather Prediction, July 2023, Madison, WI.

Aponte Torres, A., L. Tomkins, S. Yuter, M. Miller, 2023: Advection of Falling Snow Particles by Horizontal Winds within Winter Storms using NASA IMPACTS Airborne Radar Data. Abstracts, AMS Annual Meeting Student Conference, January 2023, Denver, CO.

Crowe, D., L. Allen, S. Yuter, L. Tomkins, and M. Miller, 2023: Airborne Observations of Environments for Ice Growth and Shrinkage in Winter and Summer Storms. Abstracts, AMS Annual Meeting Student Conference, January 2023, Denver, CO.

Fritz, F., S. Yuter, L. Tomkins, R. Kennedy, and M. Miller, 2023: Evaluating Weather Forecasts of Winter Precipitation Start and End Times. Abstracts, AMS Annual Meeting Student Conference, January 2023, Denver, CO.

McLaurin, L., L. Allen, S. Yuter, T. Peele, M. Miller, and L. Tomkins, 2023: Characteristics of Nearby Ice Particles in Winter Storms Sampled During NASA IMPACTS. Abstracts, AMS Annual Meeting Student Conference, January 2023, Denver, CO.

Yuter, S .E, S. R. Rhodes, M.A. Miller, and D. B. Mechem, 2022: Marine stratocumulus cloud liquid water path diurnal and seasonal variations in the southeast Pacific and southeast Atlantic. Abstracts, AGU Fall Meeting, December 2022, Chicago, IL.

McLaurin, L., S. E. Yuter, K. Burris, and M. Miller, 2022: Utilizing hourly weather station data to support pragmatic climate adaptation. Abstracts, KIETS 2022 Climate Leaders Symposium, 10-11 October 2022, Raleigh, NC.

Allen, L. R., S. E. Yuter, D. Crowe and M. A. Miller, 2022: IMPACTS in situ observations in the context of previous field studies and model simulations. NASA IMPACTS Science Team Meeting, 26-28 July 2022, Boulder, CO.

Burris, K., D. S. E. Yuter, M. A. Miller, L. M. Tomkins, and L. R. Allen, 2022: Specialized vertical profiles of winter storms to aid physical interpretation. NASA IMPACTS Science Team Meeting, 26- 28 July 2022, Boulder, CO.

Miller, M. A., 2022: Proposed Updates to Flight Leg Module: Improving aircraft coordination for the 2023 Season. NASA IMPACTS Science Team Meeting, 26-28 July 2022, Boulder, CO.

Tomkins, L. M., S. E. Yuter, A. Aponte-Torres, and M. A. Miller, , 2022: Analysis of ER-2 data to elucidate how the trajectories of ice particles are modified by horizontal air motions and wind shear. NASA IMPACTS Science Team Meeting, 26-28 July 2022, Boulder, CO.

Yuter, S. E., M. A. Miller, L. R. Allen, L. M. Tomkins, and K. D. Burris, 2022: Constraints on interpretation of cause and effect between kinematic and microphysical structures within storms and potential remedies. Abstracts, Richard H. Johnson Symposium, AMS Annual Meeting, January 2022, Houston, TX.

Peters, M. S. E. Yuter, A. Aponte, M. A. Miller, and L. R. Tomkins, 2022: The impacts of different building materials on nearby temperatures in the summer season in Raleigh, NC. Abstracts, AMS Annual Meeting Student Conference, January 2022, Houston, TX.

Allen, L. R., L. M. Tomkins, S. E. Yuter, M. A. Miller, T. Peele, D. Hueholt, and R. Harley, 2021: Ambient environments for ice mass growth and shrinkage in the context of winter storm structure. NASA IMPACTS Science Team Meeting, September 2021, Seattle, WA.

Peele, T., L. R. Allen, S. E. Yuter, R. Harley, D. Hueholt, M. A. Miller, and L. R. Tomkins, 2021: Ice growth environments and snow geometries samples during NASA IMPACTS January-February 2020. NASA IMPACTS Science Team Meeting, September 2021, Seattle, WA.

Allen, L. R., M. A. Miller, S. E. Yuter, L. M. Tomkins, 2021: Analysis of 1 Hz, High Precision Pressure Sensor Data to Identify Gravity Waves. Abstracts, AGU Fall Meeting, December 2021, New Orleans, LA.

Tomkins, L. M., S. E. Yuter, M. A. Miller, M. Petters, L. Allen, A. Aponte-Torres, 2021: Image muting of mixed precipitation to improve identification of regions of heavy snow from radar data. Abstracts, AGU Fall Meeting, December 2021, New Orleans, LA

Patel, Ronak, S. E. Yuter, M. A. Miller, S. R. Rhodes, L. McCarthy, T. Peele, 2020: Frequent GFS Biases in Winter Seasons Surface Forecasts. Abstracts, Unified Forecast System Users' Workshop, July 2020, Virtural.

Rhodes, S., S. E. Yuter, M. A. Miller, R. N. Patel, D. B. Mechem, and L. M. Tomkins, 2019: Large-scale environments associated with marine stratocumulus cloud-eroding boundaries. Abstracts, 18th Conference on Mesoscale Processes, July 2019, Savannah, GA.

Tomkins, L. M., D. B. Mechem, S. R. Rhodes, S. E. Yuter and M. A. Miller, 2019: Exploring mechanisms of stratocumulus clearing over the southeast Atlantic. Abstracts, 18th Conference on Mesoscale Processes, July 2019, Savannah, GA.

Yuter, S. E., D. M. Hueholt, M. A. Miller, P. C. Kennedy, S. R. Rhodes, M. T. Bryant, and R. N. Patel, 2019: Local environments for ice growth in winter storms. Abstracts, 18th Conference on Mesoscale Processes, July 2019, Savannah, GA.

Rhodes, S., L. Hochstatter, M. A. Miller, S. E. Yuter, 2019: Motion characteristics of propagating clouderoding boundaries in the subtropical southeast Atlantic. Abstracts, AMS 18th Annual Student Conference, January 2019, Phoenix, AZ.

Hueholt, D., S. E. Yuter, M. A. Miller, L. Lovell and P. Kennedy, 2019: High-resolution spatial and temporal observations of generating cells and waves in Colorado snowstorms. Abstracts, AMS 18th Annual Student Conference, January 2019, Phoenix, AZ.

Patel, R. N., S. E. Yuter, M. A. Miller, 2019: Variability of the urban heat island in Raleigh, NC. Abstracts, AMS 18th Annual Student Conference, January 2019, Phoenix, AZ.

Tomkins, L. M., D. B. Mechem, S. E. Yuter, M. A. Miller and S. Rhodes, 2019: WRF simulations of episodes of stratocumulus clearing over the southeast Atlantic. Abstracts, AMS Symposium on Aerosol–Cloud–Climate Interactions, January 2019, Phoenix, AZ.

Miller, M.A., N. P. Hoban, and S. E. Yuter, 2018: Detecting waves in Doppler radial velocity observations. Abstracts, AGU Fall 2018 Meeting, 10 Dec 2018, Washington, D.C. https://agu.confex.com/agu/fm18/meetingapp.cgi/Paper/420923

Allen, L. S. E. Yuter, L. Tomkins and M. A. Miller, 2018: Snow band movement and rain occurrence in northeast U.S. winter storms. Abstracts, AMS 17th Annual Student Conference, January 2018, Austin, TX.

Hueholt, D., S. E. Yuter, M. A. Miller, L. Lovell and L. Allen, 2018: Characteristics of temperature inversions in wintery mix precipitation events. Abstracts, AMS 17th Annual Student Conference, January 2018, Austin, TX.

Lovell, L., S. E. Yuter, M.A. Miller and E. Scott, 2018: Snowflake mixtures in coastal northeast United States winter storms. Abstracts, AMS 17th Annual Student Conference, January 2018, Austin, TX.

Miller, M. A., S. E. Yuter, S. Rhodes, E. Scott, L. Lovell, B. A. Colle, L. Allen, M.T. Bryant, D. M. Hueholt and L. M. Tomkins, Complex aggregates within coastal northeast U.S. snow storms. Abstracts, 17th Conference on Mesoscale Processes, 3-6 24-27 July 2017, San Diego, CA.

Yuter, S. E., N. P. Hoban, S. A. Ganetis, M. A. Miller, B. A. Colle, L. M. Tomkins, L. Lovell, E. M. Scott, L. R. Allen, D. M. Hueholt, and M. T. Bryant, 2017: Snow bands and velocity waves within northeast U.S. snow storms. Abstracts, 17th Conference on Mesoscale Processes, 3-6 24-27 July 2017, San Diego, CA.

Hoban, N. P., S. E. Yuter, L. Tomkins, S. A. Ganetis, M. A. Miller, L. Lovell, S. R. Rhodes, E. Scott, and B. A. Colle, 2017: Observed characteristics of mesoscale banding in coastal northeast U.S. snow storms. Abstracts, 28th Conference on Weather Analysis and Forecasting, January 2017, Seattle, WA.

Tomkins, L., N. Hoban, M. Miller and S. Yuter, 2017: Storm-relative movements of mesoscale snow bands within coastal Northeast U.S. storms. Abstracts, AMS 16th Annual Student Conference, January 2017, Seattle, WA.Amanatides, M., S. Berry, N. A. Corbin, J. Endries, M. A. Miller, and S. E. Yuter, 2015: Radar observations of storms for education. Abstracts, 14thAnnual AMS Student Conference, 4 Jan 2015.

Miller, M. A., M. L. Frey, and S. E. Yuter, 2015: Regional and interannual comparisons of marine stratocumulus precipitation detected using an AMSR-E 89-GHz passive microwave based method. Abstracts, 20th Conference on Satellite Meteorology and Oceanography, AMS Annual Meeting, Jan 2015.

Yuter, S. E., N. A. Corbin, M. A. Miller, S. M. Ellis, and P. C. Kennedy, 2015: Radar Observations of Storms for Education: A bridge between idealized conceptual diagrams and real weather. Abstracts, 24th Symposium on Education, AMS Annual Meeting, 4-8 Jan 2015.

Yuter, S. E., N. A. Corbin, M. A. Miller, S. M. Ellis, and P. C. Kennedy, 2015: Radar Observations of Storms for Education: Real storm examples for the mesoscale course classroom. Abstracts, 16th Conference on Mesoscale Processes, 3-6 August 2015, Boston, MA.

Fish, C. S., D. B. Mechem, M. A. Miller, S. E. Yuter, and S. P. de Szoeke, 2013: Quantifying the variability of cloud and synoptic properties over the ARM NEA Azores site. DOE ASR Joint Working Group Meeting, Rockville, MD, Nov. 2013,

Miller, M. A. and S. E. Yuter, 2013: Satellite Context for the Azores: Advection and Evolution. DOE ASR Joint Working Group Meeting, Rockville, MD, Nov. 2013.

Burleyson, C. D, S. E. Yuter, and M. A. Miller, 2012: Observations of cloud fraction variability within southeast Pacific marine stratocumulus clouds. Abstracts, AGU Fall Meeting, Dec 2012.

Frey, M., S. E. Yuter, and M. A. Miller, 2012: Regional comparisons of marine stratocumulus precipitation patterns. Abstracts, AGU Fall Meeting, Dec 2012.

Miller, M. A. and S. E. Yuter: 2010 Satellite Observations of Atypically Thick Low Marine Clouds 35th Annual Climate Diagnostics and Prediction Workshop Raleigh, NC.

Miller, M. A., and S. E. Yuter, 2008: Characteristics of shallow non-precipitating clouds as observed by the Tropical Rainfall Measuring Mission satellite. Abstracts, AGU 2008 Joint Assembly, May 2008, Ft. Lauderdale, FL.

Miller, M. A. and S. E. Yuter, 2008: Spurious precipitation in TMI retrievals within marine stratus. Abstracts, TRMM 3rd NASA/JAXA International Science Conference, February 2008, Las Vegas, NV.

Miller, M. A. and S. Yuter, 2006: Phantom precipitation and other problems in TRMM products. Proceedings, 3rd Workshop on Precipitation Measurements, Melbourne, Australia, 23-27 October 2006, International Precipitation Working Group, 10 pp.

Yuter, S., M. Miller, J. Stout, R. Wood, J. Kwiatkowski, D. Horn, and C. Spooner, 2006: Remaining challenges in satellite precipitation estimation for the Tropical Rainfall Measuring Mission. Preprints, 4th European Conference on Radar in Meteorology and Hydrology. 18-22 September 2006, Barcelona, Spain, 11.6.

Supervisory Experience

I train graduate and undergraduate students in the fundamentals of geospatial data analysis. I also provide research mentorship wherein I advise on methods, interpretation of data, directions of inquiry, and communication of results. I have been a primary research supervisor for 2 graduate students and an ancillary advisor to 8 others since 2010.

Professional Activities

- Reviewer for Atmospheric Chemistry and Physics, Journal of Geophysical Research, Journal of Applied Meteorology and Climatology, Journal of Atmospheric Sciences, and Tellus B
- Member of the American Geophysical Union, American Meteorological Society, and IEEE

Technical Skills

- Expert in the use of Matlab for data exploration, manipulation, fusion, analysis, and visualization
- Expert in the use of ArcGIS for geospatial analysis and model building
- Expert in the use of tools such as Photoshop for raster image manipulation and preparation of publication graphics
- Proficient in the basic aspects of website development, including the principles of HTML, CSS, the implementation of open-source CMS, and the use of Python-based platforms such as Dash
- Proficient in the construction, troubleshooting, and maintenance of computer workstations and large-scale storage (hundreds of TBs) servers
- Productive in the use of Python and Python-based web frameworks such as Plotly/Dash combined with MySQL to analyze and visualize geospatial data

Funding and Proposal Writing

I am currently a co-investigator on a grant from the Office of Naval research. The research goal is to use a relational database of matched observations and model forecasts at locations around the world to characterize the performance of the Navy's weather models compared to NOAA models and to identify processes within the models that most need refinement. This 3-year grant totals $461,021.

I was a co-investigator on a grant from Delta Airlines via an NCSU mater research agreement. The research goal is to develop a web-based dashboard to communicate past, current, and forecast model trends and biases to aviation forecasters. This 18-month contract totaled $262,000.

I have been a consultant for the North Carolina State Climate Office. I have performed data aggregations and comparisons of model reanalysis and climate observations dataset including GHCN, ERA-Interim, and ERA5. This work is performed at the request of the Climate Office at a daily rate. To date this work has totaled approximately $8,100.

I was a co-investigator on a NASA grant (NNH12ZDA001N) via subcontract with Stony Brook University where I was responsible for feature-tracking based analysis of pre-convective cloud elements from the GOES-R satellite. This 3-year subcontract totaled $90,000.

I was the primary author for the fellowship application to the NASA Earth and Space Science Fellowship in 2007. That fellowship application was successful and $83,960 was awarded.

I am named as senior personnel and have made major contributions to 3 current projects and 3 completed projects to NSF, NASA, and DOE. The combined awarded amount of these proposals is in excess of $2,368,000.

I was the primary author of two grant proposals to the NOAA CSTAR program in 2013 and in 2016. I was the primary author of a whitepaper proposal for the NCSU Laboratory for Analytic Sciences in 2016. I was the primary author of a grant proposal to NASA in 2022. These proposals were not funded.

I have made major contributions to 7 additional grant proposals where I am listed as senior personnel that were not funded.

Teaching Experience

Instructor	MEA 135: Introduction to Weather and Climate Lab Introductory course for non-majors	3 sections
Lab Instructor	MEA 213: Fundamentals of Meteorology I Introductory course for freshman meteorology majors	1 section
Guest Lecturer	MEA 215: Introduction to Atmospheric Sciences Undergraduate-level course for first-semester atmospheric science majors Lecture topics: atmospheric moisture	
Guest Lecturer	MEA 511: Introduction to Meteorological Remote Sensing Graduate-level course on remote sensing Lecture topics: Radar hardware and system design principles	
Guest Lecturer	MEA 593o: Introduction to Remote Sensing Graduate-level course on remote sensing Lecture topics: Satellite orbits, satellite precipitation measurement, and lidar	
Guest Lecturer	MEA 591: Remote Sensing of Earth Systems Graduate-level course on remote sensing Lecture topics: Passive microwave measurement of precipitation	