

# John Wong

## Curriculum Vitae

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**Other links:** LinkedIn, Github

## EDUCATION

2010 – 2013	<b>Ph.D., Atmospheric and Oceanic Sciences</b> University of Colorado at Boulder Advisors: Dr. David Noone (CU), Dr. Mary Barth (NCAR/ACD) <i>Dissertation: Upper Tropospheric Ozone Enhancement during the North American Monsoon Evaluated using WRF-Chem</i>
2008– 2010	<b>M.S., Atmospheric and Oceanic Sciences</b> University of Colorado at Boulder Advisor: Dr. David Noone
2006 – 2007	<b>M.A., Physics</b> University of Arkansas, Fayetteville Advisor: Dr. John Stewart <i>Masters Thesis: Web-based Application for Automated Generation of Physics Concept Inventory</i>
2003 – 2006	<b>B.S. magna cum laude, Physics</b> (Computational) University of Arkansas, Fayetteville Advisor: Dr. Jiali Li <i>Thesis: DNA Detection with a Nanopore Device</i>
2003 – 2006	<b>B.S. magna cum laude, Mathematics</b> (Applied) University of Arkansas, Fayetteville <i>Thesis: Chromatic Polynomial of Torus Networks</i>
2003 – 2006	(minor) <b>Computer Sci and Computer Engineering</b> University of Arkansas, Fayetteville

## RESEARCH EXPERIENCES

2012 – 2013	<b>Nested Regional Climate Model (NRCM)</b> Assisting in a project at the National Center for Atmospheric Research (NCAR) to test and develop the regional chemistry module for a next-generation climate model across scales as well as utilizing climatological simulations to evaluate future pollution scenarios.
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- 2010 – 2012      **Lightning parameterization at the convective scale**  
 As part of my ongoing research work with budgeting upper tropospheric summertime ozone enhancement, I have implemented a lightning parameterization module for WRF-Cem that is suitable for models running at resolutions that are transitional between fully-resolved and fully-parameterized convection.
- 2010      **Chemical kinetics with OpenCL**  
 For the class project of High Performance Scientific Computing at the University of Colorado at Boulder, I produced a version of the Regional Acid Deposition Model version 2 with Rosenbrock integration method using OpenCL. The same (identical) kernel has been tested and successfully ran on various CPUs and GPUs on platforms running Mac OS X 10.6.
- 2008 – 2013      **Convective-scale transport of trace gases assessed with models and satellite observations**  
 A collaboration between multiple scientists from NCAR, CU-Boulder, NOAA, and NASA JPL to quantify the contribution of North American summer-time convective transport to the distribution of ozone and carbon monoxide in the upper troposphere using both regional atmospheric chemistry models and satellite observations.
- 2007 – 2008      **Technical assistant** at Univ. of Arkansas  
 Debugged and optimized existing Matlab programs for analyzing signals from solid state nanopore device.

## PUBLICATIONS

- Wong, J.**, M. C. Barth, and D. Noone (2013): Evaluating a lightning parameterization based on cloud-top height for mesoscale numerical model simulations, *Geosci. Model Dev.*, 6, 429-443, doi:10.5194/gmd-6-429-2013, 2013
- Noone. D., C. Risi, A. Bailey, M. Berkelhammer, D. P. Brown, N. Buening, S. Gregory, J. Nusbaume, D. Schneider, J. Sykes, B. Vanderwende, **J. Wong**, Y. Meiller, and D. Wolfe (2013). Determining water sources in the boundary layer from tall tower profiles of water vapor and surface water isotope ratios after a snowstorm in Colorado. *Atmos. Chem. Phys.*, 13, 1607–1623, doi:10.5194/acp-13-1607-2013.
- Barth., M.C. , J. Lee, A. Hodzic, G. Pfister, W. C. Skamarock, J. Worden, **J. Wong**, and D. Noone (2012). Thunderstorms and upper tropospheric chemistry during the early stages of the 2006 North American Monsoon. *Atmos. Chem. Phys.*, 12, 11003-11026, doi:10.5194/acp-12-11003-2012.

## SELECTED ORAL PRESENTATIONS

**Wong, J.**, M. Barth, and D. Noone. Lightning NO<sub>x</sub> parameterization in WRF-Chem with emphasis on validation. Invited talk at WRF-Chem Group Meeting, August 23, 2012; Boulder, CO.

**Wong, J.** From gaming to scientific computing: An introduction to General Purpose programming with GPUs (GPGPU). Presentation at Department of Atmospheric and Oceanic Science student forum, February 16, 2011; Boulder, CO.

**Wong, J.**, D. Noone, M. C. Barth, W. Skamarock, G. Grell, and J. Worden. Budget and structural properties of the UTLS ozone enhancement during North American monsoon. Invited talk at WRF-Chem Group Meeting, October 27, 2010; Boulder, CO.

## SELECTED POSTER PRESENTATIONS

Bela, M., M. Barth, **J. Wong**, O. Toon, H. Morrison, M. Weisman, K. Manning, G. Romine, W. Wang, K. Cummings, K. Pickering, and the DC3 Science Team. (2013) Evaluation of Wet Scavenging for the May 29, 2012 DC3 Severe Storm Case. 14th Annual WRF Workshop; 2013 Jun 24 – 29; Boulder, CO. (Abstract submitted)

**Wong, J.**, M. Barth, and D. Noone. (2012) Parameterizing Lightning-Generated NO<sub>x</sub> at resolutions with Convective Parameterization for Upper Tropospheric Ozone Simulations. 12th Annual WRF Users' Workshop; 2012 Jun 26 – 29; Boulder, CO.

**Wong, J.**, M. Barth, and D. Noone. (2011) Lightning NO<sub>x</sub> Parameterization for Synoptic Meteorological-scale Predictions with Convective Parameterization in WRF-Chem. American Geophysical Union Fall meeting; 2011 Dec 5–9; San Francisco, CA.

Noone, D., C. Risi, A. Bailey, D. Brown, N. Buenning, S. Gregory, J. Nusbaumer, J. Sykes, D. Schneider, B. Vanderwende, **J. Wong**, D. Wolfe. (2010) Atmosphere-surface water exchanges from measurements of isotopic composition at a tall tower in Boulder. American Geophysical Union Fall Meeting; 2010 Dec 13–17; San Francisco, CA.

**Wong, J.**, D. Noone, M. C. Barth, W. Skamarock, G. Grell, and J. Worden. (2009) A budget of the summertime ozone anomaly of 2006 above southern United States using WRF-Chem. American Geophysical Union Fall Meeting; 2009 Dec 14–18; San Francisco, CA.

**Wong, J.**, D. Noone, M. C. Barth, W. Skamarock, G. Grell, and J. Worden. (2008) Coarse-scale convective transport of CO and O<sub>3</sub> over 36 hours above southern United States. American Geophysical Union Fall Meeting; 2008 Dec 15–19; San Francisco, CA.

## SOURCECODE CONTRIBUTIONS

### **Lightning NOx driver**

in *WRF-Chem v3.5*

Refactored old implementation of lightning nitrous oxides (NOx) emission module of WRF-Chem into two separate modules, each separately handle flash rate prediction and NOx emission respectively. Also mediate concurrent contribution from scientists from Florida State University.

### **Lightning-generated NOx for convective parameterized models**

in *WRF-Chem v3.4*

Implemented lightning NOx emission option into WRF-Chem for convective parameterized scale simulations based on Price and Rind (J. Geophys. Res., 1992) parameterization and Ott et al (J. Geophys. Res., 2010) emission guidelines.

### **Online tendency diagnostics**

in *WRF-Chem v3.2*

Developed module for decoupling tendency diagnostics for chemical species and producing accumulated diagnostic outputs.

## TECHNICAL SKILLS

**Techniques:** Data analytics, machine learning, heuristic optimization, heterogenous arch.

**Languages:** C/C++, Java, Python, Objective-C, Fortran, Javascript, PHP, \*NIX scripting

**Frameworks and libraries:** OpenCL, MPI, OpenMP, Prototype, Dojo Toolkit

**IDEs and tools:** vi, Xcode, Instruments; Git

**Data formats:** XML, JSON, NetCDF, HDF5, GTFS

**Miscellaneous:** IDL, Matlab; L<sup>A</sup>T<sub>E</sub>X; MongoDB, SQLs, exposure to Hadoop/Pig, AWS

## UPPERLEVEL COURSEWORKS

### **Computer Science**

Artificial Intelligence, Database Management Systems, Formal Languages and Computability, Graph and Combinatorial Algorithms, High Performance Scientific Computing

### **Mathematics**

Genetic Algorithms, Advanced Calculus, Numerical Analysis, Numerical Linear Algebra, Ordinary Differential Equations, Partial Differential Equations (PDE), Independent readings in Nonlinear PDE, Stochastic Processes

## Physics

Mathematical Methods in Electromagnetic Theory, Thermal Physics, Quantum Mechanics, Applied Group Theory in Physics, Fluid Instability & Turbulence

## Atmospheric Science

Numerical Weather Prediction, Atmos. Chemistry, Atmospheric Dynamics (I & II), Physical Oceanography, Radiative Transfer & Remote Sensing, Clouds & Aerosols

## CONFERENCE/WORKSHOP ATTENDANCE

3 – 7 Dec, 2012	Amer. Geophys. Union Fall Meeting, San Francisco, CA
26 – 29 Jun, 2012	12th Annual WRF Users' Workshop, Boulder, CO
5 – 9 Dec, 2011	Amer. Geophys. Union Fall Meeting, San Francisco, CA
21 – 25 Jun, 2010	11th Annual WRF Users' Workshop, Boulder, CO
16 – 17 Jun, 2010	TES Science Team Meeting, Pasadena, CA
14 – 18 Dec, 2009	Amer. Geophys. Union Fall Meeting, San Francisco, CA
19 – 22 Oct, 2009	Extra-Tropical UTLS Community Workshop, Boulder, CO
23 – 26 Jun, 2009	10th Annual WRF Users' Workshop, Boulder, CO
23 – 25 Feb, 2009	TES Science Team Meeting, Boulder, CO
15 – 19 Dec, 2008	Amer. Geophys. Union Fall Meeting, San Francisco, CA
23 – 27 Jun, 2008	9th Annual WRF Users' Workshop, Boulder, CO
2005 – 07	Apple's WWDC 2005–2007, San Francisco, CA

## HONORS, AWARDS & SCHOLARSHIPS

2012	Department of Atmospheric and Oceanic Sciences Best Poster Award
2011	United Government for Graduate Student Travel Grant
2005 – 2007	Apple's Worldwide Developer Conference Student Scholarship
2005 – 2006	Foundation of International Exchange Students Scholarship
2005 – 2006	Droke-Dunn Award for Outstanding Senior Math Major
2005 – 2006	Robert D. Maurer Research Scholarship for Physics Major
2004 – 2006	David P Richardson Math Departmental Scholarship
2004 – 2006	College of Engineering Scholarship
2004 – 2005	Univ. of Arkansas Chartwell's Room and Board Scholarship
2004 – 2005	Physics Departmental Scholarship
2004	First Place in 2004 ACM Collegiate Programming Contest
2003 – 2005	Engineering Dean's List

## TEACHING EXPERIENCE

01 – 05/2013	<b>Teaching Assistant</b> for ATOC 1050 Weather and Atmos. University of Colorado at Boulder
2008 – 2013	<b>Lab Instructor</b> for ATOC 1070 Weather and Atmos. Lab University of Colorado at Boulder

2004 – 2006

**Supplemental Instructions Leader** for Math and Physics  
Enhanced Learning Center, University of Arkansas