

Rebecca Schwantes

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EDUCATION

- California Institute of Technology** Pasadena, CA
PhD Environmental Science and Engineering June 2017
Thesis: Identifying Isoprene and Toluene Gas-Phase Oxidation Products to Better Constrain Ozone and Secondary Organic Aerosol Formation in the Atmosphere
- University of Virginia** Charlottesville, VA May 2009
B.S. in Chemistry with a specialization in Biochemistry
Distinguished Majors Program – Highest Distinction
B.A. in Mathematics

WORK HISTORY

- Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder**
National Oceanic and Atmospheric Administration (NOAA), Chemical Sciences Laboratory
Boulder, CO
Research Scientist 2 April 2020 to present
Evaluating and improving chemistry in the NOAA FV3 and WRF-chem models with an ultimate goal of improving simulated air pollutants including ozone and secondary organic aerosol.
- National Center for Atmospheric Research (NCAR), Atmospheric Chemistry Observations and Modeling Laboratory** Boulder, CO
Project Scientist 1 Sept 2019 to March 2020
Updating chemistry in CESM/CAM-Chem and assisting in the development of a new version of CESM called CAM-chem-SE-RR with the capability of regional refinement, which includes model development, emissions regridding, and evaluation against field campaign and surface observations.
- Postdoctoral Fellow* Nov 2016 to Sept 2019
Updating, optimizing, and evaluating volatile organic compound oxidation chemistry in CESM/CAM-Chem, a community earth system model, in order to improve simulated ozone.
- California Institute of Technology** Pasadena, CA Sept 2011 to Oct 2016
PhD Candidate
Conducted atmospheric chamber experiments under the supervision of Dr. John Seinfeld (primary advisor) and Dr. Paul Wennberg (secondary advisor) with a focus on identifying gas-phase oxidation products and secondary organic aerosol precursors using a CF₃O⁻ chemical ionization mass spectrometer.
- Eastern Research Group, Inc.** Chantilly, VA Aug 2009 – March 2011
Chemist
Worked as a technical contractor to the US Environmental Protection Agency to help develop a new rule that would better regulate wastewater discharges from steam electric power plants.

HONORS and AWARDS

- NCAR Advanced Study Program (ASP) Postdoctoral Fellowship Nov 2016 – Nov 2018

MENTORING, TEACHING, and SERVICE

Chemical Forecasting for Field Campaigns

Helped with chemical forecasting efforts for FIREX aircraft campaign. Summer 2019

CAM-chem Wiki Development and Maintenance

Helped create and maintain wiki page for CAM-chem to expand the user community. 2018 - 2019

NCAR Significant Opportunities in Atmospheric Research and Science

Writing Mentor

Worked with undergraduate student to enhance writing and presentation skills. Summer 2017 & 2018

Colorado Science and Engineering Fair Judge

Judged senior division high school projects for state science fair competition. April 2017 & 2018

Summer Undergraduate Research Fellowship Program

Mentor

Assisted undergraduate student in developing a project to better understand advected tracer transportation in GEOS-Chem, a global chemical transport model. Summer 2014

California Institute of Technology

Teaching Assistant

Atmospheric Chemistry and Introduction to Environmental Science and Engineering Spring 2013 & Spring 2014

Caltech Y Rise Program

Tutor

Tutored, as a volunteer, students in middle and high school struggling in math and science. Oct 2011 – April 2013

PUBLICATIONS

Peer-Reviewed Journal Articles

Schwantes, R. H., Emmons, L. K., Orlando, J. J., Barth, M. C., Tyndall, G. S., Hall, S. R., Ullmann, K., St. Clair, J. M., Blake, D. R., Wisthaler, A., and Bui, T. V.: Comprehensive Isoprene and Terpene Gas-Phase Chemistry Improves Simulated Surface Ozone in the Southeastern U.S., *Atmos. Chem. Phys.*, 20, 3739-3776, <https://doi.org/10.5194/acp-20-3739-2020>, 2020.

Emmons, L. K., **Schwantes, R. H.**, Orlando, J. J., Tyndall, G. S., Kinnison, D., Lamarque, J.-F., Marsh, D., Mills, M. J., Tilmes, S., Bardeen, C., Buchholz, R. R., Conley, A., Gettelman, A., Garcia, R., Simpson, I., Blake, D. R., Meinardi, S., Petron, G.: The Chemistry Mechanism in the Community Earth System Model version 2 (CESM2). *J. Advances in Modeling Earth Systems*, 12, e2019MS001882, <https://doi.org/10.1029/2019MS001882>, 2020.

Schwantes, R. H., Charan, S. M., Bates, K. H., Huang, Y., Nguyen, T. B., Mai, H., Kong, W., Flagan, R. C., Seinfeld, J. H.: Low-volatility Compounds Contribute Significantly to Isoprene SOA Under High-NO_x Conditions. *Atmos. Chem. Phys.*, 19, 7255-7278, <https://doi.org/10.5194/acp-2018-1358>, 2019.

Wennberg, P. O., Bates, K. H., Crouse, J. D., Dodson, L. G., McVay, R. C., Mertens, L. A., Nguyen, T. B., Praske, E., **Schwantes, R. H.**, Smarte, M. D., St Clair, J. M., Teng, A. P., Zhang, X., Seinfeld, J. H.: Gas-Phase Reactions of Isoprene and Its Major Oxidation Products. *Chem. Rev.*, 118, 3337-3390, <https://doi.org/10.1021/acs.chemrev.7b00439>, 2018.

Schwantes, R.H., Schilling, K. A., McVay, R. C., Lignell, H., Coggon, M. M., Zhang, X., Wennberg, P.O., Seinfeld, J. H.: Formation of Highly Oxygenated Low-Volatility Products from Cresol Oxidation. *Atmos. Chem. Phys.*, 17, 3453-3474, <https://doi.org/10.5194/acp-17-3453-2017>, 2017.

Kurten, T., Moller, K. H., Nguyen, T. B., **Schwantes, R. H.**, Misztal, P. K., Su, L., Wennberg, P. O., Fry, J. L., Kjaergaard, H. G.: Alkoxy Radical Bond Scissions Explain the Anomalously Low Secondary Organic Aerosol and Organonitrate Yields From α -Pinene + NO₃. *J. Phys. Chem. Lett.*, 8, 2826-2834, <https://doi.org/10.1021/acs.jpcclett.7b01038>, 2017.

Ng, N. L., Brown, S. S., Archibald, A. T., Atlas, E., Cohen, R. C., Crowley, J. N., Day, D. A., Donahue, N. M., Fry, J. L., Fuchs, H., Griffin, R. J., Guzman, M. I., Herrmann, H., Hodzic, A., Iinuma, Y., Jimenez, J. L., Kiendler-Scharr, A., Lee, B. H., Luecken, D. J., Mao, J., McLaren, R., Mutze, A., Osthoff, H. D., Ouyang, B., Picquet-Varrault, B., Platt, U., Pye, H. O. T., Rudich, Y., **Schwantes, R. H.**, Shiraiwa, M., Stutz, J., Thornton, J. A., Tilgner, A., Williams, B. J., Zaveri, R. A.: Nitrate Radicals and Biogenic Volatile Organic Compounds: Oxidation, Mechanisms, and Organic Aerosol. *Atmos. Chem. Phys.*, 17, 2103-2162, <https://doi.org/10.5194/acp-17-2103-2017>, 2017.

Nguyen, T. B., Tyndall, G. S., Crouse, J. D., Teng, A. P., Bates, K. H., **Schwantes, R. H.**, Coggon, M. M., Zhang, L., Feiner, P., Miller, D. O., Skog, K. M., Rivera-Rios, J. C., Dorris, M., Olson, K. F., Koss, A., Wild, R. J., Brown, S. S., Goldstein, A. H., de Gouw, J. A., Brune, W. H., Keutsch, F. N., Seinfeld, J. H., Wennberg, P. O.: Atmospheric Fates of Crigee Intermediates in the Ozonolysis of Isoprene. *Phys. Chem. Chem. Phys.*, 18, 10241-10254, <https://doi.org/10.1039/C6CP00053C>, 2016.

Thomas, D. A., Coggon, M. M., Lignell, H., Schilling, K. A., Zhang, X., **Schwantes, R. H.**, Flagan, R. C., Seinfeld, J. H., Beauchamp, J. L.: Real-Time Studies of Iron Oxalate-Mediated Oxidation of Glycolaldehyde as a Model for Photochemical Aging of Aqueous Tropospheric Aerosols. *Environ. Sci. Technol.* 50, 12241-12249, <https://doi.org/10.1021/acs.est.6b03588>, 2016.

Schwantes, R. H., Teng, A. P., Nguyen, T. B., Coggon, M. M., Crouse, J. D., St. Clair, J. M., Zhang, X., Schilling, K. A., Seinfeld, J. H., Wennberg, P.O.: Isoprene NO₃ Oxidation Products from the RO₂ + HO₂ Pathway. *J. Phys. Chem. A.*, 119, 10158-10171, <https://doi.org/10.1021/acs.jpca.5b06355>, 2015.

Zhang, X., **Schwantes, R. H.**, McVay, R. C., Lignell, H., Coggon, M. M., Flagan, R. C., Seinfeld, J. H.: Vapor Wall Deposition in Teflon Chambers. *Atmos. Chem. Phys.*, 15, 4197-4214, <https://doi.org/10.5194/acp-15-4197-2015>, 2015.

Nguyen, T. B., Bates, K. H., Crouse, J. D., **Schwantes, R. H.**, Zhang, X., Kjaergaard, H. G., Surratt, J. D., Lin, P., Laskin, A., Seinfeld, J. H., Wennberg, P. O.: Mechanism of the Hydroxyl Radical Oxidation of Methacryloyl Peroxynitrate (MPAN) and its Pathway toward Secondary Organic Aerosol Formation in the Atmosphere. *Phys. Chem. Chem. Phys.*, 17, 17914-17926, <https://doi.org/10.1039/C5CP02001H>, 2015.

Schilling Fahnestock, K. A., Yee, L. D., Loza, C. L., Coggon, M. M., **Schwantes, R. H.**, Zhang, X., Dalleska, N. F., Seinfeld, J. H.: Secondary Organic Aerosol Composition from C₁₂ Alkanes. *J. Phys. Chem. A.*, 119 (19), 4281-4297, <https://doi.org/10.1021/jp501779w>, 2015.

Zhang, X., **Schwantes, R. H.**, Coggon, M. M., Loza, C. L., Schilling, K. A., Flagan, R. C., Seinfeld, J. H.: Role of Ozone in SOA Formation from Alkane Photooxidation. *Atmos. Chem. Phys.*, 14, 1733-1753, <https://doi.org/10.5194/acp-14-1733-2014>, 2014.

Nguyen, T. B., Crouse, J. D., **Schwantes, R. H.**, Teng, A. P., Bates, K. H., Zhang, X., St. Clair, J. M., Brune, W. H., Tyndall, G. S., Keutsch, F. N., Seinfeld, J. H., Wennberg, P. O.: Overview of the

Focused Isoprene eXperiment at the California Institute of Technology (FIXCIT): Mechanistic Chamber Studies on the Oxidation of Biogenic Compounds. *Atmos. Chem. Phys.*, 14, 13531-13549, <https://doi.org/10.5194/acp-14-13531-2014>, 2014.

Nguyen, T. B., Coggon, M. M., Bates, K. H., Zhang, X., **Schwantes, R. H.**, Schilling, K. A., Loza, C. L., Flagan, R. C., Wennberg, P. O., Seinfeld, J. H.: Organic Aerosol Formation from the Reactive Uptake of Isoprene Epoxydiols (IEPOX) onto Non-Acidified Inorganic Seeds. *Atmos. Chem. Phys.*, 14, 3497-3510, <https://doi.org/10.5194/acp-14-3497-2014>, 2014.

Loza, C. L., Craven, J. S., Yee, L. D., Coggon, M. M., **Schwantes, R. H.**, Shiraiwa, M., Zhang, X., Schilling, K. A., Ng, N. L., Canagaratna, M. R., Ziemann, P. J., Flagan, R. C., Seinfeld, J. H.: Secondary Organic Aerosol Yields of 12-carbon Alkanes. *Atmos. Chem. Phys.*, 14, 1423-1439, <https://doi.org/10.5194/acp-14-1423-2014>, 2014.

Book Chapters

Schwantes, R. H., McVay, R. C., Zhang, X., Coggon, M. M., Lignell, H., Flagan, R. C., Wennberg, P.O., Seinfeld, J. H.: Chapter 1: Science of the Environmental Chamber. *Advances in Atmospheric Chemistry: Vol 1* In J. R. Barker, A. L. Steiner, & T. J. Wallington Eds., Singapore: World Scientific Publishing Co. Pte. Ltd., 1-93, https://doi.org/10.1142/9789813147355_0001, 2017.

Submitted/In Review

Wang, S., Apel, E. C., **Schwantes, R. H.**, Bates, K., Jacob, D. J., Fisher, E. V., Hornbrook, R. S., Hills, A. J., Emmons, L. K., Pan, L. L., Honomichl, S., Tilmes, S., Lamarque, J.-F. et al.: Global Atmospheric Budget of Acetone: Air-Sea Exchange and the Contribution to Hydroxyl Radicals. *J. Geophys. Res.*, 2020, [In Review].

Jeong, D., Seco, R., Emmons, L., Schwantes, R. H., Liu, Y., McKinney, K. A., Martin, S. T., Keutsch, F. N., Gu, D., Guenther, A. B., Vega, O., Tota, J., Souza, R. A. F., Springston, S. R., Watson, T. B., Kim, S.: Reconciling Observed and Predicted Tropical Rainforest OH Concentrations using a Chemical Ionization Mass Spectrometer during the GoAmazon2014/5 Field Campaign. *J. Geophys. Res. Atmos.*, 2020, [In Review].

He, C., Clifton, O., Felker-Quinn, E., Fulgham, S. R., Calahorrano, J. J., Lombardozzi, D., Purser, G., Riches, M., **Schwantes, R. H.**, Tang, W., Poulter, B., Steiner, A. L.: Air Pollution-Ecosystem Interactions: Perspectives on Challenges and Future Directions. *Bull. Am. Meteorol. Soc.*, 2020, [In Review]

In Preparation

Schwantes, R. H., R. S. Hornbrook, J. J. Orlando, S. Wang, E. C. Apel, A. Hills, L. K. Emmons, et al.: More Explicit Alkane Chemistry Improves the Representation of Propanal, Acetone, Butanal, Methyl Ethyl Ketone, and HO_x in the Remote Atmosphere, [In preparation].

Schwantes, R. H., F. Lacey, S. Tilmes, L. K. Emmons, M. Barth, P. Lauritzen, S. Walters, N. Davis, P. Callaghan, J. Bacmeister, R. Neale et al.: Evaluating Chemistry and Specified Dynamics Options in the Newly Developed CAM-chem-SERR Against Five Field Campaigns, [In preparation].

SELECTED PRESENTATIONS

Schwantes, R. H., et al.: More Explicit Alkane Chemistry Improves the Representation of Several Volatile Organic Compounds Including Methyl Ethyl Ketone in the Remote Atmosphere. Oral Presentation, American Geophysical Union, San Francisco, California, USA, 2019.

Schwantes, R. H., et al.: Uncertainties in Isoprene and Terpene Chemistry Impact on Simulated Surface Ozone in the United States. Oral Presentation, Winter CESM Chemistry Climate Working Group Meeting, Boulder, CO, USA, 2019.

Schwantes, R. H., et al.: The Impact of Aerosol Uptake of Organic Nitrates on Simulated Surface Ozone in CAM-chem. Oral Presentation, International Aerosol Conference (IAC), St. Louis, Missouri, USA, 2018.

Schwantes, R. H., et al.: Comprehensive Monoterpene Chemistry is Necessary for Accurately Simulating Surface Ozone in the Southeastern U.S. in CAM-Chem. Oral Presentation, Gordon Research Seminar (Early Career Portion of GRC) and Gordon Research Conference (GRC): Biogenic Hydrocarbons and the Atmosphere, Les Diablerets, Switzerland, 2018.

Guenther, A. and **R. H. Schwantes**: Atmosphere-Surface Exchange Overview. Oral Presentation, NSF-ATC and NCAR Atmospheric Chemistry Workshop, Boulder, Colorado, USA, 2018.

Schwantes, R. H., et al.: The Impact of Updating Isoprene and Monoterpene Chemistry on Simulated Surface Ozone in CAM-Chem. Oral Presentation, Winter CESM Chemistry Climate Working Group Meeting, Boulder, Colorado, USA, 2018.

Schwantes, R. H., et al.: The Impact of Chemical Mechanism Design on Simulated Ozone in CAM-Chem. Oral Presentation, American Geophysical Union, New Orleans, Louisiana, USA, 2017.