

College of Engineering, Computing and Applied Sciences

RESUME – Andrew R. Metcalf

PERSONAL DATA

Associate Professor
Department of Environmental Engineering and Earth Sciences
Clemson University
Clemson, SC 29634
864-656-0464

EDUCATION

Ph.D., California Institute of Technology, 2012, Environmental Science and Engineering
M.S., California Institute of Technology, 2007, Environmental Science and Engineering
M.S., The Pennsylvania State University, 2005, Meteorology
B.S., The Pennsylvania State University, 2005, Meteorology

PROFESSIONAL EXPERIENCE

Clemson University, 2023- , Associate Professor
2017-2023, Assistant Professor
University of Minnesota, 2013-2017, Postdoctoral Associate
2014-2016, NSF-AGS Postdoctoral Fellow
Sandia National Laboratories, 2012-2013, Postdoctoral Appointee

MEMBERSHIPS

Member, The Combustion Institute (2024-)
Member, Association of Environmental Engineering & Science Professors, AEESP (2018-)
Member, Air & Waste Management Association, A&WMA (2018-)
Member, American Chemical Society, ACS (2016-)
Member, American Association for the Advancement of Science, AAAS (2015-)
Member, American Physical Society - Division of Fluid Dynamics, APS – DFD (2013-)
Member, American Association for Aerosol Research, AAAR (2007-)
Member, American Geophysical Union, AGU (2003-)
Member, American Meteorological Society, AMS (2003-)

PROFESSIONAL ACTIVITIES

AAAR Atmospheric Aerosols Working Group Chair (2023-2024)

Elected by AAAR membership, served as Vice Chair in 2022-2023. Chairs and Vice Chairs work together to organize abstracts submitted to the AAAR annual conference, assign platform and poster presentations, and find sessions chairs for the conference.

AAAR Posters Sub-committee Chair (2022-2023)

Co-led the Student Poster Competition at the annual AAAR conference in October 2022 and October 2023, which included organizing a new initiative, the Student Oral Presentation Competition. After being Chair, I am petitioning the AAAR Board for funds to make these awards more permanent in the association.

AAAR Education Committee Member (2021-)

Nominated by current Education Committee members and appointed to the Committee by the AAAR Vice President for a 3-year term.

AAAR Education Committee Chair (2023-)

AAAR Working Groups Member (2015-)

*Instrumentation
Atmospheric Aerosols*

PUBLICATIONS (* = student advised at Clemson University)

Refereed Journal Publications

*Bao, J., Kaye, N. B., Mousavi, E., Post, C., Bhattacharya, A., Nikoopayan Tak, M. S., Merritt, J., and Metcalf, A. R., "On the Tradeoff between Controlling Particulate Matter or Carbon Dioxide to Improve Indoor Air Quality," *Indoor Environments*, under review.

McCracken, T., Chen, P., Metcalf, A., and Fan, C., "Quantifying the Impacts of Canadian Wildfires on Regional Air Pollution Networks," *Science of the Total Environment*, **928**, 172461, (2024). Impact factor 10.753.

Xia, Y., McCracken, T., Liu, T., Chen, P., Metcalf, A., and Fan, C., "Understanding Disparities of PM_{2.5} Air Pollution in Urban Areas via Deep Support Vector Regression," *Environmental Science & Technology*, **58**(19), 8404-8416, (2024). Impact factor 11.4.

Nikoopayan Tak, M. S., Bhattacharya, A., Metcalf, A. R., and Mousavi, E. S., "Cleanroom air quality: combined effects of ventilation rate and filtration schemes in a laboratory cleanroom," *Building Research & Information*, **51**:6, 717-729, (2023). Impact factor 4.799.

*Van Valkinburgh, K., Mohammadi Nafchi, A., Mousavi, E., Blouin, V., Kaye, N., and Metcalf, A.R., "Assessing Mitigation Strategies to Reduce Potential Exposures to Indoor Particle Release Events," *Aerosol and Air Quality Research*, **22**(9), 220054, (2022). Impact factor 4.530.

*Roberts, F. A., *Van Valkinburgh, K., Green, A., Post, C., Mikhailova, E., Commodore, S., Pearce, J. L., and Metcalf, A. R., "Evaluation of a New Low-Cost Particle Sensor as an Internet-of-Things Device for Outdoor Air Quality Monitoring," *Journal of the Air & Waste Management Association*, **72**(11), 1219-1230, (2022). Impact factor 2.636.

Mohammadi Nafchi, A., Blouin, V., Kaye, N., Metcalf, A., *Van Valkinburgh, K., and Mousavi, E., “Room HVAC influences on the removal of airborne particulate matter: Implications for school reopening during the COVID-19 pandemic,” *Energies*, **14**(22), (2021). Impact factor 3.252.

Commodore, S., Metcalf, A., Post, C., Watts, K., Reynolds, S., and Pearce, J. “A Statistical Calibration Framework for Improving Non-Reference Method Particulate Matter Reporting: A Focus on Community Air Monitoring Settings,” *Atmosphere*, **11**, 807, (2020). Impact factor 3.110.

Schulze, B. C., Charan, S. M., Kenseth, C. M., Kong, W., Bates, K. H., *Williams, W., Metcalf, A. R., Jonsson, H. H., Woods, R., Sorooshian, A., Flagan, R. C., and Seinfeld, J. H. “Characterization of aerosol hygroscopicity over the Northeast Pacific: Impacts on prediction of CCN and stratocumulus cloud droplet number concentrations,” *Earth and Space Science*, **7**(7), (2020). Impact factor 3.680.

Bhattacharya, A., Mousavi, E. S., Metcalf, A. R., and *Mohammadi Nafchi, A. “Particle dispersion in cleanrooms: Effects of pressurization, door opening, and traffic flow – A case study,” *Building Research & Information*, **49**(3), (2020). Impact factor 4.799.

Abell, J. T., Pullen, A., Lebo, Z. J., Kapp, P., Gloege, L., Metcalf, A. R., Nie, J., and Winckler, G., “A wind-albedo-wind feedback driven by landscape evolution,” *Nature Communications*, **11**, 96 (2020). Impact factor 17.694.

Sorooshian, A., MacDonald, A. B., Dadashazar, H., Bates, K. H., Coggon, M. M., Craven, J. S., Crosbie, E., Hersey, S. P., Hodas, N., Lin, J. J., Marty, A. N., Maudlin, L. C., Metcalf, A. R., Murphy, S. M., Prabhakar, G., Rissman, T. A., Shingler, T., Varutbangkul, T., Wang, Z., Woods, R. K., Chuang, P. Y., Nenes, A., Jonsson, H. H., Flagan, R. C., and Seinfeld, J. H., “A multi-year data set on aerosol-cloud-precipitation-meteorology interactions for marine stratocumulus clouds,” *Scientific Data*, **5**, 180026 (2018). Impact factor 8.501.

Metcalf, A. R., Narayan, S., and Dutcher, C. S., “A review of microfluidic concepts and applications for atmospheric aerosol science,” *Aerosol Science & Technology*, **52**(3), 310–329 (2017). Impact factor 4.809.

Prior to Clemson

Zhang, X., Kim, H., Parworth, C. L., Young, D. E., Zhang, Q., Metcalf, A. R., and Cappa, C. D., “Optical properties of wintertime aerosols from residential wood burning in Fresno, CA: Results from DISCOVER-AQ 2013,” *Environmental Science and Technology*, **50**(4), 1681–1690 (2016).

Metcalf, A. R., Boyer, H. C., and Dutcher, C. S., “Interfacial tensions of aged organic aerosol particle mimics using a biphasic microfluidic platform,” *Environmental Science and Technology*, **50**(3), 1251–1259 (2016).

Jung, E., Albrecht, B. A., Jonsson, H. H., Chen, Y.-C., Seinfeld, J. H., Sorooshian, A., Metcalf, A. R., Song, S., Fang, M., and Russell, L. M., “Precipitation effects of giant cloud condensation nuclei artificially introduced into stratocumulus clouds,” *Atmospheric Chemistry and Physics*, **15**, 5645–5658 (2015).

Coggon, M. M., Sorooshian, A., Wang, Z., Craven, J. S., Metcalf, A. R., Lin, J. J., Nenes, A., Jonsson, H. H., Flagan, R. C., and Seinfeld, J. H., “Observations of continental biogenic impacts on marine aerosol and clouds off the coast of California,” *Journal of Geophysical Research: Atmospheres*, **119**(11), 6724–6748 (2014).

Fast, J. D., Allan, J., Bahreini, R., Craven, J. S., Emmons, L., Ferrare, R. A., Hayes, P. L., Hodzic, A., Holloway, J., Hostetler, C. A., Jimenez, J. L., Jonsson, H., Liu, S., Liu, Y., Metcalf, A. R., Middlebrook, A., Novak, J., Pekour, M., Perring, A., Russell, L., Sedlacek, A., Seinfeld, J., Setyan, A., Shilling, J., Shrivastava, M., Springston, S., Song, C., Subramanian, R., Taylor, J. W., Vиноj, V., Yang, Q., Zaveri, R. A., and Zhang, Q., “Modeling regional aerosol and aerosol precursor variability over California and its sensitivity to emissions and long-range transport during the 2010 CalNex and CARES campaigns,” *Atmospheric Chemistry and Physics*, **14**, 10013–10060 (2014).

Craven, J. S., Metcalf, A. R., Bahreini, R., Middlebrook, A., Hayes, P. L., Duong, H. T., Sorooshian, A., Jimenez, J. L., Flagan, R. C., and Seinfeld, J. H., “Los Angeles Basin airborne organic aerosol characterization during CalNex,” *Journal of Geophysical Research: Atmospheres*, **118**(19), 11,453–11,467 (2013).

Russell, L. M., Sorooshian, A., Seinfeld, J. H., Albrecht, B. A., Nenes, A., Ahlm, L., Chen, Y.-C., Coggon, M., Craven, J. S., Flagan, R. C., Frossard, A. A., Jonsson, H., Jung, E., Lin, J. J., Metcalf, A. R., Modini, R., Mülmenstädt, J., Roberts, G. C., Shingler, T., Song, S., Wang, Z., and Wonaschütz, A., “Eastern Pacific Emitted Aerosol Cloud Experiment (E-PEACE),” *Bulletin of the American Meteorological Society*, **94**, 709–729 (2013).

Hersey, S. P., Craven, J. S., Metcalf, A. R., Lin, J., Lathem, T., Suski, K. J., Cahill, J. F., Duong, H. T., Sorooshian, A., Jonsson, H. H., Shiraiwa, M., Zuend, A., Nenes, A., Prather, K. A., Flagan, R. C., and Seinfeld, J. H., “Composition and hygroscopicity of the Los Angeles Aerosol: CalNex,” *Journal of Geophysical Research*, **118**(7), 3016–3036 (2013).

Ensberg, J. J., Craven, J. S., Metcalf, A. R., Allan, J. D., Angevine, W. M., Bahreini, R., Brioude, J., Cai, C., Coe, H., de Gouw, J. A., Ellis, R. A., Flynn, J. H., Haman, C. L., Hayes, P. L., Jimenez, J. L., Lefer, B. L., Middlebrook, A. M., Murphy, J. G., Neuman, J. A., Nowak, J. B., Roberts, J. M., Stutz, J., Taylor, J. W., Veres, P. R., Walker, J. M., and Seinfeld, J. H., “Inorganic and black carbon aerosols in the Los Angeles Basin during CalNex,” *Journal of Geophysical Research*, **118**(4), 1777–1803 (2013).

Metcalf, A. R., Loza, C. L., Coggon, M. M., Craven, J. S., Jonsson, H. H., Flagan, R. C., and Seinfeld, J. H., “Secondary organic aerosol coating formation and evaporation: Chamber studies using black carbon seed aerosol and the single-particle soot photometer,” *Aerosol Science and Technology*, **47**, 326–347 (2013).

Coggon, M. M., Sorooshian, A., Wang, Z., Metcalf, A. R., Frossard, A. A., Lin, J. J., Craven, J. S., Nenes, A., Jonsson, H. H., Russell, L. M., Flagan, R. C., and Seinfeld, J. H., “Ship impacts on the marine atmosphere: insights into the contribution of shipping emissions to the properties of marine aerosol and clouds,” *Atmospheric Chemistry and Physics*, **12**, 8439–8458 (2012).

Shingler, T., Dey, S., Sorooshian, A., Brechtel, F. J., Wang, Z., Metcalf, A., Coggon, M., Mülmenstädt, J., Russell, L. M., Jonsson, H. H., and Seinfeld, J. H., “Characterization

and airborne deployment of a new counterflow virtual impactor inlet,” *Atmospheric Measurement Techniques*, **5**, 1259–1269 (2012).

Metcalf, A. R., Craven, J. S., Ensberg, J. J., Brioude, J., Angevine, W., Sorooshian, A., Duong, H. T., Jonsson, H. H., Flagan, R. C., and Seinfeld, J. H., “Black carbon aerosol over the Los Angeles Basin during CalNex,” *Journal of Geophysical Research*, **117**(D21), D00V13 (2012).

Duong, H. T., Sorooshian, A., Craven, J. S., Hersey, S. P., Metcalf, A. R., Zhang, X., Weber, R. J., Jonsson, H., Flagan, R. C., and Seinfeld, J. H., “Water-soluble organic aerosol in the Los Angeles Basin and outflow regions: airborne and ground measurements during the 2010 CalNex field campaign,” *Journal of Geophysical Research*, **116**(D21), D00V04 (2011).

Wonaschütz, A., Hersey, S. P., Sorooshian, A., Craven, J. S., Metcalf, A. R., Flagan, R. C., and Seinfeld, J. H., “Impact of a large wildfire on water-soluble organic aerosol in a major urban area: the 2009 Station Fire in Los Angeles County,” *Atmospheric Chemistry and Physics*, **11**, 8257–8270 (2011).

Hersey, S. P., Craven, J. S., Schilling, K. A., Metcalf, A. R., Sorooshian, A., Chan, M. N., Flagan, R. C., and Seinfeld, J. H., “The Pasadena Aerosol Characterization Observatory (PACO): chemical and physical analysis of the Western Los Angeles basin aerosol,” *Atmospheric Chemistry and Physics*, **11**, 7417–7443 (2011).

Ren, X., Brune, W. H., Mao, J., Mitchell, M. J., Leshner, R. L., Simpas, J. B., Metcalf, A. R., Schwab, J. J., Cai, C., Li, Y., Demerjian, K. L., Felton, H. D., Boynton, G., Adams, A., Perry, J., He, Y., Zhou, X., and Hou, J., “Behavior of OH and HO₂ in the winter atmosphere in New York City,” *Atmospheric Environment*, **40**, S252–S263 (2006).

Ren, X., Brune, W. H., Olinger, A., Metcalf, A. R., Simpas, J. B., Shirley T., Schwab, J. J., Bai, C., Roychowdhury, U., Li, Y., Cai, C., Demerjian, K. L., He, Y., Zhou, X., Gao, H., and Hou, J., “OH, HO₂, and OH reactivity during the PMTACS-NY Whiteface Mountain 2002 campaign: observations and model comparison,” *Journal of Geophysical Research*, **111**(D10), D10S03 (2006).

Ren, X., Brune, W. H., Cantrell, C. A., Edwards, G. D., Shirley, T., Metcalf, A. R., and Leshner, R. L., “Hydroxyl and peroxy radical chemistry in a rural area of Central Pennsylvania: observations and model comparisons,” *Journal of Atmospheric Chemistry*, **52**, 231–257 (2005).

Ren, X., Edwards, G. D., Cantrell, C. A., Leshner, R. L., Metcalf, A. R., Shirley, T., and Brune, W. H., “Intercomparison of peroxy radical measurements at a rural site using laser-induced fluorescence and Peroxy Radical Chemical Ionization Mass Spectrometer (PerCIMS) techniques,” *Journal of Geophysical Research*, **108**(D19), 4605 (2003).

Other Scholarly Publications

Metcalf, A. R., “Exploring Atmospheric Soot to Protect People and the Planet,” *Scientia*, (October 2021).

PRESENTATIONS (* = student advised at Clemson University)

*Garity, R., Metcalf, A. R., “Sea Salt Aerosols’ Impacts on Climate, Air Quality, and the Built Environment,” 27th Annual Allen Weber Mini-Technical Conference, Palmetto Chapter of the American Meteorological Society, Columbia, SC (March 2024).

Metcalf, A. R., *Henry, J., *Wang, D., “An NSF User Facility for Measuring Soot Aerosol,” Eastern State Section of the Combustion Institute Spring 2024 Conference, Athens, GA (March 2024).

Metcalf, A. R., *Henry, J., “Hands-on Experience with Advanced Instrumentation: A User Facility for Research, Education, and Outreach,” American Meteorological Society 104th Annual Meeting, Baltimore, MD (January 2024).

Metcalf, A. R., *Henry, J., “A New Framework for Utilizing Instrumentation in the Atmospheric Sciences: A User Facility for Research, Education, and Outreach,” American Geophysical Union Fall Meeting, San Francisco, CA (December 2023).

Witte, M., Bahreini, R., Bucholtz, A., Chuang, P. Y., Collins, D., Metcalf, A. R., Welp, L. R., Han, M., Leandro, M. D., MacDonald, A. B., Ries, B., Bollinger, S., *Wang, D., “In situ sampling of aerosol-cloud interactions during the Southern California Interactions of Low cloud and Land Aerosol (SCILLA) airborne experiment,” American Geophysical Union Fall Meeting, San Francisco, CA (December 2023).

McCracken, T., Chen, P., Metcalf, A. R., Fan, C., “Canadian Wildfire’s Influence on Air Pollution Dynamics via Complex Network Analysis,” American Geophysical Union Fall Meeting, San Francisco, CA (December 2023).

*Bao, J., Kaye, N., Mousavi, E., Post, C., Blouin, V., Metcalf, A., “Assessing Ventilation and Filtration Performance to Improve Indoor Air Quality in an Older Educational Building,” American Association for Aerosol Research 41st Annual Conference, Portland, OR (October 2023).

*Garity, R., *Bao, J., Metcalf, A., “Improving Industrial Air Quality: Modeling, Monitoring, and Use of Low-Cost Sensors,” American Association for Aerosol Research 41st Annual Conference, Portland, OR (October 2023).

Metcalf, A. R., *Wang, D., “Characterizations of Black Carbon Aerosols from Southeast U.S. Prescribed Fires and Western U.S. Wildfires,” American Association for Aerosol Research 41st Annual Conference, Portland, OR (October 2023).

*Wang, D., Ries, B., Han, M., MacDonald, A. B., Collins, D., Bahreini, R., Chuang, P., Welp-Smith, L., Witte, M., Metcalf, A., “Black Carbon Aerosols and Aerosol-Cloud Interactions over the Northeastern Pacific Ocean,” American Association for Aerosol Research 41st Annual Conference, Portland, OR (October 2023).

Xu, T., Shin, N., Liang, Y., Bai, B., *Wang, D., Allen, J., Poland, R., McQueen, Z., El Hajj, O., Glenn, C., Kumar, K., Anosike, A., O’Brien, J., Metcalf, A., Smith, G., Saleh, R., Liu, P., Ng, N. L., “Effects of Dilution on Biomass Burning Aerosol: Evaporation of Primary Organic Aerosol (BBPOA) and Subsequent Formation of Secondary Organic Aerosol (BBSOA),” American Association for Aerosol Research 41st Annual Conference, Portland, OR (October 2023).

Metcalf, A. R., “An NSF User Facility for Measuring Black Carbon Aerosol - Filling in Gaps in Air Quality Monitoring,” Gordon Research Conference on Atmospheric Chemistry, Newry, ME (August 2023).

*Wang, D., El Hajj, O., Glenn, C., McQueen, Z., Allen, J., Smith, G., Saleh, R., Metcalf, A. R., Henry, J., “Characterizations of Black Carbon Aerosols from Prescribed and Laboratory Fires in the Southeast US,” 13th International Conference on Carbonaceous Particles in the Atmosphere, Berkeley, CA (July 2023).

Metcalf, A. R., *Henry, J., “An NSF User Facility for Measuring Black Carbon Aerosol for Research and Education,” 13th International Conference on Carbonaceous Particles in the Atmosphere, Berkeley, CA (July 2023).

*Garity, R., *Henry, J., Metcalf, A. R., Saylor, J. R., Kaye, N., Rangaraju, P., Suffield, S. R., “CFA-22-26530: Quantifying Aerosol Deposition Mechanisms in Model Dry Cask Storage Systems,” DOE Annual Meeting on Spent Fuel and Waste Science and Technology (SFWST), Las Vegas, NV (June 27, 2023).

Metcalf, A. R., “Understanding Air Quality in the In-Between Places,” ASCENT Workshop, Atlanta, GA (May 25, 2023).

Metcalf, A. R., *Wang, D., *Garity, R., *Roberts, F. A., “The Influence of Black Carbon Aerosols from Prescribed Fires on Regional Air Quality in the Southeast US,” American Meteorological Society 103rd Annual Meeting, Denver, CO (January 2023).

*Roberts, A., Metcalf, A., Post, C., “On the Coordination of Low-Cost Particulate Matter Sensors, Satellite-Based Remote Sensing Measurements, and Ground-Truth Reference Monitors to Monitor Air Quality for Regulatory Purposes,” American Meteorological Society 103rd Annual Meeting, Denver, CO (January 2023).

Emerson, E., Patterson, K., Freer, M., Swanson, B., Metcalf, A., Perkins, R., Creamean, J., DeMott, P. McMeeking, G., “A Continuous-Flow Microfluidic Based Instrument for Measuring Ice Nucleating Particles,” American Meteorological Society 103rd Annual Meeting, Denver, CO (January 2023).

Metcalf, A. R., *Henry, J., “Communicating Highly Specialized Aerosol Measurement Techniques with Non-scientists to Encourage Increased STEM Participation,” American Geophysical Union Fall Meeting, Chicago, IL (December 2022).

*Wang, D., Metcalf, A. R., “The Influence of Black Carbon Aerosols from Prescribed Fires on Regional Air Quality in the Southeast US,” American Geophysical Union Fall Meeting, Chicago, IL (December 2022).

Emerson, E., Patterson, K., Freer, M., Swanson, B., Metcalf, A., Perkins, R., Creamean, J., DeMott, P. McMeeking, G., “A Continuous-Flow Microfluidic Based Instrument for Measuring Ice Nucleating Particles,” Joint ARM User Facility and ASR PI Meeting, Rockville, MD (October 2022).

*Henry, J., *Wang, D., Metcalf, A. R., “Calibration of a Single-Particle Soot Photometer with Different Soot Surrogates,” American Association for Aerosol Research 40th Annual Conference, Raleigh, NC (October 2022).

*Bao, J., Kaye, N., Mousavi, E., Post, C., Blouin, V., Metcalf, A., “Assessing Indoor Air Quality in Educational Buildings Using a Low-Cost Sensor Network,” American Association for Aerosol Research 40th Annual Conference, Raleigh, NC (October 2022).

Emerson, E., Patterson, K., Freer, M., Swanson, B., Metcalf, A., Perkins, R., Creamean, J., DeMott, P. McMeeking, G., “A Continuous-Flow Microfluidic Based Instrument for Measuring Ice Nucleating Particles,” American Association for Aerosol Research 40th Annual Conference, Raleigh, NC (October 2022).

*Roberts, A., Post, C., Metcalf, A., “The Use of Federal Reference Sensors, Satellite-Based Instrument Measurements, and Low-Cost Sensors for Temporal and Spatial Analysis of Air Quality in South Carolina,” American Association for Aerosol Research 40th Annual Conference, Raleigh, NC (October 2022).

*Wang, D., *Garity, R., Metcalf, A., “The Influence of Black Carbon Aerosols from Prescribed Fires on Regional Air Quality in the Southeast US,” American Association for Aerosol Research 40th Annual Conference, Raleigh, NC (October 2022).

Emerson, E., Patterson, K., Freer, M., Swanson, B. E., Metcalf, A. R., Perkins, R. J., Creamean, J., DeMott, P. J., McMeeking, G. R., “A New Continuous Flow Microfluidic Device for Measuring Ice Nucleating Particles (COSMIC),” American Meteorological Society Collective Madison Meeting, Madison, WI (August 2022).

*Sarwar, N., *Wang, D., *Williams, W., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A. R., “Wildfire Aerosol–Cloud Interactions over the Eastern North Pacific Ocean,” 14th Symposium on Aerosol-Cloud-Climate Interactions at American Meteorological Society 102nd Annual Meeting, online, (January 2022).

*Sarwar, N., *Wang, D., *Williams, W., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A. R., “Airborne Characterization of Wildfire Influence on Air Quality and Clouds in California,” American Geophysical Union Fall Meeting, New Orleans, LA (December 2021).

Emerson, E. W., Freer, M., Swanson, B., Perkins, R., Levin, E., Metcalf, A., McMeeking, G. R., “A Continuous Microfluidic Ice Nucleating Particle Counter for Ambient Measurements,” American Association for Aerosol Research 39th Annual Conference, online (October 2021).

*Roberts, A., *Van Valkinburgh, K., Post, C., Pearce, J., Mikhailova, E., Metcalf, A., “Evaluation of a New Low-Cost Particle Sensor as an IoT Device for Indoor and Outdoor Particulate Matter Monitoring,” American Association for Aerosol Research 39th Annual Conference, online (October 2021).

*Sarwar, N., *Wang, D., *Williams, W., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A. R., “Black Carbon Aerosol-Cloud Effects over the Eastern North Pacific Ocean,” American Association for Aerosol Research 39th Annual Conference, online (October 2021).

*Van Valkinburgh, K., Mohammadi Nafchi, A., Kaye, N., Mousavi, E., Blouin, V., Metcalf, A., “Assessing Mitigation Strategies to Reduce Potential Exposures to Indoor Particle Release Events,” American Association for Aerosol Research 39th Annual Conference, online (October 2021).

*Roberts, F. A., Metcalf, A., “Developing a High Resolution Low-cost Sensor Network to Better Understand Local Particulate Matter (PM) Concentrations and Refine Satellite-based Measurements of PM in SC,” Air & Waste Management Association’s Conference on Atmospheric Optics: Aerosols, Visibility, and the Radiative Balance, Bryce Canyon, UT (October 2021).

Emerson, E., Freer, M., Hodshire, A., Joyce, R., McMeeking, G., Swanson, B., Metcalf, A., DeMott, P., Perkins, R., “A continuous microfluidic ice nucleating particle counter for ambient measurements,” Joint ARM User Facility and ASR PI Meeting, online (June 2021).

*Roberts, A., *Van Valkinburgh, K., Post, C., Mikhailova, E., Pearce, J., Metcalf, A. R., “Evaluation of a New Low-Cost Particle Sensor as an IoT Device for Outdoor Particulate Matter Monitoring,” Air & Waste Management Association’s Air Quality Measurement Methods and Technology Conference, online (May 2021).

*Sarwar, N., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A., “Characterization of Black Carbon Aerosol and Its Impacts on Aerosol-Cloud Interactions in the Marine Environment,” American Association for Aerosol Research 38th Annual Conference, online (October 2020).

*Van Valkinburgh, K., Kaye, N., Mousavi, E., Blouin, V., Mohammadi Nafchi, A., Metcalf, A., “Assessing Potential Airborne Virus Transmission in University Classrooms,” American Association for Aerosol Research 38th Annual Conference, online (October 2020).

Raeofy, N., Dingle, J., Bahreini, R., Metcalf, A., McMeeking, G., Hansen, T., Jiang, Y., Yang, J., Thomson, K., Gagne, S., Chan, T., Swanson, J., Jung, H., Karavalakis, G., Cocker III, D. R., Durbin, T. D., Miller, W., Johnson, K., “Optical and Microphysical Properties of Aerosols Emitted from a Marine Engine,” American Association for Aerosol Research 38th Annual Conference, online (October 2020).

Dutcher, C. S., Narayan, S., Moravec, D., Metcalf, A., Quam, D., Dallas, A., “Droplet Shape Relaxation in Confined Microfluidic Flows for Probing the Properties of Liquid-liquid Emulsions,” Society of Rheology 91st Annual Meeting, Raleigh, NC (October 2019).

*Sarwar, N., *Williams, W., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A. R., “Airborne Characterization of Wildfire Influence on Local Air Quality in California,” American Association for Aerosol Research 37th Annual Conference, Portland, OR (October 2019).

Metcalf, A. R., Post, C., Pearce, J., Green, A., *Sarwar, N., Mikhailova, E., Cope, M., “Evaluation of a New Low-Cost Particle Sensor as an IoT Device for Outdoor Particulate Matter Monitoring,” American Association for Aerosol Research 37th Annual Conference, Portland, OR (October 2019).

Schulze, B. C., Charan, S. M., Kenseth, C. M., Kong, W., Bates, K., *Williams, W., Metcalf, A. R., Jonsson, H. H., Woods, R., Sorooshian, A., Flagan, R. C., Seinfeld, J. H., “Characterization of Aerosol Hygroscopicity Over the N.E. Pacific: Impacts on CCN Prediction and Marine Stratocumulus Microphysical Properties,” American Association for Aerosol Research 37th Annual Conference, Portland, OR (October 2019).

Metcalf, A. R., “Airborne Characterization of Wildfire Influence on Local Air Quality in California,” Gordon Research Conference on Atmospheric Chemistry, Newry, ME (July 2019).

*Williams, W., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A. R., “Characterization of Marine and Wildfire Environments with the Naval Postgraduate School’s Twin Otter Aircraft,” American Geophysical Union Fall Meeting, Washington, DC (December 2018).

Metcalf, A. R., “Using Microfluidics for the Detection of Water Impurities” (invited), Kanomax Workshop 2018 at the 10th International Aerosol Conference, St. Louis, MO (September 2018).

*Williams, W., Sorooshian, A., Jonsson, H., Flagan, R., Seinfeld, J., Metcalf, A. R., “Black Carbon Aerosol in a Clean Marine Environment,” 10th International Aerosol Conference, St. Louis, MO (September 2018).

*Mohammadi Nafchi, A., McMeeking, G. R., Metcalf, A. R., “A Microfluidic Ice Nucleating Particle Counter for Continuous Measurements,” 10th International Aerosol Conference, St. Louis, MO (September 2018).

Metcalf, A. R., “The Clemson Air Quality Lab: Using Multiscale Measurements to Understand Air Pollution” (invited), Automotive Engineering Department Seminar, CU-ICAR, Greenville, SC (March 2018).

Metcalf, A. R., Hogan, C., Dutcher, C., “Freezing of Aerosol Liquid Mimics in a Microfluidic Device,” American Association for Aerosol Research 36th Annual Conference, Raleigh, NC (October 2017).

Prior to Clemson

Metcalf, A. R., “Using Multiscale Measurements to Understand Air Pollution: From Laboratory to Field Studies” (invited), Environmental Engineering and Earth Sciences Department Seminar, Clemson University (February 2017).

Metcalf, A. R., Hogan, C., Dutcher, C., “Using microfluidics for droplet and particle characterization of environmental fluids,” 69th Annual Meeting of the APS Division of Fluid Dynamics, Portland, OR, (November 2016).

Metcalf, A. R., Dutcher, C. S., “Surface activity in secondary organic aerosol liquid samples,” American Association for Aerosol Research 35th Annual Conference, Portland, OR (October 2016).

Metcalf, A. R., “Understanding Atmospheric Aerosol Particle Morphology with Implications for Climate, Air Quality, and Human Health” (invited), Environmental & Water Resources Engineering Seminar, University at Buffalo (February, 2016)

Metcalf, A. R., Boyer, H., Dutcher, C. S., “Using microfluidics to measure surface-bulk partitioning of aerosol constituents,” 18th Conference on Atmospheric Chemistry at American Meteorological Society 96th Annual Meeting, New Orleans, LA (January 2016).

Metcalf, A. R., Dutcher, C. S., “Microfluidic measurements of atmospheric aerosol mimic rheology,” American Association for Aerosol Research 34th Annual Conference, Minneapolis, MN (October 2015).

Metcalf, A. R., Dutcher, C. S., “Microfluidic measurements of atmospheric aerosol mimic mixing states,” 11th International Conference on Carbonaceous Particles in the Atmosphere, Berkeley, CA (August 2015).

Metcalf, A. R., Dutcher, C. S., “Probing aerosol particle interfaces with droplet microfluidics” (invited), Gordon Research Seminar on Microfluidics, Physics & Chemistry of, West Dover, VT (May 2015).

Metcalf, A. R., “Probing Aerosol Particle Mimics with Droplet Microfluidics” (invited), SOCAAR Seminar Series, University of Toronto (March 2015).

Metcalf, A. R., Dutcher, C. S., “Novel measurements of aerosol particle interfaces using biphasic microfluidics,” American Geophysical Union Fall Meeting, San Francisco, CA (December 2014).

Metcalf, A. R., “Field Measurements of Black Carbon Aerosol” (invited), Donaldson Company, Inc. (December 2013).

Metcalf, A. R., “Black Carbon Aerosol in the Los Angeles Basin” (invited), Particle Technology Laboratory, University of Minnesota (December 2013).

Metcalf, A. R., “Atmospheric Black Carbon: Measurements in the Los Angeles Atmosphere and Aging by Condensation of Organic Aerosol” (invited), Atmospheric, Earth, and Energy Division, Lawrence Livermore National Laboratory (March 2013).

Metcalf, A. R., “Black Carbon Aerosol in the Los Angeles Basin” (invited), Combustion Research Facility, Sandia National Laboratories (December 2011).

Metcalf, A. R., Craven, J. S., Jonsson, H. H., Flagan, R. C., Seinfeld, J. H., “Black carbon measurements over the Los Angeles Basin during CalNex,” American Association for Aerosol Research 30th Annual Conference, Orlando, FL (October 2011).

Metcalf, A. R., “A Multi-angle Light-scattering Spectrometer for Detecting Scattering Phase Functions of Single Aerosol Particles” (invited), Chemical Kinetics and Photochemistry Group, Jet Propulsion Laboratory (May 2009).

INVITED PRESENTATIONS

“Two Stories about Air Quality: Why Both Indoor and Outdoor Aerosols Matter,” Department of Atmospheric Sciences seminar, Texas A&M University (November 6, 2024).

“Aerosols and Their Influence on Clouds,” Meteorology and Atmospheric Science Department Colloquium, Penn State University (October 30, 2024).

“Two Stories about Air Quality: Why Both ‘Indoor’ and Outdoor Aerosols Matter,” Savannah River National Laboratory seminar (September 23, 2024).

“Two Stories about Air Quality: Why Both Indoor and Outdoor Aerosols Matter,” School of Civil and Environmental Engineering seminar, Georgia Tech (November 1, 2023).

“Air Quality: An Understanding of Black Carbon Aerosol and Us,” South Carolina Health Professionals for Climate Action (SCHPCA) Quarterly Meeting (March 27, 2023).

HONORS AND AWARDS

Atmospheric and Geospace Sciences Postdoctoral Research Fellowship, National Science Foundation (2014-2016)

Graduate Fellowship, American Meteorological Society/National Oceanic and Atmospheric Administration Office of Global Programs (2004).

Research Experience for Undergraduates (REU) Grant, Environmental Protection Agency (2002)

SPONSORED RESEARCH

“CHIRRP: Building Collaborations and Capacity to Address Climate Hazards in the Southeast U.S.,” NSF CHIRRP, PI, \$200,000, (\$100,000), (1/1/ 2025 – 12/31/2026).

“Networking the Future of SCEEES: Understanding Professional Networks to Support Inclusion and Professional Development,” Clemson University, co-PI, \$18,294, (1/1/2024 – 12/31/2024).

“Improving Environmental Justice through A Collaborative and Trustworthy System for Hyperlocal Air Quality,” Clemson University, co-PI, \$23,000, (1/1/2023 – 12/31/2023).

“Quantifying Aerosol Deposition Mechanisms in Model Dry Cask Storage Systems,” Department of Energy Nuclear Energy University Program, PI, \$800,000, (\$360,000), (10/1/2022-9/30/2025).

“Graduate Research Fellowship: Validating Satellite Remote-Sensing of Aerosols with Ground-based Low-cost Sensors - Abi Roberts,” SC Space Grant Consortium, advisor, \$32,000, (\$32,000), (8/15/2022-8/14/2023).

“Understanding the impact of pollution aerosol from Los Angeles/Long Beach on clouds and radiation in and upwind of the ECAPE study domain,” Department of Energy Atmospheric Systems Research Program, co-PI, \$774,674, (\$256,692), (8/1/2022-7/31/2025).

Supplement for Research Experience for Undergraduates (REU) to: “CIF: Single-particle measurements of soot and incandescing aerosol,” National Science Foundation, PI, \$7,200, (\$7,200), (9/1/2021-8/30/2026).

“CIF: Single-particle measurements of soot and incandescing aerosol,” National Science Foundation, PI, \$529,127, (\$529,127), (9/1/2021-8/30/2026).

“Making Buildings Safer by Improving Indoor Air Quality,” Spring 2021 SERCEEES Grant, PI, \$20,926, (\$20,926), (7/1/2021-6/30/2022).

“Graduate Research Fellowship: Validating Satellite Remote-Sensing of Aerosols with Ground-based Low-cost Sensors - Abi Roberts,” SC Space Grant Consortium, advisor, \$32,000, (\$32,000), (5/15/2021-5/14/2022).

“A microfluidic ice nucleating particle counter for continuous measurements from small aerial platforms,” Handix Scientific LLC/Department of Energy STTR Phase 2, co-PI, \$1,500,000, (\$249,936), (05/28/19-05/27/22).

Supplement with no-cost extension to: “RAPID: Airborne Measurements of Black Carbon Aerosol and Its Mixing State over the Eastern Pacific/Central Coast of California,” National Science Foundation, PI, \$20,031, (\$20,031), (2018-2020).

“Regional Biomass Burning Measurements for Air Quality Assessment and Satellite Validation,” SC Space Grant Consortium, PI, \$49,198, (\$49,198), (2018-2019).

“RAPID: Airborne Measurements of Black Carbon Aerosol and Its Mixing State over the Eastern Pacific/Central Coast of California,” National Science Foundation, PI, \$103,735, (\$103,735), (2018-2019).

“A microfluidic ice nucleating particle counter for continuous measurements from small aerial platforms,” Handix Scientific LLC/Department of Energy STTR, co-PI, \$223,281.90, (\$77,098), (04/09/18-01/09/19).

Prior to Clemson

“Building a microfluidic platform to study atmospheric aerosol,” National Science Foundation, PI, \$172,000, (\$172,000), (2014-2016).

GRADUATE STUDENT ADVISING

Doctoral Graduates

Arup Bhattacharya (PhD), “Airborne Contaminant Dispersal in Critical Built-Environments,” August 2022, (Committee member).

Masters Graduates

Abi Roberts (MS), “Low-cost PM sensor measurements of air quality,” August 2023, (Advisor).

Kelli Trotter (MS), “Radon Detection on Clemson University’s Campus,” August 2022, (Committee member).

Kathryn Van Valkinburgh (MS), “Using Low- and Medium-Cost Particulate Matter Sensors to Assess Indoor Air Quality,” May 2021, (Advisor).

Nilima Sarwar (MS), “Black Carbon Aerosol in the Eastern North Pacific Marine Environment,” May 2021, (Advisor).

Ali Mohammadi Nafchi (MS), “Numerical Simulation of Droplet Formation in a Microfluidic INP Measurement Device,” December 2019, (Advisor).

Isaac (Walt) Williams (MS), “Airborne Characterization of Black Carbon Aerosol in California from Biomass Burning”, August 2019, (Advisor).

Current Graduate Advising

Hannah (Ren) Garity (PhD, passed qualifying exam), “Aerosol deposition in spent nuclear fuel dry storage casks,” May 2026, (Advisor).

James Henry (MS), “Fundamental mechanisms governing aerosol deposition in spent nuclear fuel (SNF) dry storage casks (DSCs),” May 2025, (Advisor).

Dongli Wang (PhD, passed comprehensive exam), “Black carbon aerosol influence on regional air quality in the southeastern US,” May 2025, (Advisor).

Eric Vorwerk (PhD, passed qualifying exam), “Novel two-stroke diesel engines and airpath control,” May 2025, (Committee member).

Jianing Bao (PhD, passed comprehensive exam), “Assessing Indoor Air Quality in Educational Buildings Using a Low-Cost Sensor Network,” May 2025, (Advisor).

TEACHING

Courses Taught

EES 4300/6300, Air Pollution Engineering, F17, F18, F19, F20, S21, S22, S23, S24.

EES 8330, Combustion and Air Pollution Control Systems, S19, S20, S21, S22, S23.

EES 8340, Particles in the Atmosphere, F20, F22.

EES 9610, EES PhD Seminar, S19, F19, F20, F21, F22, F23.

New Course Development

EES 4910/6910, Special Topics: Earth’s Atmosphere and Climate, S20, F21, F23.

UNIVERSITY AND PUBLIC SERVICE

Continuing Education

“Atmospheric Physics,” Guest Lecturer (March 2019).

Committees

Department: Member, Department Advisory Committee (2017-)
Member, Undergraduate Curriculum Committee (2017-)

School: Member, Graduate Policies and Procedures Handbook Committee (2023-2024)

CECAS: Elected Representative, Faculty Advisory Board to the Vice President for Research (2023-)

Other Service

Greenhouse Gas Inventory Action Team member in the Palmetto Air Quality Collaborative (2023-)

Advising the SC Office of Resilience on matters related to our state's GHG inventories, how to monitor them, and what to propose to EPA for the next steps to reduce the GHG footprint in South Carolina.

Advisor for Environmental Engineering undergraduates (2020-)

University Representative, University Corporation for Atmospheric Research (UCAR) (2019-)

Advocated for Clemson University to join UCAR and participate in governance of NSF-sponsored atmospheric research.

MISCELLANEOUS

Proposal Reviewer

National Science Foundation

MRI Panel (May 2022)

Graduate Research Fellowship Program (2017)

Atmospheric Chemistry Program (2015-)

Department of Energy

Atmospheric Systems Research Program (2015-)

Peer Reviewer

Nature Climate Change (2021-)

Journal of Aerosol Science (2021-)

Atmosphere (2020-)

Micromachines (2019-)

Atmospheric Environment (2017-)

Aerosol Science & Technology (2015-)

Atmospheric Measurement Techniques (2014-)

Atmospheric Chemistry and Physics (2014-)

Journal of Geophysical Research – Atmospheres (2013-)

Student Competition Judge

Student Poster Competition, AAAR Annual Meeting (2015-)

Outstanding Student Paper Awards, AGU Fall Meeting (2014, 2018, 2021)

Public Outreach

Varences Elementary School Science Night (2023-)

October 15, 2024