Daniel A. Rothenberg

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Education

Massachusetts Institute of Technology, Cambridge, MA
Ph.D., Dept. of Earth, Atmospheric and Planetary Sciences, *Atmospheric Science* — exp. Summer 2016
Committee: Chien Wang, Dan Czizco, Paul O'Gorman, Steve Ghan
Dissertation Title: Impacts of Droplet Activation on Global Model Estimates of Aerosol-Cloud Interactions
Certificate; Science, Technology and Policy — exp. Summer 2016

Cornell University, Ithaca, NY
B.S., Atmospheric Science, *magna cum laude*, Honors in Research — 2010
Thesis Advisor: Natalie Mahowald
Thesis Title: Volcano Impacts on Climate and Biogeochemistry

Honors and Awards

Outstanding Student Presentation Award (†), AMS	2015
National Science Foundation Graduate Research Fellowship, NSF	2012
National Defense Science And Engineering Fellowship, ASEE (*declined*)	2012
Father James B. Macelwane Award in Meteorology, AMS	2011
Klein Fellowship, MIT-EAPS	2011
Charney Prize, MIT-EAPS	2011
Academic Excellence Award - Atmospheric Science, Cornell/CALS	2011
Richard and Helen Hagermeyer Scholarship, AMS	2010

Research Experience

Program in Atmospheres, Oceans, and Climate, MIT, Cambridge, MA
Research Assistant — 2011-present
Used novel uncertainty quantification techniques to develop emulator of droplet activation for patameterization in global models
Developed open-source, modular parcel modeling framework for studying droplet activation from diverse aerosol populations and for evaluating activation schemes
Used global climate models (CESM, CMIP5 archive, AEROCOM Indirect Effects Experiment) to study aerosol indirect effects and aerosol-cloud interactions
Participated in Fifth Ice Nucleation Workshop Part 2 in Karlsruhe, Germany; assisted with the operation of the Spectrometer for Ice Nucleation (SPIN) and developed software for automating the instrument and designing experiment setups

Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, NY
Undergraduate Research Assistant — 2008-2011
Studied biogeochemical/climate processes and interactions with a coupled carbon-climate model
Performed and analyzed fully-coupled model simulations studying transient climate change in the 20th century

Center for Multiscale Modeling of Atmospheric Processes, Colorado State University, Fort Collins, CO
Summer Intern — summer 2010
Implemented end evaluated a baroclinic instability test case on a very high resolution global atmospheric dynamical core, identifying numerical problems
Developed novel visualization tools for analyzing model data on geodesic computational meshes

Professional Activities

NSPG, STEM on the Hill Congressional Visits Day, Washington, DC	Spring 2015
AMS, Weather Water and Climate Day, Washington, DC	June 2015
AMS, 7th Annual Geosciences Congressional Visits Day, Washington, DC	September 2014

AMS, Summer Policy Colloquium, Washington, DC — SUMMER 2014
MIT/SPI, ASTE Science/Engineering Congressional Visits Day, Washington, DC — SPRING 2012/2014
CMMAP/NCAR/NCEP, Summer School on Atmospheric Modeling, Boulder, CO — SUMMER 2010

Teaching Experience

Graduate

Global Warming Science (12.340x) — SPRING 2016
MIT-EdX and MIT, Department of Earth, Atmospheric and Planetary Sciences
Teaching Assistant

Atmospheric Physics and Chemistry (12.806/12.306) — SPRING 2014-2015
MIT, Department of Earth, Atmospheric, and Planetary Sciences
Teaching Assistant

"Climate Change Science" IAP Seminar — WINTER 2011-2013
MIT, Joint Program on the Science and Policy of Global Change
Lecturer

Undergraduate

Object-Oriented Programming and Data Structures (CS 2110) — 2009-2010
Cornell University, Department of Computer Science
Course Consultant, Teaching Asssitant

Leadership and Service

Student Conference Planning Committee
American Meteorological Society
- Co-Chair — 2015-2016
- Session Chair — 2011-2014

Graduate Climate Conference Executive Committee
MIT/Woods Hole Oceanographic Institution/University of Washington
- Co-Chair — 2013
- Steering Committee Member — 2015
- Advisor; Fundraising Chair — 2015

Atmospheric Sciences Seminar Committee
MIT Department of Earth, Atmospheric, and Planetary Sciences
- Member — 2012-2014
- Chair — 2014-2015

Reviewer
- Journal of Geophysical Research - Atmospheres — 2014-PRESENT

Science Policy Initiative Executive Committee — 2013-PRESENT
Massachusetts Institute of Technology

/r/science Moderator — 2010-2011, 2016-PRESENT
Reddit (volunteer)

Work Experience

Google / Ravenbrook Software — 2011
Contract Developer
Ported a high-performance algorithm used in surface temperature analysis at the National Climatic Data Center from Fortran to Python
Developed extensive documentation and test suite for algorithm

Identified and corrected numerous numerical and programming bugs and validated algorithm against synthetic datasets

Orion Network Services 2006-2007
Software Developer
Developed an online river flooding visualization tool for NOAA using ArcGIS and other scripting tools

Publications

Refereed/Peer-Reviewed

1. **Rothenberg, Daniel** and Chien Wang: Development and Evaluation of a metamodel for droplet activation in a mixing-state-resolving coupled aerosol-climate model. (*in prep*)
2. **Rothenberg, D.**, Wang, C., and Avramov, A.: Impact of activation parameterizations on aerosol-cloud interactions in a global climate model. (*in prep*)
3. Garimella, S., **Rothenberg, D.**, Wang, C., Cziczo, D. J.: How uncertainty in field measurements of ice nucleating particles influences modeled cloud forcing. (*in prep*)
4. Garimella, S., Kristensen, T. B., Ignatius, K., Welti, A., Voigtländer, J., Kulkarni, G. R., Sagan, F., Kok, G. L., Dorsey, J., Nichman, L., **Rothenberg, D.**, Rösch, M., Kirchgäßner, A., Ladkin, R., Wex, H., Wilson, T. W., Ladino, L. A., Abbatt, J. P. D., Stetzer, O., Lohmann, U., Stratmann, F., and Cziczo, D. J.: The SPectrometer for Ice Nuclei (SPIN): An instrument to investigate ice nucleation, Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2015-400, 2016. (*in review*)
5. **Rothenberg, Daniel** and Chien Wang: Metamodeling of Droplet Activation for Global Climate Models, J. Atmos. Sci., 73, 1255–1272. doi:10.1175/JAS-D-15-0223.1, 2016
6. **Rothenberg, D.**, Mahowald, N., Lindsay, K., Doney, S. C., Moore, J. K., and Thornton, P.: Volcano impacts on climate and biogeochemistry in a coupled carbon–climate model, Earth Syst. Dynam., 3, 121-136, doi:10.5194/esd-3-121-2012, 2012.
7. Mahowald, N., Lindsay, K., **Rothenberg, D.**, Doney, S. C., Moore, J. K., Thornton, P., Randerson, J. T., and Jones, C. D.: Desert dust and anthropogenic aerosol interactions in the Community Climate System Model coupled-carbon-climate model, Biogeosciences, 8, 387-414, doi:10.5194/bg-8-387-2011, 2011.
8. Mahowald, N. M., Kloster, S., Engelstaedter, S., Moore, J. K., Mukhopadhyay, S., McConnell, J. R., Albani, S., Doney, S. C., Bhattacharya, A., Curran, M. A. J., Flanner, M. G., Hoffman, F. M., Lawrence, D. M., Lindsay, K., Mayewski, P. A., Neff, J., **Rothenberg, D.**, Thomas, E., Thornton, P. E., and Zender, C. S.: Observed 20th century desert dust variability: impact on climate and biogeochemistry, Atmos. Chem. Phys., 10, 10875-10893, doi:10.5194/acp-10-10875-2010, 2010.

Presentations and Talks

Conference Posters

Rothenberg, D., Wang, C. and Avramov, A.: Impacts of Droplet Activation on Fast and Slow Responses in a Coupled Aerosol-Climate Model. Gordon Research Seminar/Conference. Bates College, ME. 2015

Rothenberg, Daniel and Chien Wang. Assessing the sensitivity of global aerosol indirect effects to activation treatment. Graduate Climate Conference, University of Washington. Seattle, WA. 2014

Rothenberg, Daniel and Chien Wang. A Novel Parameterization of Droplet Activation Suitable for Global Climate Models. 14th Conference on Cloud Physics, American Meteorological Society. Boston, MA. 2014

Rothenberg, Daniel and Chien Wang. A Novel Parameterization of Droplet Activation Suitable for Global Climate Models. CENSAM Workshop. Singapore. 2014

Rothenberg, Daniel and Chien Wang. Evaluating the Role of Aerosol Mixing State in Cloud Droplet Nucleation using a New Activation Parameterization. 94th Annual Meeting of the American Meteorological Society, Sixth Symposium on Aerosol-Cloud-Cimate Interactions. Atlanta, GA. 2013.

Rothenberg, Daniel and Chien Wang. Global Climate Response to Enhanced Anthropogenic Aerosol Emissions in a "hazy world" Experiment with the CESM. 6th Graduate Climate Conference. 2013.

Rothenberg, Daniel and Ross Heikes. A baroclinic instability test case on an anelsatic dynamical core. 91st Annual Meeting of the American Meteorological Society, 24th Conference on Weather and Forecasting/20th Conference on Numerical Weather Prediction. Seattle, WA. 2012.

Conference Talks

Rothenberg, Daniel. A Python-based Parcel Model Framework for Studying Aerosol-Cloud Processes. Sixth Symposium on Advances in Modeling and Analysis Using Python. New Orleans, 2016. Program Link

Rothenberg, Daniel, Chien Wang and Alexander Avramov. On the Sensitivity of Model-derived Estimates of Aerosol Indirect Effects and Forcings to Activation Schemes. 96th Annual Meeting of the American Meteorological Society, Eighth Symposium on Aerosol-Cloud-Climate Interactions. New Orleans, LA. 2016. Program Link

† **Rothenberg, Daniel**, Chien Wang and Alexander Avramov. Evaluating Advanced Aerosol Activation Treatments in a Coupled Climate/Mixing-State Resolving Aerosol Model. 95th Annual Meeting of the American Meteorological Society, 7th Symposium on Aerosol-Cloud-Climate Interactions. Phoenix, AX. 2015.

Rothenberg, Daniel and Chien Wang. Evaluating the Role of Aerosol Mixing State in Cloud Droplet Nucleation using a New Activation Parameterization. American Geophysical Union Fall Meeting, (A34D-03). 2013.

Rothenberg, Daniel and Chien Wang. Cloud and Climate Impacts in a Hazy World Simulation. 93rd Annual Meeting of the American Meteorological Society, 5th Symposium on Aerosol-Cloud-Climate Interactions. Austin, TX. 2013.

Rothenberg, Daniel and Nick Barnes. Lessons From Deploying the USHCN Pairwise Homogenization Algorithm in Python. 92nd Annual Meeting of the American Meteorological Society, Second Symposium on Advances in Modeling and Analysis Using Python. New Orleans, LA. 2012

Note: annotations (†, etc) correspond to "Honors and Awards" section.

Professional Affiliations

American Meteorological Society	2010-PRESENT
American Physical Society	2011-PRESENT
American Geophysical Union	2013-PRESENT
Association for Computing Machinery	2011-2012

Technical Skills

Note: Please visit my Github page for examples of projects implementing these skills

Data Science - Python (*expert*), Matlab, Java, d3.js, git/hg/svn
Numerical Modeling - Python/Cython/Numba, legacy/modern Fortran, C/C++/CUDA (*familiar*); emphasis on scientific software design and application of software engineering to numerical codes/tools
Atmospheric/Climate Models - pyrcel, CESM, MIT-CRM, WRF (*familiar*)
High-Performance Computing - NCAR supercomputers (bluefire/yellowstone); previously worked on NERSC and Oak Ridge systems
Web Design - Django, ghost, HTML/CSS

Personal Interests

Violin performance - classical (18 years), Winter sports, Backpacking/hiking, Software development/engineering, Meteorology education/forecasting, Debate and rhetoric, Science/Innovation policy

Last Updated: April 20, 2016