

SARA LANCE - Curriculum Vitae

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Atmospheric Sciences Research Center
State University of New York (SUNY-Albany)
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EDUCATION

PhD, Georgia Institute of Technology Dec 2007
Atmospheric Science Atlanta, GA
Advisor: Dr. Athanasios Nenes
Thesis: "Quantifying Compositional Impacts of Ambient Aerosol on Cloud Droplet Formation"

BSE, Arizona State University May 2002
Chemical Engineering Tempe, AZ

WORK EXPERIENCE

Research Associate Aug 2016 – Present
Atmospheric Science Research Center (ASRC), SUNY-Albany Albany, NY

Research Scientist Aug 2015 – Aug 2016
Earth, Atmospheric and Planetary Sciences (EAPS) Cambridge, MA
Massachusetts Institute of Technology

Affiliate Researcher Jul 2014 – Jul 2015
Cooperative Institute for Research in Environmental Sciences (CIRES) Boulder, CO
University of Colorado

Research Scientist May 2012 – Feb 2015
Stratton Park Engineering Company (SPEC), Inc. Boulder, CO
Cloud Physics and Instrumentation

Research Scientist I/II Jan 2010 – May 2012
CIRES, University of Colorado Boulder, CO
National Oceanic and Atmospheric Administration (NOAA)

CIRES Innovative Research Program (IRP) grant recipient, CU-Boulder July 2011
"Contact Freezing on Demand: Measurement of contact nuclei with a
novel instrument using single droplets levitated in an optical trap"
<http://cires.colorado.edu/science/pro/irp/2011/>

Postdoctoral Fellow Jan 2008 – Jan 2010
Research Associates Program, National Research Council/NOAA Boulder, CO

Graduate Fellow Jun 2004-Apr 2007
Advanced Studies Program (ASP), National Center for Atmospheric Research Boulder, CO

RESEARCH INTERESTS

-) Fundamentals of Interactions between Aerosols, Clouds and Precipitation
-) Chemical properties and mixing-state of cloud condensation nuclei and ice nuclei
-) Instrument development and characterization

PUBLICATIONS

2015

Davis, R. D., **S. Lance**, J. A. Gordon, S. B. Ushijima, M. A. Tolbert, Contact Efflorescence as a pathway for crystallization of atmospherically relevant particles, *Proc. Nat. Acad. Sci.*, 112 (52), 15815-15820, doi:10.1073/pnas.1522860113, 2015.

Davis, R. D., **S. Lance**, J. A. Gordon, M. A. Tolbert, A long working-distance optical trap for in situ analysis of contact induced phase transformations of single aerosol particles, *Anal. Chem.*, 87 (12), 6186–6194, doi: 10.1021/acs.analchem.5b00809, 2015.

2014

Beswick, K., D. Baumgardner, M. Gallagher, A. Volz-Thomas, P. Nedelec, K.-Y. Wang, and **S. Lance**, The backscatter cloud probe – a compact low-profile autonomous optical spectrometer, *Atmos. Meas. Tech.*, 7, 1443-1457, 2014.

2013

Lance, S., T. E. Raatikainen, T. Onasch, D. Warsnop, X.-Y. Yu, L. Alexander, M. Stolzenberg, P. McMurry, J. N. Smith and A. Nenes. Aerosol mixing-state and cloud activation efficiency during MIRAGE 2006, *Atmos. Chem. Phys.*, 13, 5049-5062, doi:10.5194/acpd-13-5049-2013, 2013.

Jensen, E. J., G. Diskin, R. P. Lawson, **S. Lance**, T. P. Bui, D. Hlavka, M. McGill, L. Pfister, O.B. Toon, and R. Gao, Ice nucleation and dehydration in the Tropical Tropopause Layer, *Proc. Nat. Acad. Sci.*, 110 (6), 2041-2046, 2013.

Raatikainen, T., A. Nenes, J.H. Seinfeld, R. Morales, R.H. Moore, T. Latham, **S. Lance**, L.T. Padro, J.J. Lin, K.M. Cerully, A. Bougiatioti, J. Cozic, C.R. Ruel, P.Y. Chuang, B.E. Anderson, R.C. Flagan, H. Jonsson, N. Mihalopoulos, J.N. Smith, Worldwide data sets constrain the water vapor uptake coefficient in cloud formation, *Proc. Natl. Acad. Sci.*, 110 (10), 3760-3764, doi:10.1073/pnas.1219591110, 2013.

2012

McBride, P. J., K. S. Schmidt, P. Pilewskie, A. Walther, A. K. Heidinger, D. E. Wolfe, C. Fairall, and **S. Lance**, A Calnex climatology of cloud optical properties retrieved from a ship-based spectrometer and comparisons with satellite and aircraft retrieved cloud properties, *J. Geophys. Res.*, 117, D00V23, doi:10.1029/2012JD017624, 2012.

Lance, S., Coincidence Errors in a Cloud Droplet Probe (CDP) and a Cloud and Aerosol Spectrometer (CAS), and the Improved Performance of a Modified CDP, *J. Atmos. Oceanic Technol.*, 29, 1532-1541, doi:10.1175/JTECH-D-11-00208.1, 2012.

Baumgardner, D., L. Avallone, A. Bansemer, S. Borrmann, P. Brown, U. Bundke, P. Y. Chuang, D. Cziczo, P. Field, M. Gallagher, J.-F. Gayet, A. Heymsfield, A. Korolev, M. Krämer, G. McFarquhar, S. Mertes, O. Möhler, **S. Lance**, P. Lawson, M. D. Petters, K. Pratt, G. Roberts, D. Rogers, O. Stetzer, J. Stith, C. Twohy, M. Wendish, In situ airborne instrumentation: addressing and solving measurement

problems in ice clouds, *Bull. Amer. Meteor. Soc.*, 93, ES29-ES34, doi: 10.1175/BAMS-D-11-00123.1, 2012.

2011

Cerully, K. M., T. Raatikainen, **S. Lance**, D. Tkacik, P. Tiitta, T. Petaja, M. Ehn, M. Kulmala, D. R. Worsnop, A. Laaksonen, J. N. Smith, and A. Nenes, Aerosol hygroscopicity and CCN activation kinetics in a boreal forest environment during the 2007 EUCAARI campaign, *Atmos. Chem. Phys.*, 11, 12369-12386, 2011.

Lance, S., M. Shupe, G. Feingold, C.A. Brock, J. Cozic, J. S. Holloway, R. H. Moore, A. Nenes, J. P. Schwartz, J. R. Spackman, K. D. Froyd, D. M. Murphy, J. Brioude, O. R. Cooper, A. Stohl, J. F. Burkhardt, H. Sodemann, Cloud condensation nuclei as a modulator of ice processes in Arctic mixed-phase clouds, *Atmos. Chem. Phys.*, 11, 8003-8015, 2011.

Brock, C. A., J. Cozic, R. Bahreini, K. D. Froyd, A. M. Middlebrook, A. McComiskey, J. Brioude, O. R. Cooper, A. Stohl, K. C. Aikin, J. A. de Gouw, D. W. Fahey, R. A. Ferrare, R.-S. Gao, W. Gore, J. S. Holloway, G. Hubler, A. Jefferson, D. A. Lack, **S. Lance**, et al., Characteristics, sources, and transport of aerosols measured in spring 2008 during the aerosol, radiation, and cloud processes affecting Arctic Climate (ARCPAC) Project, *Atmos. Chem. Phys.*, 11, 2423-2453, 2011.

2010

Lance, S., C.A. Brock, D. Rogers, and J.A. Gordon, Water droplet calibration of a cloud droplet probe and in-flight performance in liquid, ice and mixed-phase clouds during ARCPAC, *Atmos. Meas. Tech.*, 3, 1683-1706, 2010.

2009

Lance, S., A. Nenes, C. Mazzoleni, M.K. Dubey, H. Gates, V. Varutbangkul, T.A. Rissman, S.M. Murphy, A. Sorooshian, R.C. Flagan, J.H. Seinfeld, G. Feingold, H.H. Jonsson, Cloud condensation nuclei activity, closure, and droplet growth kinetics of Houston aerosol during the Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS), *J. Geophys. Res.*, 114, D00F15, doi:10.1029/2008JD011699, 2009.

Prior to 2009

Lance, S., J. Medina, J.N. Smith and A. Nenes. Mapping the Operation of the DMT Continuous Flow CCN Counter, *Aerosol Sci. Technol.*, 40 (4): 242-254, 2006.

Lance, S., T. Rissman and A. Nenes, Chemical and Dynamical Effects on Cloud Droplet Number: Implications for Estimates of the Aerosol Indirect Effect, *J. Geophys. Res.*, 109, D22208, 2004.

Simpson, M., **S. Lance**, and G. Moore, Kinetics of Molten Chloride Salt Sorption into Zeolite-4A. In W. Schneider (Ed.), *Light Metals 2002*, 51-56, 2002.

TEACHING and MENTORING EXPERIENCES

Guest Lecturer, "12.335/12.835: Experimental Atmospheric Chemistry" taught by Prof. Dan Cziczo, Massachusetts Institute of Technology, Fall 2015

Guest Lecturer, "ATOC 5151: Atmospheric Chemistry" taught by Prof. Maggie Tolbert, University of Colorado-Boulder, Spring 2015

Training on instrument operation, performance, sampling strategies and scientific analysis for University of North Dakota atmospheric science department in March 2014 and for the Bureau of Royal Rainmaking and Agricultural Aviation (BRRAA), Thailand over two weeks in June 2014.

Mentor for two CU-Boulder college graduates (Seth Griswold and Taylor O'Donnell) in calibrations of cloud probe instruments at SPEC, Inc., Jan 2013 – Feb 2015.

Mentor for Ryan Davis, a CU-Boulder graduate student, and Alexander Moyer, a CU-Boulder undergraduate student, in the design and development of a new instrument for measuring contact nucleation and scientific analysis of results, Jul 2011 – Present.

Teaching Assistant, “EAS 4803/8803: Experimental Methods in Air Quality” for Dr. Greg Huey, Dr. Michael Bergin and Dr. Karsten Baumann, Georgia Institute of Technology, Spring 2004

Teaching Assistant, “EAS 2750: Physics of the Weather” for Dr. George Chimonas, Georgia Institute of Technology, Fall 2003

DISTINCTIONS and AWARDS

Served on a proposal review panel for the Department of Energy (DOE) Atmospheric System Research (ASR) Funding Opportunity on “Ice Processes”

American Meteorological Society (AMS) Cloud Physics Committee member, 2013-2014.

CIRES Innovative Research Program (IRP) grant recipient, CU-Boulder, July, 2011.

“Contact Freezing on Demand: Measurement of contact nuclei with a novel instrument using single droplets levitated in an optical trap” <http://cires.colorado.edu/science/pro/irp/2011/>

Lance et al. (2006) makes the top 10 most-cited articles published in the journal Aerosol Science and Technology, <http://nenes.eas.gatech.edu/Files/Top10Cited.htm>, 2009.

Glen Cass Award, Georgia Institute of Technology, 2006.

Advanced Study Program Graduate Fellowship at the National Center for Atmospheric Research (NCAR), Boulder, CO, 2004-2007.

President's Fellowship, Georgia Institute of Technology, Atlanta, GA, 2002-2003.

Professional Development Grant, Georgia Institute of Technology, Atlanta, GA, 2002.

Arizona State University Academic Scholarship, Regents and President's Awards, Tempe, AZ, 1998.

UNDERGRADUATE RESEARCH EXPERIENCES

2001-2002 Research Assistant, Arizona State University, Tempe, AZ.

Analyzed aerosol mass spectrometer data acquired from a six-week study at the Michigan Biological Station, PROPHET 2001

Summer 2001 Department of Defense funded Energy Research Undergraduate Laboratory Fellowship (ERULF) at Argonne National Laboratory-West, Idaho Falls, ID.

Ceramic Nuclear Wasteform Research.. Studied the absorption of radioactive chloride salts in zeolite molecular sieves

Summer 2000 National Science Foundation funded Research Experience for Undergraduates (REU) at North Carolina State University, Raleigh, NC.

Green technology. Modeled phase equilibria associated with continuous polymerization in supercritical carbon dioxide

INSTRUMENTATION DESIGNED/BUILT

DLC: Droplet Levitation Chamber (CIRES IRP 2011)
DCS: Droplet Calibration System (at NOAA & at SPEC, Inc.)
HTDMA: Humidified Tandem Differential Mobility Analyzer

Used/Deployed for
Laboratory Nucleation Studies
Calibration of Cloud Probes
MIRAGE (see below)

FIELD PROJECT PARTICIPATION

SEAC4RS, Houston	http://espo.nasa.gov/missions/seac4rs	Aug-Sep 2013
DC3, Kansas	http://www.eol.ucar.edu/projects/dc3/	May-Jun 2012
CalNex, California	http://www.esrl.noaa.gov/csd/calnex/	May-Jun 2010
ARCPAC, Alaska	http://www.esrl.noaa.gov/csd/arcpac/	Apr 2008
EUCAARI, Finland	http://www.atm.helsinki.fi/eucaari/	Apr 2007
GoMACCS, Texas	http://www.esrl.noaa.gov/csd/2006/	Sep-Aug 2006
MIRAGE, Mexico City	http://mirage-mex.acd.ucar.edu/	Mar 2006

ANALYSIS of DATASETS (in addition to list above)

ATTREX, Pacific Ocean	http://espo.nasa.gov/missions/attrex	2011, 2013, 2014
ICE-T, St Croix	http://www.eol.ucar.edu/projects/ice-t/	July 2011
MacPex, Houston	http://www.espo.nasa.gov/macpex/	Apr 2011
SpartICus, Oklahoma	http://acrf-campaign.arm.gov/sparticus/	Jan-June 2010
ISDAC, Alaska	http://acrf-campaign.arm.gov/isdac/	Apr 2008

COMMERCIAL INSTRUMENTS DEPLOYED / CHARACTERIZED

SPEC Cloud Probes (<i>FCDP, 2D-S, FFSSP, CPI, HVPS, etc.</i>)	<u>Deployed for</u> ATTREX, DC3, SEAC4RS
DMT Cloud Probes (<i>CAS, CDP, CIP, PIP</i>)	ARCPAC, Calnex
<i>CCNc</i> : DMT Cloud Condensation Nuclei Counter	MIRAGE, GoMACCS, EUCAARI
<i>DMAs</i> : TSI Differential Mobility Analyzers	MIRAGE, EUCAARI
<i>CPCs</i> : TSI Condensation Particle Counters	MIRAGE, EUCAARI

CONFERENCES and WORKSHOPS

2015

249th American Chemical Society (ACS) National Meeting, Denver, CO, Mar 2015 (contributions to a platform presentation given by Ryan Davis)

Contact Induced Efflorescence of Amorphous Inorganic Microparticles

2014

Summer Workshop on Data Analysis of Cloud Microphysics Measurements, Boston, MA, Jul 2014 (platform presentation and contributions to a platform presentation given by Paul Lawson)

Introduction on Cloud Condensation Nuclei (CCN) measurements and the performance of the DMT CCN Counter.

Small Particle Measurement and Calibration of the 2D-Stereo probe with water droplets and a high speed spinning disk.

American Meteorological Society (AMS) Cloud Physics conference, Boston, MA, Jul 2014 (poster)

Coordinated observations of cloud microphysical properties from multiple aircraft during SEAC4RS

2013

Department of Energy (DOE) Atmospheric System Research (ASR) Fall Working Group Meeting, Rockville, MD, Nov 2013 (platform presentation)

Modeling radiative properties and radiative effects of Arctic mixed-phase stratus based on in-situ observations from ISDAC 2008.

International Conference on Clouds and Precipitation (ICCP), Workshop on Measurement Problems in Ice Clouds, Zurich, Switzerland, Jul 2013 (contributions to several areas)

Cirrus Formation, Evolution, and Impact on Climate.

Mixed-phase clouds and glaciation.

Calibration, Standards and Measurement Interferences.

DOE ASR Science Team Meeting, Potomac, MD, Mar 2013 (poster)

SPartICus Cirrus particle sizes and habits.

2012

International Conference on Clouds and Precipitation (ICCP), Leipzig, Germany, Jul 2012 (contributions to platform presentation given by Paul Lawson)

SPEC Learjet investigations of First Ice in ICE-T.

Storm Penetrating Aircraft (SPA-10) Workshop, Boulder, CO, Jun 2012 (platform presentation)

Cloud microphysics instruments for deployment on the SPA-10.

ATTREX Science Meeting, Boulder, CO, Jun 2012 (platform presentation)

Uncertainties and limitations of the FCDP measurements during ATTREX 2011.

DC3 Science Meeting, Salina, KS, May 2012 (platform presentation)

Preliminary cloud microphysics measurements from the DC-8 during DC3.

2011

American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, Dec 2011 (contributions to platform presentation given by Steve Brown)

Efficiency of N₂O₅ heterogeneous uptake over Los Angeles during CalNex 2010.

AGU Fall Meeting, San Francisco, CA, Dec 2011 (contribution to platform presentation given by Tomi Raatikainen)

CCN activation kinetics: quantifying compositional impacts in polluted and pristine environments.

2010

AGU Fall Meeting, San Francisco, CA, Dec 2010 (poster)

Pollution effects on marine stratus off the coast of California during Calnex 2010.

AGU Fall Meeting, San Francisco, CA, Dec 2010 (contribution to platform presentation given by Patrick McBride)

Cloud property retrievals from surface spectral transmittance and airborne spectral reflectance: Comparisons with satellite, microwave, and in-situ observations during CalNex.

Annual Meeting of the Facility for Airborne Atmospheric Measurements (FAAM) Cloud Instrument Working Group, Cranfield, Bedford, UK, Nov 2010 (Invited, remote presentation)

Calibration and Performance of the CDP.

AMS Conference on Cloud Physics, Portland, OR, Jun 2010 (platform presentation and a poster)

CCN as a modulator of ice processes in Arctic mixed-phase clouds.

Water droplet calibration of the DMT Cloud Droplet Probe (CDP) and in-flight performance in liquid, ice and mixed-phase clouds during ARCPAC.

Workshop for In Situ Airborne Instrumentation: Addressing and Solving Measurement Problems in Ice Clouds, Seaside, OR, Jun 2010 (Invited to lead the session)
Calibration Techniques and Standards.

2009

AGU Fall Meeting, San Francisco, CA, Dec 2009 (platform presentation)
CCN as a modulator of ice processes in Arctic mixed-phase clouds.

ARCPAC Science Meeting, Boulder, CO, Mar 2009 (platform presentation)
Measuring microphysical properties of Arctic clouds during ARCPAC 2008.

Prior to 2009

ISDAC Science Meeting, Lansdowne, VA, 2008 (platform presentation)
Microphysical properties of Arctic clouds during ARCPAC 2008.

ICCP, Cancun, MX, 2008 (poster)
Water-Aerosol Interactions Downwind of Mexico City: Inferences about Chemical Composition and Aging of Ambient Aerosol.

AGU Fall Meeting, San Francisco, CA, Dec 2007 (poster)
CCN Closure in the Polluted Boundary Layer over Houston, TX During the Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS 2006).

American Association for Aerosol Research (AAAR) Conference, Reno, NV, 2007 (platform presentation)
CCN Closure in the Polluted Boundary Layer over Houston, TX During the Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS 2006).

AAAR Conference, Saint Paul, MN, 2006 (platform presentation)
Measuring Water-Aerosol Interactions Downwind of Mexico City: Inferences about Chemical Composition and Aging of Ambient Aerosol.

AAAR Conference, Austin, TX, 2005 (platform presentation)
Charting Water-Aerosol Interactions to Infer Chemical Composition and Aging of Ambient Aerosols.

AAAR Conference, Atlanta, GA, 2004 (platform presentation)
Mapping the Performance of a New Continuous-Flow CCN Counter.

AAAR Conference, Anaheim, CA, 2003 (platform presentation)
Chemical and Dynamical Effects on Cloud Droplet Number: A Reverse Modeling Approach.