

Michael J. Lawler

Born: San Diego, CA, USA
Citizenship: USA

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Education

University of California, Irvine (2005-2011)

Ph.D. Earth System Science, Sept. 2011.

Thesis: Measurements and Modeling of Reactive Halogens in Marine Air.

Advisor: Eric Saltzman

M.S. Earth System Science, 2008.

University of California, Berkeley (2001-2005)

B.A. Earth and Planetary Science, May 2005, with Honors.

Thesis: Chamber Investigation of NO_y Uptake by a Pine Tree in a Lab Environment.

Advisor: Ron Cohen

Study abroad at Georg-August University, Göttingen, Germany (2003-2004)

Post-PhD Research Experience

University of California, Irvine (Sept 2015- current)

Department of Chemistry

visitor at: National Center for Atmospheric Research (Boulder, CO)

Assistant Project Scientist

Analysis of field and laboratory studies on recently formed nanoparticles to identify their mechanisms of formation in different environments.

University of Eastern Finland, Kuopio (Jan 2012 - Aug. 2015)

Department of Applied Physics

visitor at: National Center for Atmospheric Research (Boulder, CO)

Postdoctoral Researcher

Advisor: James Smith.

Development and application of techniques for measuring the composition of recently formed ambient nanoparticles to understand their chemical growth.

Scientific Accomplishments

- Made the first direct observations of gas phase HOCl in the marine atmosphere using a technique I developed. This helped constrain gas-aerosol halogen cycling mechanisms and Cl radical levels.
- Demonstrated a critical role for organic molecules in apparent open ocean new particle formation, through the development of high resolution particle mass spectrometry analysis techniques.

- Made the first observations of gas phase I₂ in marine air away from sea ice and macroalgal sources to demonstrate that it is not the primary source of I atoms in remote marine air.

Professional Expertise

Chemical Ionization Mass Spectrometry (CIMS) methods and development
Sub-micron aerosol instrumentation methods and development
Characterization of organic and inorganic non-refractory aerosol composition
High resolution time-of-flight (TOF) mass spectrometry data analysis
Field and laboratory observation organization, setup, troubleshooting
Environmental data analysis with Igor Pro and MATLAB (including GUI development)
Testing chemical mechanisms using box models (e.g. FORTRAN-based MECCA)
Concise and clear scientific writing for publication
Collaborative research on large projects (e.g. CLOUD at CERN)

Teaching and Mentoring

Writing Mentor (Spring-Summer 2016, NCAR SOARS program)

Helping masters student Meghan Mitchell improve her academic writing skills.

Research Mentor (Summer 2015- current, at NCAR and UC Irvine)

Training and helping mentor a 2nd-year graduate student (Danielle Draper).

Writing Mentor (Summer 2015, NCAR SOARS program)

Helped undergraduate researcher Breanna Zavadoff develop academic writing skills.

Teaching Assistant for ESS 114, Field Methods (Spring 2008, UC Irvine).

Organized field and lab experiments, held discussion sections, and graded lab reports for advanced earth science undergraduates.

Teaching Assistant for ESS 53, Ocean Biogeochemistry (Winter 2008, UC Irvine).

Held discussion sections and test reviews, and graded homework assignments for earth science undergraduates.

Teaching Assistant for ESS 11, Climate Change and Policy (Winter 2007, UC Irvine).

Held discussion sections, graded homework assignments, and prepared and delivered a lecture on atmospheric radiation for diverse undergraduates.

Honors

Admission to SOLAS Summer School in Corsica, France (2011).

Runner-up: Best Graduate Student Paper (2009, Earth System Science, UC Irvine).

Best Graduate Student Poster Presentation (2007, Earth System Science, UC Irvine).

Departmental Citation for graduating B.A. students (2005, EPS, UC Berkeley).

Community Involvement

Laboratory tours for new employees and college students (2015-2016).

Laboratory tours for high school and college students (2011).

Earth Day booth volunteer (2008 and 2009).

Judge of Earth System Science award, California State Science Fair (2008).

Professional Society Membership

American Association for Aerosol Research (2015-current).

American Geophysical Union (2006-2015).

American Association for the Advancement of Science (2008-2012).

Languages

English: native

German: fluent

Spanish and French: basic

Publications

Lawler, M.J., Sarnela, N., Sipilä, M., Petäjä, T., Worsnop, D.R., and Smith, J.N. Time-resolved chemistry of newly formed particles at a boreal forest site. *Manuscript in preparation*.

Ahlm, L., et al. (**7th author**). Modeling the thermodynamics and kinetics of sulfuric acid-dimethylamine-water nanoparticle growth in the CLOUD chamber, *accepted for publication in Aerosol Sci. & Tech*, 2016.

Lawler, M.J., Winkler, P., Smith, J.N., and the CLOUD Consortium. Unexpectedly acidic nanoparticles formed in dimethylamine-ammonia-sulfuric acid nucleation experiments at CLOUD. *Atmos. Chem. Phys. Disc.*, doi:10.5194/acp-2016-361, 2016.

Hodshire, A.L., **Lawler, M.J.**, Zhao, J., Ortega, J., Jen, C., Yli-Jutti, T., Brewer, J.F., Kodros, J.K., Barsanti, K.C., Hanson, D.R., McMurry, P.H., Smith, J.N., and Pierce, J.R. Analysis of multiple new-particle growth pathways observed at the US DOE Southern Great Plains field site. *Atmos. Chem Phys.*, doi:10.5194/acp-2016-157, 2016.

Tröstl, J., et al. (**39th author**) Low-volatility organic compounds are key to initial particle growth in the atmosphere. *Nature*, doi: 10.1038/nature18271, 2016.

Lehtipalo, K., et al. (**39th author**). The effect of acid-base clustering and ions on the growth of atmospheric nano-particles. *Nat. Commun.*, doi:10.1038/ncomms11594, 2016.

Kim, J., et al. (**4th author**). Hygroscopicity of nanoparticles produced from homogeneous nucleation in the CLOUD experiments. *Atmos. Chem. Phys.* **16**, 293-304, doi:10.5194/acp-16-293-2016, 2016.

Lawler, M.J., Whitehead, J., O'Dowd, C., Monahan, C., McFiggans, G., and Smith, J.N. Composition of 15-85 nm diameter particles in marine air, *Atmos. Chem. Phys.* **14**, 11557-11569, doi: 10.5194/acp-14-11557-2014, 2014.

Fry, J.L., Draper, D.C., Barsanti, K.C., Smith, J.N., Ortega, J., Winkler, P.M., **Lawler, M.J.**, Brown, S.S., Edwards, P.M., Cohen, R.C., and Lee, L. Secondary organic aerosol formation and organic nitrate yield from NO₃ oxidation of biogenic hydrocarbons, *Env. Sci. & Tech.*, doi: 10.1021/es502204x, 2014.

Bianchi, F. et al (**29th author**). Insight into acid-base nucleation experiments by comparing the chemical composition of positive, negative, and neutral clusters, *Env. Sci. & Tech.*, doi: 10.1021/es502380b, 2014.

You, Y. et al. (**7th author**). Atmospheric amines and ammonia measured with a chemical ionization mass spectrometer (CIMS), *Atmos. Chem. Phys.*, doi: 10.5194/acpd-14-16411-2014, 2014.

Bzdek, B.R., **Lawler, M.J.**, Horan, A.J., Pennington, M.R., DePalma, J.W., Zhao, J., Smith, J.N., and Johnston, M.J. Molecular constraints on particle growth during new particle formation, *Geo. Res. Lett.* **41**, 6045-6054, doi: 10.1002/2014GL060160, 2014.

Lawler, M.J., Mahajan, A.S., Saiz-Lopez, A., and Saltzman, E.S., Observations of I₂ at a remote marine site, *Atmos. Chem. Phys.* **14**, 2669-2678, doi: 10.5194/acp-14-2669-2014, 2014.

Lawler, M. J., Sander, R., Carpenter, L. J., Lee, J. D., von Glasow, R., Sommariva, R., and Saltzman, E. S., HOCl and Cl₂ observations in marine air, *Atmos. Chem. Phys.* **11**, 7617-7628, doi: 10.5194/acp-11-7617-2011, 2011.

Lee, J.D. et al. (**25th author**). Reactive halogens in the marine boundary layer (RHAMBLe): the tropical north Atlantic experiments, *Atmos. Chem. Phys.* **10**, 1031-1055, 2010.

Lawler, M. J., Finley, B. D., Keene, W. C., Pszenny, A. A. P., Read, K. A., von Glasow, R., and Saltzman, E. S., Pollution-enhanced reactive chlorine chemistry in the eastern tropical Atlantic boundary layer, *Geophys. Res. Lett.* **36**, L08810, doi:10.1029/2008GL036666, 2009.

Saltzman, E. S., De Bruyn, W. J., **Lawler, M. J.**, Marandino, C. A., and McCormick, C. A., A chemical ionization mass spectrometer for continuous underway shipboard analysis of dimethylsulfide in near-surface seawater, *Ocean Science* **5**, 537-546, 2009.

Neu, J. L., **Lawler, M. J.**, Prather, M. J., and Saltzman, E. S., Oceanic alkyl nitrates as a source of tropospheric ozone, *Geophys. Res. Lett.* **35**, L13814, doi: 10.1029/2008GL034189, 2008.

Selected Presentations

Lawler, M.J., Sarnela, N., Sipilä, M., Petäjä, T., Worsnop, D.R., and Smith, J.N. New particle formation in the boreal forest: characterizing the molecules responsible for growth. *American Association for Aerosol Research Annual Conference, 2015*, oral.

Lawler, M. J., Ortega, J.V., and Smith, J. N. Nanoparticle composition at a rural U.S. forest site: evidence for diverse sources. *American Geophysical Union. Fall Meeting 2014*, poster.

Lawler, M. J., Smith, J. N., Winkler, P., and the CLOUD consortium. TDCIMS nanoparticle composition at CLOUD7. *International Conference on Nucleation and Atmospheric Aerosols 2013*, oral.

Lawler, M. J., Mahajan, A., and Saltzman, E. S. Observations of I₂ in the tropical Atlantic, *American Geophysical Union. Fall Meeting 2012*, poster.

Lawler, M. J., Saltzman, E. S., and Sander, R. Constraints on reactive chlorine cycling mechanisms in remote marine air, *American Geophysical Union. Fall Meeting 2010*, poster.

Lawler, M. J., and Saltzman, E. S. Measurement of HOCl and Cl₂ in the remote marine boundary layer, *American Geophysical Union, Fall Meeting 2009*, oral.

Lawler, M. J., and Saltzman, E. S. Cl₂ measurements in polluted coastal air using a Br⁻ Addition CIMS technique, *American Geophysical Union. Fall Meeting 2008*, poster.