

Christina S. McCluskey

mccluscs@atmos.colostate.edu
Atmospheric Science Department
Colorado State University
Fort Collins, Colorado, USA

Work: +1 (970) 491-7484

EDUCATION

PhD Atmospheric Science December 2013 – present
Dissertation Topic: Exploring links between the abundance of ice nucleating particles in sea spray aerosol and ocean biological activity via laboratory mesocosms and field observations.
Co-advisors: Sonia Kreidenweis and Paul DeMott

M.S. Atmospheric Science August 2011 – December 2013
Colorado State University Fort Collins, CO
Thesis Topic: Characteristics of atmospheric ice nucleating particles associated with biomass burning in the US: prescribed burns and wildfires
Co-advisors: Sonia Kreidenweis and Paul DeMott

B.S. Chemistry, Mathematics Minor August 2007 – May 2011
Coastal Carolina University Conway, SC

RESEARCH EXPERIENCE

Graduate Research Assistant July 2011 – Present
Department of Atmospheric Science, Colorado State University Fort Collins, CO
Focus and research activities of the Ice group:

- Extensive field experience focused on observations of atmospheric ice nucleating particles (INPs) associated with sea spray aerosol, biomass burning, forested regions, and pollution
- NCAR aircraft and CSIRO research ship measurements of aerosol, INPs and bioaerosol
- Mesocosm experiments for exploring the abundance of INPs released with sea spray aerosol during phytoplankton blooms with NSF Center for Aerosol Impacts on Climate and Environment
- Method development for determining contributions of black carbon to INP populations
- Method development for online, single-particle analysis of the chemical composition of INPs
- Field projects with significant contribution:
 - BEACHON-RoMBAS (Bio-hydro-atmosphere interactions of Energy, Aerosols, Carbon, H₂O, Organics and Nitrogen—Rocky Mountain Biogenic Aerosol Study) – Colorado, 2011
 - FLAME-4 (Fire Lab at Missoula Experiment) – Montana, 2012
 - IDEAS – 4 & 4A (NCAR Instrument Development Education in Airborne Science) – Colorado, 2011 & 2013
 - CAICE (Center for Aerosol Impacts on Climate and the Environment) Marine Aerosol Reference Tank and IMPACTS (Investigation into Marine Particle Chemistry and Transfer Science) Experiments – California, 2014
 - NSF Pre-CalWater and CalWater 2015 - California, 2014 & 2015
 - BACCHUS (Impact of Biogenic versus Anthropogenic emissions on Clouds and Climate: towards a Holistic UnderStanding) Mace Head Observatory Study – Ireland, 2015
 - CAPRICORN (Clouds, Aerosols, Precipitation Radiation and atmospheric Composition Over the southeRN ocean) – Tasmania, Australia, 2015
 - ARISTO (NCAR Airborne Research Instrumentation Testing Opportunity - Colorado, 2016

Undergraduate Research Student, Simpson and Slusher Research Groups August 2010 – May 2011
Department of Chemistry and Physics, Coastal Carolina University Conway, SC

- Method comparison for two techniques for measuring ozone concentrations
- Method development for detecting bisphenol-A using Solid Phase Micro-Extraction with GC-FID

NSF REU Intern, Collett Research Group May 2010 – August 2010
Department of Atmospheric Science, Colorado State University Fort Collins, CO

- Analyzed filter samples collected in the Rocky Mountain National Park using an Ion Chromatograph and a Total Carbon/Total Nitrogen Analyzer
- Examined data for trends and characteristics of total nitrogen composition in RMNP

NASA Student Airborne Research Program Intern, Blake Research Group July 2009 – August 2009
Student Airborne Research Program, NASA, University of California - Irvine Irvine, CA

- Operated a Whole Air Sampler on NASA's DC-8 scientific aircraft and collected air samples at ground level for a grid survey of gaseous species in the Central Valley
- Investigated the various emissions from dairy farm silage piles and their contribution to ozone production

TEACHING AND MENTORING EXPERIENCE

REU Intern Graduate Student Mentor June – July 2015
Department of Atmospheric Science, Colorado State University Fort Collins, CO

General Chemistry Workshop Leader August 2008 – May 2011
Department of Chemistry and Physics, Coastal Carolina University Conway, SC

Chemistry Tutor August 2008 – May 2011
Department of Chemistry and Physics, Coastal Carolina University Conway, SC

PUBLICATIONS

1. **McCluskey, C. S.**, T. C. J. Hill, F. Malfatti, C. M. Sultana, C. Lee, M. V. Santnder, C. M. Beall, K. A. Moore, G. C. Cornwell, D. B. Collins, K. A. Prather, T. Jayarathne, F. Azam, E. A. Stone, S. M. Kreidenweis, P. J. DeMott, A dynamic link between ice nucleating particles released in nascent sea spray aerosol and oceanic biological activity during two mesocosm experiments, In Review, *J. Atmos. Sci.*
2. **McCluskey, C. S.**, P. J. DeMott, A. J. Prenni, E. J. T. Levin, G. R. McMeeking, A. P. Sullivan, T. C. J. Hill, S. Nakao, C. M. Carrico, S. M. Kreidenweis (2014), Characteristics of atmospheric ice nucleating particles associated with biomass burning in the US: prescribed burns and wildfires, *J. Geophys. Res.*, 119(17), 10458 – 10470, doi:10.1002/2014JD021980
3. Levin, E. J. T., G. R. McMeeking, P. J. DeMott, **C. S. McCluskey**, C. M. Carrico, S. Nakao, T. Jayarathne, E. A. Stone, C. E. Stockwell, R. J. Yokelson, Kreidenweis, S. M. (2016). Ice Nucleating Particle Emissions from Biomass Combustion and the Potential Importance of Soot Aerosol. *J. Geophys. Res. Atmos*, doi: 10.1002/2016JD024879
4. Carrico, C. M., A. J. Prenni, S. M. Kreidenweis, E. J. T. Levin, **C. S. McCluskey**, P. J. DeMott, G. R. McMeeking, S. Nakao, C. Stockwell, R. J. Yokelson (2016), Rapidly Evolving Ultrafine and Fine Mode Biomass Smoke Physical Properties: Comparing Laboratory and Field Results, *J. of Geophys. Res. Atmos.*, doi: 10.1002/2015JD024389
5. Twohy, C. H., G. R. McMeeking, P. J. DeMott, **C. S. McCluskey**, T. C. J. Hill, S. M. Burrows, G. R. Kulkarni, M. Tanarhte, D. N. Kafle and D. W. Toohey (2016), Abundance of fluorescent biological aerosol particles at temperatures conducive to the formation of mixed-phase and cirrus clouds, *Atmos. Chem. Phys.*, doi: 10.5194/acp-16-8205-2016.

6. DeMott, P. J., T. C. J. Hill, **C. S. McCluskey**, K. A. Prather, D. B. Collins, R. C. Sullivan, M. J. Ruppel, R. H. Mason, V. E. Irish, T. Lee, C. Y. Hwang, T. S. Rhee, J. R. Snider, G. R. McMeeking, S. Dhaniyala, E. R. Lewis, J. J. B. Wentzell, J. Abbatt, C. Lee, C. M. Sultana, A. P. Ault, J. L. Axson, M. D. Martinez, I. Venero, G. Santos-Figueroa, M. D. Stokes, G. B. Deane, O. L. Mayol-Bracero, V. H. Grassian, T. H. Bertram, A. K. Bertram, B. F. Moffett and G. D. Franc (2015), Sea spray aerosol as a unique source of ice nucleating particle, *Proc. Natl. Acad. Sci. U.S.A.*, 201514034.
7. Wang, X., C. M. Sultana, J. Trueblood, T. C. J. Hill, F. Malfatti, C. Lee, O. Laskina, K. A. Moore, C. M. Beall, **C. S. McCluskey**, G. C. Cornwell, Y. Zhou, J. L. Cox, M. A. Pendergraft, M. V. Santander, T. H. Bertram, C. D. Cappa, F. Azam, P. J. DeMott, V. H. Grassian, K. A. Prather (2015), Microbial Control of Sea Spray Aerosol Composition: A Tale of Two Blooms, *ACS Cent. Sci.* 2015, DOI: 10.1021/acscentsci.5b00148.
8. Mason, R. H., C. Chou, **C. S. McCluskey**, E. J. T. Levin, C. L. Schiller, T. C. J. Hill, J. A. Huffman, P. J. DeMott, A. K. Bertram (2015), The micro-orifice uniform deposit impactor-droplet freezing technique (MOUDI-DFT) for measuring concentrations of ice nucleating particles as a function of size: improvements and initial validation, *Atmos. Meas. Tech. Discuss.*, 8(2), 223-2262.
9. Hiranuma, N., S. Augustin-Bauditz, H. Bingemer, C. Budke, J. Curtius, A. Danielczok, K. Diehl, K. Dreischmeier, M. Ebert, F. Frank, N. Hoffmann, K. Kandler, A. Kiselev, T. Koop, T. Leisner, O. Möhler, B. Nillius, A. Peckhaus, D. Rose, S. Weinbruch, H. Wex, Y. Boose, P. J. DeMott, J. D. Hader, T. C. J. Hill, Z. A. Kanji, G. Kulkarni, E. J. T. Levin, **C. S. McCluskey**, M. Murakami, B. J. Murray, D. Niedermeier, M. D. Petters, D. O'Sullivan, A. Saito, G. P. Schill, T. Tajiri, M. A. Tolbert, A. Welti, T. F. Whale, T. P. Wright, and K. Yamashita (2015), A comprehensive laboratory study on the immersion freezing behavior of illite NX particles: A comparison of seventeen ice nucleation measurement techniques, *Atmos. Chem. Phys.* 15, 2489-2518, doi: 10.5194/acp-15-2489-2015.
10. Levin, E. J. T., G. R. McMeeking, **C. S. McCluskey**, P. J. DeMott, and S. M. Kreidenweis (2014), A New Method to Determine the Number Concentrations of Refractory Black Carbon Ice Nucleating Particles, *Aerosol Sci. Tech.*, doi: 10.1080/02786826.2014.977843
11. Prenni, A. J., Y. Tobo, E. Garcia, P. J. DeMott, J. A. Huffman, **C. S. McCluskey**, S. M. Kreidenweis, J. E. Prenni, C. Pöhlker, and U. Pöschl (2013), The impact of rain on ice nuclei populations at a forested site in Colorado, *Geophys. Res. Lett.*, 40, 277-231.
12. Tobo, Y., A. J. Prenni, P. J. DeMott, A. Huffman, **C. S. McCluskey**, G. Tian, C. Pöhlker, U. Pöschl, and S. M. Kreidenweis (2013), Biological aerosol particles as a key determinant of ice nuclei populations in a forest ecosystem, *J. Geophys. Res.*, 118(10), doi: 10.1002/jgrd.50801.

MEETINGS AND PRESENTATIONS

1. **McCluskey, C. S.**, T. C. J. Hill, S. Atwood, K. Rocci, Y. Boose, G. C. Cornwell, C. M. Sultana, K. A. Moore, A. Martin, K. A. Prather, N. Rothfuss, H. Taylor, M. Petters, J. Ovadnevaite, D. Ceburnis, C. O'Dowd, M. Keywood, A. Protat, P. J. DeMott, S. M. Kreidenweis, Sea spray aerosols influence atmospheric ice nucleating particle populations, Oral Presentation at the *International Conference on Clouds and Precipitation*, July 2016, Manchester, England.
2. **McCluskey, C. S.**, T. C. J. Hill, E. J. T. Levin, G. C. Cornwell, C. M. Sultana, C. Lee, H. A. Al-Mashat, O. Laskina, V. H. Grassian, C. M. Beall, K. A. Moore, K. A. Prather, D. Pham, R. C. Moffett, S. M. Kreidenweis, P. J. DeMott, Identifying links between sea spray ice nucleating particle and oceanic biological activity, Poster Presentation at the *American Geophysical Union Fall Meeting*, December

2015, San Francisco, CA.

3. **McCluskey, C. S.**, T. C. J. Hill, E. J. T. Levin, G. C. Cornwell, C. M. Sultana, C. Lee, H. A. Al-Mashat, O. Laskina, V.H. Grassian, C. M. Beall, K. A. Moore, R. C. Moffett, K. A. Prather, S. M. Kreidenweis, P. J. DeMott, Identifying links between sea spray ice nucleating particle and oceanic biological activity, Oral Presentation for *the American Meteorological Society Annual Meeting*, January 06, 2015, Phoenix, AZ.
4. **McCluskey, C. S.**, and co-authors, Does biology change the abundance of ice nucleating particles in sea spray aerosol?, Poster Presentation at the *CAICE Annual Meeting*, October 27, 2014, La Jolla, CA.
5. **McCluskey, C. S.**, P. J. DeMott, A. J. Prenni, E. J. T. Levin, G. R. McMeeking, A. P. Sullivan, T. C. J. Hill, S. Nakao, C. M. Carrico, and S. M. Kreidenweis, Characteristics of atmospheric ice nucleating particles associated with biomass burning in the US: prescribed burns and wildfires, invited Oral Presentation for *Coastal Carolina University School of Coastal and Marine Systems Science Seminar Series*, December 12, 2013, Conway, SC.
6. **McCluskey, C. S.**, C. H. Twohy, G. R. McMeeking, T. C. Hill, P. J. DeMott, D. W. Toohey, Measuring the abundance of fluorescent particles on the NCAR GV: coupling the CVI with the WIBS-4A, invited Oral Presentation for the *EOL external advisory committee meeting*, December 4, 2013, Broomfield, CO.
7. **McCluskey, C. S.**, P. J. DeMott, A. J. Prenni, G. R. McMeeking, A. P. Sullivan, E. Levin, S. Nakao, C. M. Carrico, G. D. Franc, T. C. Hill, and S. M. Kreidenweis, Observations of Ice Nuclei Associated with Biomass burning, Poster Presentation at the *International Conference on Nucleation and Atmospheric Aerosols*, June 24-28, 2013, Fort Collins, CO.
8. **McCluskey, C. S.**, P. J. DeMott, A. J. Prenni, G. R. McMeeking, A. P. Sullivan, E. Levin, S. Nakao, C. M. Carrico, G. D. Franc, T. C. Hill, and S. M. Kreidenweis, The production and characteristics of ice nuclei from biomass burning in the US, Oral Presentation at the *ESF Workshop on Ice Nucleation*, April 4-6, Vienna, Austria, poster presentation at the *European Geophysical Union Annual Meeting*, April 6-10, 2013, Vienna, Austria.
9. **McCluskey, C. S.**, P. J. DeMott, A. J. Prenni, A. P. Sullivan, G. McMeeking, Y. Desyaterik, G. Franc, T. C. Hill, and S. M. Kreidenweis, 2012: Ice Nuclei Produced from Prescribed Fires in Southeastern United States. Poster Presentation at the *American Association for Aerosol Research Annual Meeting*, Abstract 2CC.12, October 3, 2012, Minneapolis, MN.
10. **McCluskey, C. S.**, K. B. Beem, and J. L. Collett Jr., The presence of reactive nitrogen in fine and coarse aerosol, Poster Presentation at the *American Geophysical Union Fall Meeting*, December 2010, San Francisco, CA.
11. **McCluskey, C. S.**, M. Yang, and D. R. Blake, Investigation of dairy farm silage emissions, Poster Presentations at the *American Chemical Society Regional Conference*, 2009, San Juan, PR, and the *American Geophysical Union Fall Meeting*, December 2009, San Francisco, CA.

SKILLS AND TRAINING

Extensive field study experience

Flight scientist during NCAR IDEAS (Instrument Development and Education in Airborne Science) IV project (<http://www.eol.ucar.edu/raf/Projects/IDEAS/>)

Laboratory and field instrumentation: ice spectrometer, total particle counters, continuous flow diffusion chamber, aerodynamic particle sizer, aircraft counterflow virtual impactor, wideband integrated bioaerosol sampler, single particle soot photometer

Proficient programming in IDL, MatLab, Igor and excel

Completed training in responsible conduct of research

HONORS AND PROFESSIONAL ACTIVITIES

Travel Award, International Conference on Clouds and Precipitation - 2016

CSU Dept. of Atmos. Science ASCENT Travel Award - 2015

CSU Dept. of Atmos. Science Herbert Riehl Memorial Award - 2015

Outstanding Student Poster Award, American Association for Aerosol Research Annual Meeting, 2012

CCU Chemistry Student of the Year, 2011

CSU Dept. of Atmos. Sci. MAC Student Travel Award Committee, 2016 - present

CSU Dept. of Atmos. Sci. REU Internship Selection Committee, 2013-present

Student Member on the 2018 AMS Cloud Physics Committee, 2015-present

American Association for Aerosol Research CSU Student Organization – Vice President (2012/2013 & 2015/2016), President (2013/2014), Member (2014/2015 & 2016/2017)

American Geophysical Union, 2009/2010, 2013 – Present

American Meteorological Society, 2011/2012, 2014/2015