



Chapter 13 – AMAD Staff Biosketches



K. WYAT APPEL, PHYSICAL SCIENTIST

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Atmospheric Science, 2001, North Carolina State University
B.S. in Meteorology, 1999, North Carolina State University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2004–2008.
Meteorologist, North Carolina Department of Environment and Natural Resources, Division of Air Quality, Raleigh, NC, 2002–2004

SELECTED PUBLICATIONS (6 out of 6 from 2004 to present)

Irwin, J.S., K. Civerolo, C. Hogrefe, W. Appel, K. Foley and J. Swall, 2008. A procedure for inter-comparing the skill of regional-scale air quality model simulations of daily maximum 8-hour ozone concentrations, *Atmospheric Environment*, doi:10.1016/j.atmosenv.2008.02.046.
Appel, K.W., P.V. Bhave, A.B. Gilliland, G. Sarwar and S.J. Roselle, 2008. Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: Sensitivities impacting model performance; Part II - particulate matter, *Atmospheric Environment*, doi:10.1016/j.atmosenv.2008.03.036.
Sarwar, G., S.J. Roselle, R. Mathur, W. Appel, R.L. Dennis and B. Vogel, 2008. A comparison of CMAQ HONO predictions with observations from the Northeast Oxidant and Particle Study. *Atmospheric Environment*, doi:10.1016/j.atmosenv.2007.12.065.
Appel, K.W., Gilliland, A.B., Sarwar, G., Gilliam, R.C., 2007. Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: Sensitivities impacting model performance. *Atmospheric Environment*, doi:10.1016/j.atmosenv.2007.08.044.
Gilliland, A., Appel, K.W., Pinder, R.W., Dennis, R., 2006. Seasonal NH₃ emissions for the continental United States; inverse model estimation and evaluation. *Atmospheric Environment* 40, 4986-4998.
Appel, K.W., Riordan, A.J., Holley, T.A., 2005. An Objective Climatology of Carolina Coastal Fronts. *Weather and Forecasting* 20, 439-455.

SELECTED PRESENTATIONS (6 out of 6 from 2004 to present)

Appel, K.W., Roselle, S.J., Gilliam, R.C., 2008. Analysis of the impact of meteorology on CMAQ predictions with MM5 and WRF. Joint session of the 15th joint conference on the applications of air pollution meteorology with the A&WMA and 10th conference on atmospheric chemistry, 88th annual AMS meeting, New Orleans, LA, January 21-25, 2008.
Pinder, R.W., Gilliland, A.B., Gilliam, R.C., Appel, K.W., 2007. Evaluating uncertainty predictions using an ensemble of CMAQ model configurations. 6th Annual CMAS Models-3 Users' Conference, October 1-3, 2007, Chapel Hill, NC.
Appel, K.W., 2006. Effects of vertical-layer structure and boundary conditions on CMAQ – v4.5 and v4.6 model performance. 5th Annual CMAQ Models-3 Users' Conference, October 16-18, 2006, Chapel Hill, NC.
Appel, K.W., Gilliland, A.B., Eder, B., 2005. A performance evaluation of the 2005 Release of Models-3 CMAQ. 4th Annual CMAS Models-3 Users' Conference, September 26-28, 2005, Chapel Hill, NC.
Appel, K.W., Howard, S., Gilliam, R.C., Phillips, S., 2005. The Atmospheric Model Evaluation Tool (AMET): Air quality module. 4th Annual CMAS Models-3 Users' Conference, September 26-28, 2005, Chapel Hill, NC.
Appel, K.W., Gilliland, A.B., Eder, B., 2005. An annual evaluation of the 2005 release of Models-3 CMAQ. NOAA-EPA Golden Jubilee Celebration Symposium on Air Quality Modeling and Its Applications, September 19-21, 2005, Durham, NC.



NARRATIVE

My area of research is in the evaluation of regional-scale meteorological and air quality models, with a focus on operational and diagnostic evaluation techniques. Other interests include the impacts of meteorological model performance on air quality model performance, and other areas related to the impacts of meteorology on air quality.

**JESSE O. BASH, PHYSICAL SCIENTIST**

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D in Air Resources, 2006, University of Connecticut
M.S. in Air Resources, 2003, University of Connecticut
B.S. in Geography, 2000, New Mexico State University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 2007–2008
Graduate Research Assistant, University of Connecticut, Storrs, CT, 2000–2006
Image Analyst, New Mexico State University Center for Applied Remote Sensing in Agriculture,
Meteorology, and the Environment (CARSAME), Las Cruces, NM, 1998–2000

SELECTED AWARDS AND HONORS

Gamma Sigma Delta, Graduate Achievement in Agriculture, 2004
Alpha Chi, Academic Recognition, 1998

SELECTED PUBLICATIONS

- Bash, J.O., Miller, D.R., 2007: A relaxed eddy accumulation system for measuring surface fluxes of mercury, *Journal of Atmospheric and Oceanic Technology*, 25(2), 244-257.
- Bash, J.O., Miller D.R., 2007: A note on elevated total gaseous mercury concentrations downwind from an agricultural field during tilling, *Science of the Total Environment*, 388, 379-388.
- Bash, J.O., Bresnahan, P.A., Miller, D.R., 2007: A conceptual compartmentalized dynamic surface interface model for atmosphere-surface exchanges of mercury, *Journal of Applied Meteorology and Climatology* 46(10), 1606-1618.
- Bash, J.O., Miller, D.R., Meyer, T.H., Bresnahan, P.A., 2004: Northeast United States and Southeast Canada natural mercury emissions estimated with a surface emission model, *Atmospheric Environment* 38, 5683-5692.
- Bash, J.O., Miller, D.R., Thomas, H., 2004: An eddy accumulation system for mercury flux measurements. *RMZ Materials and Geoenvironment* 51, 1505-1508.
- Bash, J.O., Miller, D.R., Bresnahan, P.A., Thomas, H., 2004: A model for natural emissions of mercury in the Northeast United States, *RMZ Materials and Geoenvironment* 51, 1509-1512.

SELECTED PRESENTATIONS

- Bash, J.O., Modeling mercury air-surface exchange, Seminar at Appalachian Laboratory, September 11, 2008, Frostburg, MD.
- Bash, J.O., Trends and modeling of the total gaseous mercury flux and mercury deposition in the leaf litter fall in a Northeastern red maple canopy, 2007 NADP Scientific Meeting, September 10-13, 2007, Boulder, CO.
- Bash, J.O., Miller, D.R., Annual mercury total gaseous mercury flux measurements over a hardwood forest, 8th International Conference on Mercury as a Global Pollutant, August 6-11, 2006, Madison, WI.
- Bash, J.O., Meyer, T.H., Bresnahan, P.A., Miller, D.R., A proposed coupling of natural mercury emissions and deposition in CMAQ, 5th Annual Models-3 User Conference, September 26-28, 2005, Chapel Hill, NC.



NARRATIVE

My work at the EPA has focused on improving dry deposition parameterizations in the Community Multiscale Air Quality (CMAQ) model, to better understand ecosystem exposure to air pollutants. This includes working with scientists in the modeling community to develop air-surface exchange algorithms for use in regional air quality models and collaborating with scientists in the measurement community. My recent research involves modeling air-surface mercury and ammonia exchange and collaborating with measurement groups to design experiments to measure critical parameters in their air-surface exchange algorithms.

**WILLIAM G. BENJEY, RESEARCH PHYSICAL SCIENTIST**

Applied Modeling Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. in Microclimatology, 1974, University of Michigan
M.S. in Climatology, 1969, University of Michigan
B.A. in Physical Geography, 1966, University of Michigan

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERLAMAD/AMB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 1990–2008
Oceanographer, U.S. Department of the Interior, Minerals Management Service, Environmental Studies
Section, Anchorage, AK, 1982–1990
Physical Scientist, Office of the Federal Inspector for the Alaska Natural Gas Pipeline, Environmental
Monitoring Group, Irvine, CA, 1981–1982
Chief, Ohio Water Quality Planning Section, USEPA Region V, Water Division, Chicago, IL, 1978–1981
Environmental Specialist, USEPA Region V, Water Division, Ohio Water Quality Planning Section,
Chicago, IL, 1975–1978
Research Specialist, Environmental Research Institute of Michigan (the Willow Run Laboratories),
Infrared Imaging Laboratory, Ann Arbor, MI, 1974–1975

SELECTED AWARDS AND HONORS

USEPA, ORD/NERL Special Achievement Team Award, 2007
USEPA/ORD Bronze Medal Team Award, 2005
USEPA/ORD Bronze Medal Team Award, 1999

SELECTED PUBLICATIONS (from 1997 to present)

- Cook, R., V. Isakov, J.S. Touma, W. Benjey, J. Thurman, E. Kinnee, and D. Ensley. 2008. Resolving Local-Scale Emissions for Modeling Air Quality near Roadways. *Journal of the Air and Waste Management Association*, 58(3): 451-461.
- Cooter, E.J., R. Gilliam, W. Benjey, C. Nolte, J. Swall, and A. Gilliland. 2007. Examining the Impact of Changing Climate on Regional Air Quality over the U.S. *Air Pollution Modeling and Its Application XVIII*, First Edition, C. Borrego and E. Renner, Editors, Elsevier, Amsterdam, The Netherlands.
- Loughlin, D., T. Johnson, C. Shay, B. Hemming, B. Bierwagen, A. Grambsch, W.G. Benjey and A. Gilliland. 2007. Projecting Future-Year Pollutant Emissions: Emerging Approaches from the EPA ORD Global Change Air Quality Assessment. *Proceedings of the 16th Annual Emission Inventory Conference*, 1-11. (available at <http://www.epa.gov/ttn/chief/conference/ei16/>)
- Roy, B., G.A. Pouliot, A. Gilliland, T. Pierce, S. Howard, P.V. Bhave, and W. Benjey. 2007. Refining Fire Emissions for Air Quality Modeling with Remotely Sensed Fir Counts: A Wildfire Case Study. *Atmospheric Environment*, 41:655-665.
- Hanna, A. and W.G. Benjey, Guest Editors. 2006. Special Issue on Model Evaluation: Evaluation of Urban and Regional Eulerian Air Quality Models. *Atmospheric Environment*, 40(26):4809-4810.
- Benjey, W.G. and E.J. Cooter. 2005. Inter-annual and Seasonal Variability of Meteorologically Influenced Emissions. *Proceedings of the 14th Annual Emission Inventory Conference: Transforming Emission Inventories, Meeting Future Challenges Today*, 1-15. (available at <http://www.epa.gov/ttn/chief/conference/ei14/>)
- Houyoux, M.R., M. Strum, N. Possiel, W.G. Benjey, R. Mason, G. Pouliot, D. Loughlin, A. Eyth, and C. Seppanen. 2005. EPA's New Emissions Modeling Framework. *Proceedings of the 14th Annual Emission Inventory Conference: Transforming Emission Inventories, Meeting Future Challenges Today*, 1-10. (available at <http://www.epa.gov/ttn/chief/conference/ei14/>).
- Pouliot, G., T. Pierce, W. Benjey, S.M. O'Neill and S.M. Ferguson. 2005. Wildfire Emission Modeling: Integrating BlueSky and SMOKE. *Proceedings of the 14th Annual Emission Inventory Conference:*



Transforming Emission Inventories, Meeting Future Challenges Today, 1-8. (available at <http://www.epa.gov/ttn/chief/conference/ei14>)

Eyth, A.M. and W.G. Benjey. 2005. Generating Sophisticated Spatial Surrogates Using the MIMS Spatial Allocator. *Proceedings of the 14th Annual Emission Inventory Conference: Transforming Emission Inventories, Meeting Future Challenges Today*, 1-16. (available at <http://www.epa.gov/ttn/chief/conference/ei14>).

VanDenBerg, F., R. Kubiak, W.G. Benjey, M.S. Majewski, S.R. Yates, G.L. Reeves, J. H. Smelt, and A.M.A. VanDerLinden. 1999. Emission of Pesticides into the Air, *Water, Air and Soil Pollution*, 115:195-218.

Benjey, W.G., J.M. Godowitch and G. Gipson. 1999. Emission Subsystem, in Science Algorithms of the EPA Models-3 Community Multiscale Air Quality (CMAQ) Modeling System. Part II, Chapter 10. D.W. Byun and J.K.S. Ching, Editors, U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA/600/R-99/030.

Aneja, V.P., A.B. Murthy, W. Battye, R. Battye and W.G. Benjey. 1998. Analysis of Ammonia and Aerosol Concentrations Near the Free Troposphere at Mt. Mitchell, NC, USA, *Atmospheric Environment*, 32(3):353-358.

Bullock, O.R., W.G. Benjey, and M.H. Keating. 1997. The Modeling of Regional-Scale Atmospheric Mercury Transport and Deposition using RELMAP, *Proceedings of the 6th Annual Emission Inventory Conference*. 1-12.

SELECTED PRESENTATIONS (from 2001 to present)

Benjey, W.G. 2006. Relative Effects of Observationally-Nudged Modeled Meteorology and Down-Scaled Global Climate Model Meteorology on Biogenic Emissions. Fifth Annual Community Modeling and Analysis System (CMAS) Conference, Chapel Hill, NC.

Benjey, W.G., and T.E. Pierce. 2004. An Approach to a Unified Process-based Regional Emission Flux Modeling Platform. Thirteenth Annual Emission Inventory Conference, Clearwater, FL.

Cooter, E.J. A. Gilliland, W. Benjey, R. Gilliam and J. Swall. 2004. Overview of the Climate Impact on Regional Air Quality (CIRAQ) Project. Third Annual Community Modeling and Analysis System (CMAS) Conference, Chapel Hill, NC.

Benjey, W.G., E. Cooter, A. Gilliland, A.E. Grambsch, E.L. Wright, C.D. Geron, C. Gage and D.A. Winner. 2003. Creating an Emission Inventory for Modeling Global Climate Change Effects. Twelfth Annual Emission Inventory Conference, San Diego, CA.

Benjey, W.G., M.R. Houyoux, and J.W. Susick. 2001. Implementation of the SMOKE Emission Data Processor and SMOKE Tool Input Data Processor in Models-3. Tenth Annual Emission Inventory Conference, Denver, CO.

NARRATIVE

My area of expertise at EPA is the improvement and analysis of air emission data components of urban and regional air quality modeling. The focus is on the modeling of emissions to the air, including methods to fill gaps in reported data and to better temporally, spatially, and chemically allocate annual emission data to the hourly gridded form needed for air quality models, particularly the Community Multiscale Air Quality (CMAQ) model. This has included service as project officer for the Sparse Matrix Operator Kernel Emission (SMOKE) model, which is an operational modeling system maintained and improved by the EPA Office of Air Quality Planning and Standards

More recent work includes ongoing research on the current and future (ca. 2050) spatial and temporal behavior of emissions as part of the EPA Climate Impact on Regional Air Quality (CIRAQ) program, and oversight of the development of other emission tools, such as the open software Spatial Allocator for gridding and reprojecting air quality data. I also participate on the OAQPS-led team for the Emission Modeling Framework (EMF), and on the joint Emission Modeling Team. I serve as Task Order Project Officer for AMAD's primary modeling support contract, and as contract Project Officer on the Community Modeling and Analysis System (CMAS) Center. CMAS was established under a cooperative grant to the University of North Carolina (UNC) for the purpose of encouraging the modeling community to share in the support and further improvement of the CMAQ family of air quality modeling tools.

PRAKASH V. BHAVE, PHYSICAL SCIENTIST

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Environmental Science & Engineering, 2003, California Inst. of Technology

M.S. in Environmental Engineering Science, 1999, California Inst. of Technology

B.S. in Environmental Engineering Science, 1998, Univ. of California Berkeley

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present

Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2003–2008

Associate Consultant Intern, ENVIRON Corporation, Novato, CA 1997–1998

SELECTED AWARDS AND HONORS

USEPA Bronze Medal for Commendable Service, 2007

USEPA NERL Special Achievement Award, 2006

NOAA Time-off Award for contributions to SPECIATE database, 2006

USEPA Bronze Medal for Commendable Service, 2005

NOAA Atmospheric Sciences Modeling Division CIYA award, 2004

Environmental Science and Technology Outstanding Review award, 2002

SELECTED PUBLICATIONS (10 out of 22 from 2000 to present)

Davis, J.M.; Bhave, P.V.; Foley, K.M. 2008. Parameterization of N₂O₅ Reaction Probabilities on the Surface of Particles Containing Ammonium, Sulfate, and Nitrate, *Atmospheric Chemistry and Physics*, 8:5295-5311.

Appel, K.W.; Bhave, P.V.; Gilliland, A.B.; Sarwar, G.; Roselle, S.J. 2008. Evaluation of the Community Multiscale Air Quality (CMAQ) Model Version 4.5: Sensitivities Impacting Model Performance; Part II – Particulate Matter, *Atmospheric Environment*, 42:6057-6066.

Nolte, C.G.; Bhave, P.V.; Arnold, J.R.; Dennis, R.L.; Zhang, K.M.; Wexler, A.S. 2008. Modeling Urban and Regional Aerosols – Application of the CMAQ-UCD Aerosol Model to Tampa, a Coastal Urban Site, *Atmospheric Environment*, 41:3179-3191.

Pinder, R.W.; Dennis, R.L.; Bhave, P.V. 2008. Observable Indicators of the Sensitivity of PM_{2.5} Nitrate to Emission Reductions, Part I: Derivation of the Adjusted Gas Ratio and Applicability at Regulatory-Relevant Time Scales, *Atmospheric Environment*, 42:1275-1286.

Dennis, R.L.; Bhave, P.V.; Pinder R.W. 2008. Observable Indicators of the Sensitivity of PM_{2.5} Nitrate to Emission Reductions, Part II: Sensitivity to Errors in Total Ammonia and Total Nitrate of the CMAQ-Predicted Nonlinear Effect of SO₂ Emission Reductions on PM_{2.5} Nitrate, *Atmospheric Environment*, 42:1287-1300.

Kleindienst, T.E.; Jaoui, M.; Lewandowski, M.; Offenber, J.H.; Lewis, C.W.; Bhave, P.V.; Edney, E.O. 2007. Estimates of the Contributions of Biogenic and Anthropogenic Hydrocarbons to Secondary Organic Aerosol at a Southeastern U.S. Location, *Atmospheric Environment*, 41:8288-8300.

Sarwar, G.; Bhave, P.V. 2007. Modeling the Effect of Chlorine Emissions on Ozone Levels over the Eastern United States, *Journal of Applied Meteorology & Climate*, 46:1009-1019.

Yu, S.; Bhave, P.V.; Dennis, R.L.; Mathur, R. 2007. Seasonal and Regional Variations of Primary and Secondary Organic Aerosols over the Continental United States: Semi-empirical estimates and model evaluation, *Environmental Science and Technology*, 41: 4690-4697.

Bhave, P.V.; Pouliot, G.A.; Zheng, M. 2007. Diagnostic Model Evaluation for Carbonaceous PM_{2.5} Using Organic Markers Measured in the Southeastern U.S., *Environmental Science and Technology*, 41:1577-1583.

Reff, A.; Eberly, S.L.; Bhave, P.V. 2007. Receptor Modeling of Ambient Particulate Matter Data Using Positive Matrix Factorization: Review of Existing Methods, *Journal of the Air & Waste Management Association*, 57:146-154.

SELECTED PRESENTATIONS (16 out of 70 from 2000 to present)

- Bhave, P.V.; Napelenok, S.L.; Pouliot, G.A.; Carlton, A.; Sarwar, G. Simulating Secondary Organic Aerosol Across the United States – Sensitivity Analyses Using the CMAQ Model, *International Conference on Carbonaceous Particles in the Atmosphere*, Berkeley, August 2008.
- Bhave, P.V.; Davis, J.M.; Foley, K.M.; Sarwar, G.; Pinder, R.W.; Roselle, S.J.; Riemer, N.; Appel, K.W.; Gilliland, A.B.; Pleim, J.E.; Dennis, R.L. A Comprehensive Parameterization of $\gamma_{\text{N}_2\text{O}_5}$ on Particles Containing NH_4 , NO_3 , and SO_4 , *International Aerosol Modeling Algorithms Conference*, Davis, December 2007.
- Bhave, P.; Shankar, U. Box Model Tests of Two Mass Transfer Methods for Volatile Aerosol Species in CMAQ, *6th Annual CMAS Conference*, 1.3, Chapel Hill, October 2007.
- Bhave, P.; Schere, K.; Appel, W.; Mathur, R. Evaluating the Performance of the CMAQ Model for $\text{PM}_{2.5}$ and its Components, *International Conference on Air Quality VI*, Arlington, September 2007.
- Bhave, P.V. Panel Discussion: Chemistry and Aerosol Process Evaluation, *AMS-EPA Workshop on the Evaluation of Regional-Scale Air Quality Modeling Systems*, Research Triangle Park, August 2007 (invited presentation).
- Bhave, P.V. Organic PM Module in CMAQ, *EPRI Workshop on Primary and Secondary Organic PM in Atmospheric Models*, Palo Alto, February 2007 (invited presentation).
- Bhave, P.V. Impacts of Temperature Dependence on Modeled SOA, *EPRI Workshop on Primary and Secondary Organic PM in Atmospheric Models*, Palo Alto, February 2007 (invited presentation).
- Bhave, P.; Sarwar, G.; Appel, W.; Dennis, R. Revised Treatment of N_2O_5 Hydrolysis in CMAQ, *Models-3 Users' Conference*, 1.4, Chapel Hill, October 2006.
- Bhave, P.V. Regional-Scale Air Quality Modeling Using CMAQ, *Environmental Partnership Summit*, Research Triangle Park, September 2006 (invited presentation).
- Bhave, P. Source Apportionment of Primary and Secondary Carbonaceous Aerosol in the United States using Models and Measurements, *Asian Aerosol Conference*, O-42, Mumbai, December 2005.
- Bhave, P. Yu, S.; Lewis, C. Evaluation of a Model for Predicting the Fossil-Fuel and Biogenic Contributions to Fine Particulate Carbon, *American Association of Aerosol Research*, 11B1, Austin, October 2005.
- Bhave, P.; Nolte, C.; Pleim, J.; Schwede, D.; Roselle, S. Continued Development of the CMAQ Modal Aerosol Model, *Models-3 Users' Conference*, P.18, Chapel Hill, September 2005.
- Bhave, P.V.; Pouliot, G.A.; Zheng, M. Source Apportionment of Primary Carbonaceous Aerosol Using the Community Multiscale Air Quality Model, *27th NATO International Technical Meeting on Air Pollution Modeling and its Application*, Banff, Canada, October 2004 (conference paper and oral presentation).
- Bhave, P.V.; Roselle, S.J.; Binkowski, F.S.; Nolte, C.G.; Yu, S.; Gipson, G.L.; Schere, K.L. CMAQ Aerosol Module Development: Recent Enhancements and Future Plans, *Models-3 Users' Workshop*, Chapel Hill, October 2004.
- Bhave, P.V. Measurement Needs for Evaluating Model Calculations of Carbonaceous Aerosol, *UN-EMEP Workshop on PM Measurement and Modeling*, New Orleans, April 2004 (invited presentation).
- Bhave, P.V. Postprocessing Model Output for Comparison to Ambient Data, *EPA-OAQPS PM Model Performance Workshop*, Chapel Hill, February 2004 (invited presentation).

NARRATIVE

My research emphasis at NERL is on the development and testing of particulate-matter components in the Community Multiscale Air Quality (CMAQ) model. I have mentored three postdoctoral researchers on related projects. Since 2006, I have led the CMAQ Chemistry and Aerosols Workgroup, which is composed of a dozen staff scientists who meet biweekly to communicate and coordinate research and development on CMAQ's gas-phase chemistry, aerosol processes, aqueous chemistry, and related tools (e.g., process analysis, sulfate tracking, carbon apportionment, Direct Decoupled Method [DDM], UC Davis sectional aerosol module [CMAQ-UCD])



SHERRY A. BROWN, IT SPECIALIST

Office of the Director
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

B.S. in Computer Science, 2003, North Carolina State University

PROFESSIONAL EXPERIENCE

IT Specialist, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC,
2008–present

Support Services Specialist, NOAA Atmospheric Sciences Modeling Division (in
partnership with USEPA/NERL), Research Triangle Park, NC, 2004–2008

Secretary, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research
Triangle Park, NC, 1995–2004

NARRATIVE

My area of expertise is the development of AMAD's web site, which includes identifying and establishing goals for the design and implementation of internal and external web sites and applications. I utilize desktop publishing, graphics, and spreadsheet software to create items such as brochures, web graphics, and graphics for scientific publications, and to produce Division scientific posters for conferences.

O. RUSSELL BULLOCK JR., RESEARCH PHYSICAL SCIENTIST

Applied Modeling Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Meteorology, 1984, North Carolina State University
B.S. in Meteorology, *magna cum laude*, 1980, North Carolina State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC, 2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1989–2008
Computer Programmer/Analyst, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1987–1989
Senior Scientific Specialist, Program Resources, Inc., and Computer Sciences Corporation (on-site contractors to USEPA), Research Triangle Park, NC, 1984–1987
Senior Member of Technical Staff, Computer Data Systems, Inc. (on-site contractor to USEPA), Research Triangle Park, NC, 1983–1984
Graduate Research Assistant, NOAA Meteorology Division (in partnership with USEPA), Research Triangle Park, NC, 1981–1983
Research Assistant, NOAA Meteorology Division (in partnership with USEPA), Research Triangle Park, NC, 1980–1981

SELECTED AWARDS AND HONORS

Two USEPA Bronze Medals, 2008
USEPA/NERL Special Achievement Award, 2007
USEPA Bronze Medal, 2005
USEPA Silver Medal, 1998
USEPA Bronze Medal, 1996

SELECTED PUBLICATIONS (14 out of 21 from 1994 to present)

Bullock, O.R., Jr., D. Atkinson, T. Braverman, K. Civerolo, A. Dastoor, D. Davignon, J.-Y. Ku, K. Lohman, T.C. Myers, R.J. Park, C. Seigneur, N.E. Selin, G. Sistla, and K. Vijayaraghavan. The North American Mercury Model Intercomparison Study (NAMMIS): Study description and model-to-model comparisons. *Journal of Geophysical Research* 113, D17310, doi:10.1029/2008JD009803 (2008).

Pongprueksa, P., C.-J. Lin, S.E. Lindberg, S.O. Pehkonen, C. Jang, T. Braverman, O.R. Bullock, Jr., T.C. Ho, and H.-W. Chu. Scientific uncertainties in atmospheric mercury models III: Boundary and initial conditions, model grid resolution, and Hg(II) reduction mechanism. *Atmospheric Environment* 42, 1828-1845 (2008).

Driscoll, C. T., M. Abbott, R. Bullock, J. Janson, D. Leonard, S. Lindberg, J. Munthe, N. Pirrone, M. Nilles, Airshed and watersheds. In: R. Harris, D. P. Krabbenhoft, R. Mason, M. W. Murray, R. Reash, T. Saltman, editors. *Ecosystem Responses to Mercury Contamination*. CRC Press, Taylor and Francis Group, Boca Raton-London-New York, pp. 216 (2007).

Lin, Che-Jen, P. Pongprueksa, O. R. Bullock, Jr., S. E. Lindberg, S. O. Pehkonen, C. Jang, T. Braverman, and T. C. Ho. Scientific uncertainties in atmospheric mercury models II: Sensitivity analysis in the CONUS domain. *Atmospheric Environment* 41, 6544-6560 (2007).

Ryaboskapko, A., O.R. Bullock Jr., J. Christensen, M. Cohen, A. Dastoor, I. Iiyin, G. Petersen, D. Syrakov, R.S. Artz, D. Davignon, R.R. Draxler, and J. Munthe. Intercomparison Study of Atmospheric Mercury Models: 1. Comparison of models with short-term measurements. *Science of the Total Environment* 376, 228-240 (2007).

Ryaboskapko, A., O.R. Bullock Jr., J. Christensen, M. Cohen, A. Dastoor, I. Iiyin, G. Petersen, D. Syrakov, R.S. Artz, D. Davignon, R.R. Draxler, and J. Munthe. Intercomparison study of atmospheric mercury models: 2. Modeling results vs. long-term observations and comparison of country atmospheric balances. *Science of the Total Environment* 377, 319-333 (2007).

- Mason, R.P., M.L. Abbott, R.A. Bodaly, O.R. Bullock Jr., C.T. Driscoll, D. Evers, S.E. Lindberg, M. Murray, and E.B. Swain, Monitoring the response to changing mercury deposition. *Environmental Science and Technology* 39, Issue 1, 14A-22A, (2005).
- Bullock, O. R., Jr., Modeling transport and transformation of mercury and its compounds in continental air masses. In: N. Pirrone and K. Mahaffey, editors. *Dynamics of Mercury Pollution on Regional and Global Scales*. Springer, Norwell, MA, USA, pp. 744 (2005).
- Bullock, O. R., Jr. and K. A. Brehme, Description and evaluation of atmospheric mercury simulation using the CMAQ model. *Atmospheric Environment* 36, 2135-2146 (2002)
- Ryaboshapko, A., R. Bullock, R. Ebinghaus, I. Ilyin, K. Lohman, J. Munthe, G. Petersen, C. Seigneur, I. Wangberg, Comparison of mercury chemistry models. *Atmospheric Environment* 36, 3881- 3898 (2002).
- Lee, Xuhui, O. R. Bullock, Jr., and R. J. Andres, Anthropogenic emissions of mercury to the atmosphere in the northeast United States. *Geophysical Research Letters* 28, 1231-1234 (2001).
- Bullock, O. R., Jr., Current methods and research strategies for modeling atmospheric mercury. *Fuel Processing Technology* 65-66, 459-471 (2000).
- Bullock, O. R., Jr., Modeling assessment of transport and deposition patterns of anthropogenic mercury air emissions in the United States and Canada. *The Science of the Total Environment* 259, 145-157 (2000).
- Bullock, O. R., Jr., K. A. Brehme and G. R. Mapp, Lagrangian modeling of mercury air emission, transport and deposition: An analysis of model sensitivity to emissions uncertainty. *The Science of the Total Environment* 213, 1-12 (1998).

SELECTED PRESENTATIONS (8 out of 29 from 2001 to present)

- Bullock, O. R., Jr., Application of Regional Models for Assessing Source-Receptor Relationships for a Global Pollutant: Capabilities and Concerns for Atmospheric Mercury, United Nations Environment Program Global Partnership on Atmospheric Mercury Transport and Fate Research, Rome, Italy (2008) {also presented at the EPRI Model Development Workshop in Palo Alto, CA, USA}.
- Bullock, O. R., Jr., The effect of lateral boundary values on atmospheric mercury simulations with the CMAQ model. 29th NATO/SPS International Technical Meeting on Air Pollution Modelling and Its Application, Aveiro, Portugal (2007).
- Bullock, O. R., Jr., Atmospheric Mercury Deposition: Overview of Source Assessment. Wisconsin Department of Natural Resources Natural Resources Board Mercury Seminar, Stevens Point, WI, USA (2007).
- Lindberg, S., R. Bullock, R. Ebinghaus, D. Engstrom, X. Feng, W. Fitzgerald, N. Pirrone, E. Prestbo and C. Seigneur, Expert Panel Presentation: A synthesis of progress and uncertainties in attributing the sources of mercury in deposition. 8th International Conference on Mercury as a Global Pollutant, Madison, WI, USA (2006).
- Bullock, O. R., Jr., Atmospheric mercury model testing and application in North America. Second Meeting of the LRTAP Task Force on Hemispheric Transport of Air Pollution, Moscow, Russia (2006).
- Bullock, O. R., Jr., T. Braverman, Application of the CMAQ mercury model for U.S. EPA regulatory support. 28th NATO/SPS International Technical Meeting on Air Pollution Modelling and Its Application, Leipzig, Germany (2006).
- Bullock, O. R., Jr., Aqueous reduction of Hg^{2+} to Hg^0 by HO_2 in the CMAQ model. 7th International Conference on Mercury as a Global Pollutant, Ljubljana, Slovenia (2004).
- Bullock, O. R., Jr., Modeling atmospheric mercury in continental air masses. International Workshop on Harmonization of Mercury Measurements Methods and Models to Assess Source-Receptor Impact on Air Quality and Human Health, Maratea, Italy (2004).

NARRATIVE

My area of expertise is the development and application of atmospheric simulation models to simulate the emission, transport, transformation, and deposition of various toxic substances, with a recent focus on mercury deposition and its effects on aquatic ecosystems. I have been directly involved with the development of a number of regulatory actions by EPA addressing mercury and other toxic substances.

ANN MARIE GROVER CARLTON, PHYSICAL SCIENTIST

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Environmental Science, 2006, Rutgers University
M.S. in Bioresource Engineering, 1999, Rutgers University
B.S. in Bioresource Engineering, 1995, Rutgers University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present
Research Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2006–2008
Environmental Engineer, USEPA Region 2, Edison, NJ 1998–2003
Environmental Engineer, USEPA Region 2, New York, NY 1996–1998

SELECTED AWARDS AND HONORS

Distinguished Alumnus (early career) Award, Rutgers University, 2009.
National Science Foundation, US/Nordic Biogenic SOA European Workshop Series, invited, 2007, 2008
Gordon Conference on Biogenics and the Atmosphere, invited and emerging scientist award, 2007
Brookhaven National Laboratory, Atmospheric Chemistry Colloquium for Emerging Senior Scientists, invited, 2005
Air & Waste Management Association Air Pollution Research Grants, 2003, 2004
USEPA, Superior Achievement Award (World Trade Center Team), 2002
USEPA Bronze Medal, 2001
Who's Who Among American and International Business Women, 2000
USEPA Region 2, Superior Accomplishment Recognition, 1997, 1999, 2000, 2001
USEPA Region 2, Regional Administrator's Team Award (Response to Hurricane George), 1998
National Science Foundation, Graduate Fellowship, 1996

SELECTED PUBLICATIONS (9 out of 13 from 1999 to present)

Carlton, A.G., B.J. Turpin, K. Altieri, S. Seitzinger, R. Mathur, S. Roselle, R.J. Weber (2008) "CMAQ Model Performance Enhanced When In-Cloud SOA is Included: Comparisons of OC Predictions with Measurement", *Environmental Science & Technology* (accepted).
Ervens, B.E., A.G. Carlton, B.J. Turpin, K. Altieri, G. Feingold, S. Kreidinweis, (2008) "Secondary organic aerosol yields from cloud processing upon isoprene oxidation", *Geophysical Research Letters* 35:L02816, doi:10.1029/2007GL031828. ***Editor's Highlight Article and Science Daily News Feature***
Altieri, K., Seitzinger, S., Carlton, A.G., Tan, Y., Turpin, B.J. (2007). "Secondary Organic Aerosol Formation Through Cloud Processing: Acids and Oligomers from Aqueous Methylglyoxal Photooxidation", *Atmospheric Environment* (in review).
Carlton, A.G., B.J. Turpin, K. Altieri, S. Seitzinger, A. Reff, H.-J. Lim, B. Ervens (2007) "Atmospheric Oxalic Acid and SOA Production from Glyoxal: Results of Aqueous Photooxidation Experiments", *Atmospheric Environment*, doi:10/1016/j.atmosenv.2007.05034.
Altieri, K., A.G. Carlton, B.J. Turpin, S. Seitzinger (2006) "Formation of Oligomers in Cloud Processing Reactions of Isoprene Oxidation Products". *Environmental Science & Technology*, 40:4956-4960.
Carlton, A.G., H-J Lim, K. Altieri, S. Seitzinger, B.J. Turpin. (2006) "Link between Isoprene and Secondary Organic Aerosol (SOA): Pyruvic acid oxidation yields low volatility organic acids in clouds", *Geophysical Research Letters*, 33: L06822, doi:10.1029/2005GL025374.
Lim, H-J, A.G. Carlton and B.J. Turpin. (2005) "Isoprene Forms Atmospheric Particulate Matter through Cloud/Fog Processing: Model Simulations", *Environmental Science & Technology*, 39:4441-4446.
Carlton, A.G. and A. Teitz. (2002) "Design of a cost effective weighing facility for PM_{2.5} quality assurance", *J. of the Air & Waste Management Association*, 52:174-185.

Carlton, A.G., M. Simcik, S.J. Eisenreich, R. Porcja, W. Johnson, B. Buckley and B.J. Turpin. (1999) "Micro-analysis methods for characterization of personal exposures", *Aerosol Science and Technology*, 31:66-80.

SELECTED PRESENTATIONS (14 out of 40+ from 2004 to present)

- Carlton, A.G., et al., "To What Extent Can 'Biogenic' SOA be Controlled?", American Geophysical Union (AGU) Dec. 2008.
- Carlton, A.G., et al., "Secondary Organic Aerosol Modeling in CMAQ and Comparisons with Ambient Tracer Data" AAAR, Orlando, FL, Oct. (2008) (T).
- Carlton, A.G., et al., "Generalized numerical approach to the treatment of aqueous chemistry in CMAQ", CMAS, Chapel Hill, NC, Oct. 2007.
- Carlton, A.G., et al., "CMAQ predictions of in-cloud secondary organic aerosol (SOA) in the Eastern U.S.", American Association for Aerosol Research (AAAR), Reno, NV, Sep. 2007.
- Altieri, K., A.G. Carlton, et al., SOA formation through cloud processing: acids and oligomers from aqueous methylglyoxal photooxidation, AAAR, Reno, NV, Sep 2007.
- Turpin, B. J., A.G. Carlton invited, *Plenary Lecture* "In-cloud SOA formation from water-soluble products of biogenic emissions" Presented at the Gordon Research Conference on Biogenic Hydrocarbons and the Atmosphere, Ventura, CA, Feb 2007.
- Carlton, A.G., "SOA from Isoprene Oxidation Products: Model Simulation of Cloud Chemistry". Gordon Conference on Biogenics and the Atmosphere, Ventura, CA, Feb. 2007.
- Ervens, B, Carlton, A.G., et al., "Isoprene as SOA precursor: Aerosol mass formation by processes in haze particles and clouds," American Geophysical Union Conference, San Francisco, CA, December 2006.
- Carlton, A.G., et al., "SOA formation through cloud processing: kinetics and products of aqueous-phase glyoxal/methylglyoxal and hydroxyl radical reactions". International Aerosol Conference, Minneapolis, MN Sep. 2006.
- Carlton, A.G., et al., "SOA Production from Isoprene: Aqueous-Phase Mechanisms". American Association for Aerosol Research (AAAR), Austin, TX. Oct. 2005.
- Turpin, B.J., A.G. Carlton, et al., *Plenary Lecture* "Secondary Organic Aerosol Formation through Cloud Processing". Gordon Atmospheric Chemistry Conference, Big Sky, MT. Sep. 2005.
- Carlton, A.G., H-J, Lim, K. Altieri, et al., "Secondary Organic Aerosol Potential from Isoprene: Aqueous-Phase Mechanisms". Gordon Atmospheric Chemistry Conference, Big Sky. MT, and ACCESSVIII, Yellowstone National Park, Sep. 2005.
- Altieri, K.E., A.G. Carlton, et al., "Formation of oligomers in cloud processing: reactions of isoprene oxidation products" Surface Ocean – Lower Atmosphere Study (SOLAS), Corsica, France. (2006).
- Carlton, A.G., H-J Lim, B.J. Turpin, "Link Between Isoprene and SOA: Fate of Pyruvic Acid in Dilute Aqueous Solution". AAAR, Atlanta, GA. Feb. 2005.

NARRATIVE

A key interest of mine is atmospheric aqueous-phase (cloud) chemistry. Because clouds cover ~60% of the Earth's surface, modeling aqueous-phase chemistry is very important. While the Community Multiscale Air Quality (CMAQ) model includes of hundreds of explicit and semi-explicit gas-phase chemical reactions, the aqueous mechanism has only 7 reactions. My work focuses on improving the representation of aqueous chemistry in atmospheric models and linking cloud processes to secondary organic aerosol formation.

**JASON K.S. CHING, PHYSICAL SCIENTIST**

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. in Atmospheric Sciences, 1974, University of Washington
M.S. in Meteorology, 1964, Pennsylvania State University
B.S. in Meteorology, 1962, University of Hawaii

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 1998–2008
Branch Chief, Atmospheric Model Development Branch, NOAA Atmospheric Sciences Modeling Division
(in partnership with USEPA/NERL), Research Triangle Park, NC, 1990–1998
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 1975–1990
Meteorologist, NOAA BOMAP-IFYGL-GATE Project Office, Washington DC, 1970–1975
Meteorologist, Woods Hole Oceanographic Institute, Woods Hole, MA., 1964–1966

SELECTED AWARDS AND HONORS

USEPA Bronze Medal, R&D on Models-3 and CMAQ modeling systems, 1999
USEPA Bronze Medal, Advanced modeling system for characterizing and assessing air pollutant impacts
on Federally protected pristine areas (Class 1 areas), 1996
USEPA Bronze Medal, Development, evaluation, and application of Regional Acid Deposition Model
(RADM), 1990
NAPAP Certificate, Outstanding contribution to NAPAP, 1989

SELECTED PUBLICATIONS (13 out of 30 from 1968 to present)

Ching, J., M. Brown, S. Burian, F. Chen, R. Cionco, A. Hanna, T. Hultgren, T. McPherson, D. Sailor,
Haider T., and D. Williams: "National Urban Database and Access Portal Tool (NUDAPT), Submitted
to Bulletin of American Meteorological Society , 4/2008
Pullen, J., J. Ching, D. Sailor, W. Thompson, B. Bornstein, and D. Koracin: Progress Toward Meeting the
Challenges of Our Coastal Urban Future, Accepted for publication by Bulletin of American
Meteorological Society (2008)
Isakov, V., J. Irwin, and J. Ching. Using CMAQ for Exposure Modeling and Characterizing the Sub-Grid
Variability for Exposure Estimates. *Journal of Applied Meteorology and Climatology*. 46: 1354-1371
(2007)
Touma, J.S., V. Isakov, J. Ching, and C. Seigneur. Air quality modeling of hazardous pollutants: Current
status and future directions. *Journal of the Air & Waste Management Association* 56:547-558 (2006)
Ching, J., J. Herwehe and J. Swall: On joint deterministic grid modeling and sub-grid variability
conceptual framework for model evaluation, *Atmos. Env.*, 40 (2006) 4935-4945.
Dupont, S., T.L. Otte, and J.K.S. Ching, 2004: Simulation of meteorological fields within and above urban
and rural canopies with a mesoscale model (MM5) *Boundary Layer Meteorol.*, 2004 113: 111-158.
U.S. Environmental Protection Agency. *Science algorithms of the EPA Models-3 Community Multiscale
Air Quality (CMAQ) modeling system*. D.W. Byun, and J.K.S. Ching (Eds.). EPA-600/R-99/030,
National Exposure Research Laboratory, Research Triangle Park, NC (1999).
Ching, J.K.S., F.S. Binkowski, and O.R. Bullock, Jr. Deposition of Semivolatile Toxic Air Pollutants to the
Great Lakes: A Regional Modeling Approach. In *Atmospheric Deposition of Contaminants to the
Great Lakes and Coastal Waters*. J.E. Baker (ed.). SETAC Technical Publication Series. Publication
sponsored by the Society of Environmental Toxicology and Chemistry (SETAC) and the SETAC
Foundation for Environmental Education. SETAC Press, Pensacola, Florida, p.293-304, (1997).
Ching, J. K. S., S.T. Shipley, E.V. Browell, 1988: Evidence for cloud venting of mixed layer ozone and
aerosols. *Atmos. Env.* 12(2):225-242.

- Godowitch, J.M., J.K.S. Ching and J.F. Clarke, 1987: Spatial variation of the evolution and structure of the urban boundary layer. *Boundary Layer Meteorol.* 38:249-272.
- Clarke, J.F., J.K.S. Ching, J.M. Godowitch and F.S. Binkowski, 1987: Surface layer turbulence in an urban area. *Modeling the Urban Boundary Layer*. Am. Meteorol. Soc. Special Book, 542p.
- Ching, J.K.S., 1985: Urban scale variations of turbulence parameters and fluxes. *Boundary Layer Meteorol.*, 33(4):335-362.
- Ching, J.K.S., J. F. Clarke, J. S. Irwin and J. M. Godowitch, 1983a: Relevance of mixed layer scaling for daytime dispersion based on RAPS and other field programs. *Atmos. Env.*, 17(4):854-871.

SELECTED PRESENTATIONS (10 out of 112 from 1976 to present)

- Ching, J., H. Taha, F. Chen, M. Shiguang: "Sensitivity of CMAQ to urbanized meteorological fields based on National Urban Database and Access Portal Tools (NUDAPT)" 15th Joint Conference on Application of Air Pollution Meteorology with A&WMA New Orleans, LA 20-24 January 2008
- Ching, J., V. Isakov and M. Majeed "Descriptions of sub-grid model variability and methods for incorporation in advanced applications of CMAQ")" 15th Joint Conference on Application of Air Pollution Meteorology with A&WMA New Orleans, LA 20-24 January 2008
- Ching, J., National urban database and access portal tools (NUDAPT): a project overview, 7th AMS Urban Environment Symposium, San Diego, CA Sep 10-14, 2007
- Ching, J., A. Hanna D. Williams, S. Burian. S. Hamilton, 2006: "National Urban Database and Access Portal Tool (NUDAPT) Facilitating advancements in urban meteorology and climate modeling with community-based urban databases" 5th Annual Models-3 User's Conference, Oct 16-16, 2006, UNC-Chapel Hill, NC Community Modeling and Analysis System.
- Ching, J., M. Majeed, V. Isakov, A. Khlystov, 2006 "Fine scale air quality modeling using a hybrid dispersion and CMAQ modeling approach, An example application in Wilmington, De." 5th Annual Models-3 User's Conference, Oct 16-16, 2006, UNC-Chapel Hill, NC Community Modeling and Analysis
- Ching, J., S. Burian, S. Dupont and D. Roy (2006): "Advanced meteorological modeling with urban canopy parameters for air quality and dispersion applications in urban areas" International Conference of Urban Climatology, Gothenburg, Sweden (June 12-16, 2006).
- Ching, J., A. Hanna D. Williams, S. Burian. S. Hamilton and Rick Fry, 2006: "Prospectus: National Database of High-Resolution Building and other Urban Data for Advanced Modeling" 6th AMS Urban Environment Symposium, Atlanta, Georgia (Jan 30-Feb 2, 2006).
- Ching, J., V. Isakov and M. Majeed, 2006: "Approach for incorporating sub-grid variability (SGV) information into air quality modeling" 14th Joint conference on the Applications of Air Pollution Meteorology with the Air and Waste Management Association, Atlanta, GA Jan 30-Feb 2, 2006.
- Ching, J., V. Isakov, J. Herwehe, M. Majeed, 2005: Incorporating sub-grid variability concentration distributions with CMAQ, 4th Annual Models-3 User's Conference, Sep 26-28, 2005, UNC-Chapel Hill, NC Community Modeling and Analysis System.
- Ching, J., J. Herwehe, T. Pierce, J. Swall, (2004): Paradigm using joint deterministic grid modeling and sub-grid variability stochastic descriptions as a template for model evaluation. Preprints, 3rd Annual Models-3 User's Conference, October 18-20, 2004, Chapel Hill, NC Community Modeling and Analysis System, CD ROM P.6 (2004).

NARRATIVE

My area of expertise is the development and application of air quality models (e.g., CMAQ) and meteorological models (e.g., MM5 and WRF) at regional to urban to neighborhood scales. From 1990 to 1998, I initiated and oversaw implementation of the CMAQ portion of the Models-3/CMAQ system. Since then, I have been developing methodologies to improve the linkages between CMAQ and exposure models, with a focus on urban areas. These activities include (1) advanced urban canopy modeling (in MM5) and developing an urban database (NUDAPT), (2) fine-scale air quality modeling, (3) describing and parameterizing sub-grid-scale concentration variability (SGV) for CMAQ grid predictions, and (4) development of means to incorporate SGVs as stochastic variables in CMAQ for utilization to improve human population exposure assessments.

ELLEN COOTER, RESEARCH PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Meteorology, 1985, University of Oklahoma (Interdisciplinary)
 M.S. in Meteorology, 1978, University of Oklahoma
 B.S. in Meteorology, 1976, University of Oklahoma

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC,
 2008–present
 Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
 Research Triangle Park, NC, 1990–2008
 Assistant State Climatologist, Oklahoma Climatological Survey, Norman, OK, 1981–1990

SELECTED AWARDS AND HONORS

USEPA NERL Special Achievement Award (Team recognition), 2007
 USEPA Bronze Medal (Team recognition), 2004

SELECTED PUBLICATIONS (9 of 28 from 1990 to present)

Cooter, E., J. Swall and R. Gilliam, 2007. "Comparison of 700 hPa NCIP-R1 and AMIP-R2 Wind Patterns over the Continental U.S. Using Cluster Analysis," *Journal of Applied Meteorology and Climatology*, 46(100): 1744-1758.

Cohen, Y. and Cooter, E., 2002. "Multimedia Environmental Distribution of Toxics (MEND-TOX). II: Software implementation and case studies," *Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management*, 6(2): 87-101.

Cooter, E.J., Hutzell, W.T., Foreman W. and Majewski, M., 2002. "A Regional Atmospheric Fate and Transport Model for Atrazine. 2. Evaluation," *Environ. Sci. Technol.*, 36 (21): 4593-4599.

Cooter, E. J. and D. Schwede, 2000. "Sensitivity of the NOAA multilayer model to instrument error and parameterization uncertainty," *Journal of Geophysical Research*, 105 (D5): 6695-6707.

Cooter, E. J. 1998. "Chapter 2: General Circulation Model Scenarios for the Southern United States." In *The Productivity and Sustainability of Southern Forest Ecosystems in a Changing Environment*, R. Mickler and S. Fox, eds. Springer, New York, NY. pp 15-54.

Dhakhwa, G.B., C.L. Campbell, S. K. LeDuc and E. J. Cooter, 1997. "Use of crop models in assessing the interactive effects of global warming and CO₂ doubling on Maize production," *Agricultural and Forest Meteorology*, 87(4): 253-272.

Sampson, D.A., E. J. Cooter, P.M. Dougherty and H. Lee Allen, 1996. "Comparison of the UKMO and GFDL GCM Climate Projections in NPP simulations for southern loblolly pine stands," *Climate Research*, 7(1): 55-69.

Cooter, E. J. and S. K. LeDuc, 1995. "Recent frost date trends in the north-eastern USA," *International Journal of Climatology*, 15: 65-75.

Cooter, E. J., S. K. LeDuc and L. Truppi, 1992. "Climate research for ecological monitoring and assessment: A New England example," *Climate Research*, 2:101-112.

SELECTED PRESENTATIONS (10 of 30 from 1990 to present)

Cooter, E.J. 2008. "EPA ORD Hydrometeorological Products, Service and Supporting Research Needs." Presented to the Office of the Federal Coordinator for Meteorological Services and Support Research Mini-Workshop on Hydrometeorological Products, Services and Supporting Research, September 17, Silver Springs, Maryland.

Cooter, E.J, R. Gilliam, W.G. Genjey, C. Nolte, J. Swall and A. Gilliland. 2006. "Examining the impact of climate change on regional air quality over the United States." Presented at the International Meeting on Air Pollution Modelling and its Application, 15-19 May, 2006, Leipzig, Germany.

Cooter, E., 2004 "Overview of the Climate Impact on Regional Air Quality (CIRAQ) Project." Presented as 3rd Annual CMAS Models-3 Users' Conference, October 18-20, 2004, Chapel Hill, NC



- Cooter, E. and W. Hutzell, 2000. Regional modeling of the atmospheric transport and deposition of atrazine, SETAC, 21st Annual Meeting, 12-16 November, Nashville, TN.
- Cooter, E.J. and Y. Cohen, 2000. Modeling Flux Pathways for volatile and Semi-Volatile Organic Compounds in a Multimedia Environment, 6th International Conference on Air-Surface Exchange of Gases and Particles, 3-7 July, 2000, Edinburgh, UK.
- Cooter, E.J. and B. Hutzell, 2000. Atmospheric Transport and Deposition of Atrazine to Lake Michigan, IAGLR-2000, May 21-26, 2000, Cornwall, Ontario, Canada.
- Cooter, E. J., J. B. Hill and Y. Cohen, 1999. Impact of secular precipitation changes on the deposition of B[a]P to the Neuse River basin of North Carolina, 11th Conference on Applied Climatology, January 10-15, 1999, Dallas, Texas.
- Cooter, E. J., Y. Cohen and J. Hill, 1998. Application of a hybrid compartmental model to the Neuse River Basin of North Carolina. Presented at the AW&MA Symposium on Measurement of Toxic and Related Air Pollutants, September 1-3, 1998, Cary, NC. Presentation made on September 2.
- Cooter, E..J., 1997. Fate and transport modeling of agricultural atrazine emissions to the Great lakes Basin: Step 1 – Linkage of terrestrial emissions and the atmospheric system components. Presented at the 40th Conference of the International Association for Great Lakes Research (IAGLR), Buffalo State College and University of Buffalo, Buffalo, NY, June 4, 1997.
- Cooter, E.J., 1991. "Climate Data and Analysis for the New England Forest Health Monitoring Project (NEFHM/EMAP Forests)." Presented at the AMS Seventh Conference of Applied Climatology, September 10-12, 1991, Salt Lake City, Utah.

NARRATIVE

In my research with EPA/NOAA over the past 18 years, I have used my multidisciplinary background in applied meteorology/climatology to conduct independent research in the areas of global change analysis, multimedia modeling/air-surface exchange, and climate/ecosystem interactions. Previously, I participated in developing the first regional-scale linked CMAQ multimedia application for a semivolatile chemical (atrazine), and I am now working with a team of AMAD and National Risk Management Research Laboratory (NRMRL) collaborators to use monitored field data and an existing agricultural production management tool to develop the soil resistance component of a bidirectional ammonia flux model for CMAQ. I recently completed a statistical evaluation of downscaled climate scenarios with the AMAD Climate Impacts on Regional Air Quality (CIRAQ) Team. Most recently, I am acting as the atmospheric modeling lead for the Future Midwest Landscape (FML) theme of the EPA Ecological Research Program (ERP) and am an active contributor to that project's peer-reviewed Implementation Plan. I am also collaborating with watershed modeling scientists in the NERL Ecological Research Division (Athens) regarding the linkage of air quality and watershed models to improve regional estimation of contaminant flux to terrestrial and aquatic ecosystems.

JAMES L. CROOKS, POSTDOCTORAL FELLOW

Atmospheric Exposure Integration Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Physics, 2005, University of North Carolina at Chapel Hill
 M.S. in Statistics, 2006, University of North Carolina at Chapel Hill
 B.S. (with high honors) in Physics and History, 1998, Emory University

PROFESSIONAL EXPERIENCE

Postdoctoral Fellow, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
 Postdoctoral Fellow, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
 Research Triangle Park, NC, 2008
 Postdoctoral Fellow, Duke University Department of Statistical Sciences, Durham, NC, 2007–2008
 Postdoctoral Fellow, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC,
 2006–2007

SELECTED PUBLICATIONS

Crooks, J., Whitsel, E., Catellier, D., Liao, D., Quibrera, P., and Smith, R. (2009?) Hierarchical Models for the Effect of Spatial Interpolation Error on the Inferred Relationship between Ambient Particulate Matter Exposure and Cardiovascular Health, submitted to *Biostatistics*.
 Crooks, J., Berger, J., and Loredo, T., (2007) Posterior-Guided Importance Sampling for Calculating Marginal Likelihoods with Application to Bayesian Exoplanet Searches, Duke University *Department of Statistical Sciences Discussion Paper* 2007-26.
 Crooks, J., and Frampton, P., (2006) Conformal Transformations and Accelerated Cosmologies, *Phys. Rev. D* 73 123512.
 Crooks, J., Dunn, J., Frampton, P., Norton, H., and Takahashi, T., (2003), Cosmic Degeneracy with Dark Energy Equation of State, *Astropart. Phys.* 20 361-367.
 Crooks, J., Dunn, J., Frampton, P., Ng, Y., and Rohm, R., (2001) CMB with Quintessence: Analytic Approach and CMBFAST, *Mod. Phys. Lett. A* 16 63-74.
 Crooks, J., Dunn, J., and Frampton, P., (2001) Relic Neutrinos and Z-Resonance Mechanism for Highest-Energy Cosmic Rays. *Astrophys. J.* 546 L1-L4.

SELECTED PRESENTATIONS

Crooks, J., Whitsel, E., Catellier, D., Liao, D., Quibrera, P., and Smith, R., *Hierarchical Models for the Effect of Spatial Interpolation Error on the Inferred Relationship between Ambient Particulate Matter Exposure and Cardiovascular Health*, Accepted Talk, Twentieth Conference of the International Society for Environmental Epidemiology, Pasedena, CA, October 2008.
 Crooks, J., Berger, J., and Loredo, T., *Posterior-Guided Importance Sampling for Calculating Marginal Likelihoods*, Invited Session on Astrostatistics, Joint Statistical Meeting, Denver, CO, August 2008.
 Crooks, J., *What will Duke Forest Look Like in 2100? Emulating a Stochastic Simulator*, New Researcher Talk, Case Studies in Bayesian Statistics 9, Pittsburgh, PA, October 2007.
 Crooks, J., *Interpolating Stochastic Model Output*, poster, SAMSI Complex Computer Models Transition Workshop, Research Triangle Park, NC, May 2007.
 Crooks, J., (2007) *Progress Toward Interpolating Stochastic Model Output*, Invited Talk, SAMSI Terrestrial Models Mid-Program Workshop, Research Triangle Park, NC, April 2007.

NARRATIVE

Since becoming a statistician three years ago, I have conducted research at the intersection of large-scale computer modeling and the natural sciences, with an emphasis on environmentally relevant applications. In statistics, I am interested in spatial and spatio-temporal processes, Bayesian nonparametrics and model selection, and integrating computer models with observational data to improve predictions.

ROBIN L. DENNIS, PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Physics, 1972, University of Wisconsin-Madison
M.S. in Physics, 1969, University of Wisconsin-Madison
B.S. in Physics, *magna cum laude*, 1966, University of Redlands

PROFESSIONAL EXPERIENCE

Senior Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
Senior Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1998–2008
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1984–1998
Staff Scientist, Environmental and Societal Impacts Groups, NCAR, Boulder, CO 1979–1984
Senior Fellow, Advanced Study Program, NCAR, Boulder, CO 1978–1979
Research Scholar, Environment Program, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria 1976–1978
National Science Foundation Postdoctoral Fellow, Environment Program, IIASA, Laxenburg, Austria 1975–1976
Project Associate, Energy Systems and Policy Research Program and Air Pollution Research Program, Institute for Environmental Studies, UW-Madison, Madison, WI, 1972–1975

SELECTED AWARDS AND HONORS

USEPA Bronze Medal for Nitrogen and Mercury Watershed TMDL Assessments Team, 2008
NOAA Administrator's Award, 2007
USEPA/NERL Science Achievement Award for Leadership in Atmospheric Deposition to Watersheds and Multimedia Modeling, 2006
USEPA Bronze Medal for CMAQ Model Development and Evaluation, 2005
USEPA Bronze Medal for Contribution to NARSTO PM Assessment, 2004
USEPA/SETAC, Scientific Achievement Award for Air-Water Linkage for Chesapeake Bay, 1999

SELECTED PUBLICATIONS (16 out of 54 from 1990 to present)

Wu, Y. J. Walker, C. Peters-Lidard, D. Schwede, R. Dennis, and W. Robarge. A new model of bi-directional ammonia exchange between the atmosphere and biosphere: Ammonia stomatal compensation point. *Agricultural and Forest Meteorology*, accepted for publication.
Pinder, R.W., A.B. Gilliland, R.L. Dennis, 2008. The Environmental Impact of Atmospheric NH₃ Emissions under Present and Future Conditions in the Eastern United States, *Geophysical Research Letters*, 35, L12808. June 2008.
Pinder, R.W. R.L. Dennis, P.V. Bhave, 2008. Observable Indicators of the Sensitivity of PM_{2.5} Nitrate to Emission Reductions, Part I: Derivation of the Adjusted Gas Ratio and Applicability at Regulatory-Relevant Time Scales, *Atmospheric Environment*, Vol., 42, 1275-1286.
Dennis, R.L., P.V. Bhave and R.W. Pinder, 2008. Observable Indicators of the Sensitivity of PM_{2.5} Nitrate to Emission Reductions, Part II: Sensitivity to errors in total ammonia and total nitrate of the CMAQ-predicted nonlinear effect of SO₂ emission reductions on PM_{2.5} nitrate. *Atmospheric Environment*, Vol. 42, 1287-1300.
Sullivan, T.J., B.J. Cosby, J.R. Webb, R.L. Dennis, A.J. Bulger, F.A. Deviney, Jr. Steamwater Acid-Base Chemistry and Critical Loads of Atmospheric Sulfur Deposition in Shenandoah National Park, Virginia, 2008. *Environmental Monitoring and Assessment*, Vol. 137, No. 1-3, pp 85-99.
Dennis, R.L., R. Haeuber, T. Blett, J. Cosby, C. Driscoll, J. Sickles and J.M. Johnston. 2007. Sulfur and nitrogen deposition on terrestrial and freshwater ecosystems in the United States, *Air & Waste Management Association Environmental Manager*, December 2007, pp 12-17
Yu, Shaocai, R.L. Dennis, S. Roselle, A. Nenes, J. Walker, B. Eder, K. Schere, J. Swall, 2005. An assessment of the ability of 3-D air quality models with current thermodynamic equilibrium models to

- predict aerosol NO₃⁻, *Journal of Geophysical Research-Atmospheres*, vol 110, D07S13, doi:10.1029/2004JD004718.
- Arnold, J.R., R.L. Dennis and G.S. Tonnesen, 2003. Diagnostic evaluation of numerical air quality models with specialized ambient observations: testing the Community Multiscale Air Quality modeling system (CMAQ) at selected SOS 95 ground sites, *Atmospheric Environment*, 37, 1185-1198.
- Gilliland, A.B., R.L. Dennis, S.J. Roselle and T.E. Pierce, 2003. Seasonal NH₃ Emissions Estimates for the Eastern United States based on Ammonium Wet Concentrations and an Inverse Modeling Method, *Journal of Geophysical Research - Atmospheres*, vol 108, No. D15, 4477 doi:10.1029.2002JD003063, 2003.
- Mathur, R. and R.L. Dennis, 2003. Seasonal and Annual Modeling of Reduced Nitrogen Compounds Over the Eastern United States: Emissions, Ambient Levels and Deposition Amounts, *Journal of Geophysical Research - Atmospheres*, vol 108, No. D15, 4481 doi:10.1029.2002JD002794, 2003.
- Paerl, H.W., R.L. Dennis and D.R. Whitall, 2002. Atmospheric Deposition of Nitrogen: Implications for Nutrient Over-enrichment of Coastal Waters, *Estuaries*, 25, No. 4B, 677-693.
- Meyers, T., J Sickles, R. Dennis, K. Russell, J. Galloway, and T. Church, 2001. Atmospheric nitrogen deposition to coastal estuaries and their watersheds, in R.A. Valigura, R.B. Alexander, M.S. Castro, T.P. Meyers, H.W. Paerl, P.E. Stacey and R. E. Turner (Eds.) *Nitrogen Loading in Coastal Water Bodies: An Atmospheric Perspective*, American Geophysical Union, Coastal and Estuarine Studies, Washington, D.C., 254 pp.
- Dennis, R.L. and R. Mathur, 2001. Airshed domains for modeling atmospheric deposition of oxidized and reduced nitrogen to the Neuse/Pamlico system, 2001, *Hydrological Science and Technology*, Special Issue, 17, No. 1-4, 107-117.
- Linker, L.C, G.W. Shenk, R.L. Dennis, J.S. Sweeney, 2000. Cross-Media Models of the Chesapeake Bay Watershed and Airshed, *Water Quality and Ecosystem Modeling*, 1, 91-122.
- Russell, A.G., and R.L. Dennis, 2000. A NARSTO Critical Review of Photochemical Air Quality Modeling, *Atmospheric Environment*, 34, 2283-2324.
- Dennis, R.L., Using the Regional Acid Deposition Model to Determine the Nitrogen Deposition Airshed of the Chesapeake Bay Watershed, in Joel E. Baker, editor, *Atmospheric Deposition to the Great Lakes and Coastal Waters*, Society of Environmental Toxicology and Chemistry, Pensacola, FL, pp 393-413, 1997.

SELECTED PRESENTATIONS (6 out of 60 from 2001 to present)

- Dennis, R.L. 2008. Air Quality Model Insights into Nitrogen Dry Deposition Missed by Networks, NADP Annual Meeting, October 14-16, 2008, Madison, Wisconsin.
- Dennis, R.L. 2007. The Problem of Atmospheric Nitrogen Deposition for Chesapeake Bay, ASA-CSSA-SSSA 2007 International Annual Meetings, November 4-8, 2007, New Orleans, Louisiana
- Dennis, R.L. 2007. CMAQ Insight Discussion, EPA Science Advisory Board Integrated Nitrogen Committee, May 8, 2007, Washington DC (conference call)
- Dennis, R.L. 2007. Atmospheric Loads, Scientific Summit on Impacts of Growth on Water Quality, UM Center for Environmental Sciences, Annapolis, Maryland
- Dennis, R.L. and R. Mathur, 2006. Fate and Transport of Ammonia at the Local to Regional Level, Workshop on Agricultural Air Quality: State of the Science, Bolger Conference Center, June 5-8, 2006, Potomac, MD
- Dennis, R.L. 2002, From Acidifying to Eutrophying Deposition: An Evolving Path and Evolving Model, National Institute of Public Health and the Environment, October 17, 2002, The Hague, Netherlands

NARRATIVE

A key interest is environmental problem solving and bringing science to bear to inform and guide decision making. I was involved in setting the vision and conceptual development for EPA's third-generation air quality modeling system and the resulting Community Multiscale Air Quality (CMAQ) model. I have conducted the diagnostic evaluation of various regional models. I am engaged in and direct the application of regional models for assessments, particularly involving cross-media modeling, linking air and water for coastal estuarine assessments (e.g., for Chesapeake Bay), with attention to atmospheric deposition. More recently I have been involved in linking air and freshwater/terrestrial ecosystems for critical loads assessments. I am the AMAD theme lead for ecosystem exposure modeling.

BRIAN K. EDER, RESEARCH PHYSICAL SCIENTIST

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Meteorology, 1993, North Carolina State University
M.S. in Meteorology, 1984, North Carolina State University
B.S. in Meteorology, 1980, North Carolina State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Adjunct Professor, Marine, Earth and Atmospheric Sciences (MEAS) Department, North Carolina State University, Raleigh, NC, 1995–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1985–2008
Computer Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA), Research Triangle Park, NC, 1984–1985.
Assistant State Climatologist, MEAS Department, North Carolina State University, Raleigh, NC, 1981–1984

SELECTED AWARDS AND HONORS

USEPA Bronze Medal Award, 2004
Member, American Meteorological Society Committee on Applied Climatology, 1997–2000
USEPA Bronze Medal Award, 1999

SELECTED PUBLICATIONS (since 1987)

Eder, B., D. Kang, S.T. Rao, R. Mathur, S. Yu, T. Otte, K. Schere, R. Wayland, S. Jackson, P. Davidson and J. McQueen, 2008: A demonstration of the use of National air quality forecasts for developing local air quality index forecasts. Submitted to *Bulletin of the American Meteorological Society*.
Eder, B., D. Kang, R. Mathur, J. Pleim and S. Yu, 2008: A performance evaluation of the National Air Quality Forecast Capability for the summer of 2007. Submitted to *Atmos. Environ.*
Eder, B., D. Kang, R. Mathur, S. Yu and K. Schere, 2006: An Operational evaluation of the Eta-CMAQ air quality forecast model. *Atmos. Environ.* 40: 4894 - 4905.
Eder, B. and S. Yu, 2006: A performance evaluation of the 2004 release of Models-3 CMAQ. *Atmos. Environ.* 40: 4811-4824.
Yu., S., B. Eder, R. Dennis, S. Chu and S. Schwartz, 2006: New unbiased metrics for the evaluation of air quality models. *Atmos. Sci. Lett.* 7: 26-34.
Kang, D., B. Eder, A. Stein, G. Grell, S. Peckhman and J. McHenry, 2005: The New England Air Quality Forecasting Pilot Program: Development of an evaluation protocol and performance benchmark. *J. Air & Waste Manage. Assoc.* 55: 1782-1796.
Cooter, E., B. Eder. et al., 2005: Effects of climate change on weather and water. *Environ. Manag.* October, 2005: 32-35.
Mebust, M., B. Eder, F. Binkowski and S. Roselle, 2003 Models-3 CMAQ Model Aerosol Component 2. Model Evaluation . *J. of Geophys. Res.* 108, No. D6
Cohn, R., B. Eder, S. Le Duc, R. Dennis, 2001: Development of an aggregation and episode selection scheme to support the Models-3 Community Multiscale Air Quality Model . *J. App. Met.*, 40: 210-228.
Eder, B., S. LeDuc and J. Sickles, 1999: A climatology of total ozone mapping spectrometer data using rotated principal component analysis. *J. Geophys. Res.* 104, No. D3, pp 3691-3709.
Davis, J., B. Eder, D. Nychka, and Q. Yang, 1998: Modeling the effects of meteorology on ozone in Houston using cluster analysis and generalized additive models. *Atmos. Environ.*, 32: 2505-2520.
Davis, J., Eder, B. and P. Bloomfield, 1998: *Case Studies in Environmental Statistics*, Chapter 2: Modeling Ozone in the Chicago Urban Area. Springer-Verlag Press, pp. 5-26.
Davis, J., Eder, B. and P. Bloomfield, 1998: *Case Studies in Environmental Statistics*, Chapter 3: Regional and temporal models for ozone along the Gulf Coast. Springer-Verlag Press, pp. 27-50.

- Eder, B., J. Davis and P. Bloomfield, 1994: An Automated Classification Scheme Designed to Better Elucidate the Dependence of Ozone on Meteorology. *J. App. Met.*, 33: 1182-1199.
- Eder, B., J. Davis and P. Bloomfield, 1993: A Characterization of the Spatiotemporal Variation of Non-Urban Ozone in the Eastern United States. *Atmos. Environ.*, 27A : 2645-2668.
- Cooter, E., B. Eder, S. LeDuc and L. Truppi, 1993: Climate Change Models and Forest Impacts Research. *J. Forestry*, 91 : 38-43.
- Eder, B., and R. Dennis, 1990: On The Use of Scavenging Ratios for the Inference of Surface-Level Concentration and Subsequent Dry Deposition of Ca^{2+} , Mg^{2+} , Na^+ and K^+ . *Water, Air, and Soil Pollution* 52, No. 3-4, pp 197-216.
- Eder, B., 1989: A Principal Component Analysis of SO_4^- Precipitation Concentrations over the Eastern United States. *Atmos. Environ.* 23: 2739-2750.
- Eder, B., J. Davis and J. Monahan, 1987: The Spatial and Temporal Analysis of the Palmer Drought Severity Index over the Southeastern United States. *J. of Climatology* - 7: 31-56.

SELECTED PRESENTATIONS (since 1996)

- Eder, B. K., An Evaluation of the Experimental WRF-CMAQ Air Quality Forecast Model for the Summer of 2007th Focus Group Workshop, Falls Church, VA; September 18, 2007
- Eder, B. K., J. Sickles, and D. Shadwick. A PCA of Clean Air Status and Trends Network (CASTNet) air concentration data. *AWMA Specialty Conference Proceedings Environmental Data Analysis*, Oct. 4, 2005, Oak Brook, IL.
- Eder, B. K., Yu, Shaocai and R. Dennis, 2003: An Evaluation of the MODELS-3 CMAQ Aerosol Module, 2003 AAAR PM Meeting Particulate Matter: Atmospheric Sciences, Exposure and the Fourth Colloquium on PM and Human Health, March 31 - April 4, 2003, Pittsburgh, PA
- Eder, B.K, Yu, S., Dennis, R., Pleim, J and K. Schere, 2002: *Preliminary Evaluation of the June 2002 Version of CMAQ*. CMAS Models-3 User's Workshop, Oct. 21-23, Research Triangle Park, NC
- Eder, B. K., Yu, S., Dennis, R., Pleim, J and K. Schere, 2002: *Testing of the June 2002 Version of the US EPA's CMAQ*. BMU/UBA-U.S. EPA-EMEP Workshop, October 7-11, Bad Breisig, Germany.
- Eder, B. K., Kang, D. and K. Schere, 2002: *An Evaluation Protocol for NOAA's Air Quality Forecasting Pilot Program*. November 7-8, Camp Spring, MD.
- Eder, B.K., Mebust, M. and S. K. LeDuc, 2001: A Preliminary Evaluation of Models-3 CMAQ Using Particulate Matter Data from the IMPROVE Network; *Reprints, 25th NATO/CCMS International Technical Meeting on Air Pollution Modeling and Its Applications*, October 15-19, 2001, Louvain-la-Neuve, Belgium, pp 327-334.
- Eder, B. K., S. K. LeDuc, A. B. Gilliland, and P. L. Finkelstein, 2001: On the use of NEXRAD Stage IV data in the multimedia modeling of pollutant transport. *Preprints from the Symposium Precipitation Extremes: Prediction, Impacts, and Responses*, Albuquerque, New Mexico, January 15-18, 2001, American Meteorological Society, Boston, pp 284-285.
- Eder, B. K., F.S. Binkowski, S.J. Roselle and Michelle Mebust, 2000: A Preliminary Evaluation of Models-3 CMAQ Using the Light Extinction Coefficient (b_{ext}). Reprints from the 14th Annual International Symposium on the Measurement of Toxic and Related Air Pollutants, September 12-14, 2000, Research Triangle Park, NC, Air & Waste Management Assoc.
- Eder, B.K., R. Cohn. S.K. LeDuc and R. Dennis, 2000. An Aggregation and Episode Selection Scheme for EPA's Models-3 CMAQ. *Preprints from the 12th Conference on Applied Climatology, May 7-11, 2000, Asheville, NC*, American Meteorological Society, Boston, 166-169.
- Eder, B. K. And J. E. Sickles, II, 1998: Climatological and Regional Analyses of CASTNet Air Concentration Data. Reprints from the 13th Annual International Symposium on the Measurement of Toxic and Related Air Pollutants, September 1-3, 1998, Cary, NC, Air & Waste Management Assoc., pp. 402-413.

NARRATIVE

My area of expertise is the application of multivariate statistical techniques to (1) examine the relationships between meteorology and air quality and (2) perform operational and diagnostic model evaluation of the Community Multiscale Air Quality (CMAQ) model and the National Weather Service Air Quality Forecast System.

KRISTEN M. FOLEY, STATISTICIAN

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Statistics, 2006, North Carolina State University
M.S. in Statistics, 2003, North Carolina State University
B.S. in Statistics, 2001, North Carolina State University

PROFESSIONAL EXPERIENCE

Statistician, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Statistician, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 2007–2008
Postdoctoral Fellow, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC, 2006–2007

SELECTED AWARDS AND HONORS

USEPA Bronze Medal for Commendable Service, 2008
American Statistical Association Section on Bayesian Statistical Science (SBSS) Student Paper Award,
2006

SELECTED PUBLICATIONS (8 out of 8 from 2005 to present)

- Swall, J., Foley, K. The impact of spatial correlation and incommensurability on model evaluation. *Atmospheric Environment*, (in press).
- Pinder, R. W., Gilliam, R.C., Appel, A., Napelenok, S.L., Foley, K.M., Gilliland, A.B. Efficient probabilistic estimates of ozone concentration using an ensemble of model configurations and direct sensitivity calculations. *Environmental Science and Technology*, (in review).
- Davis, J.M., Bhave, P.V., Foley, K.M. 2008. Parameterization of the N₂O₅ Reaction Probability on the Surface of Particles Containing Ammonium, Sulfate, and Nitrate, *Atmospheric Chemistry and Physics*, 8: 5295 – 5311.
- Irwin, J., Civerlo, K., Hogrefe, C., Appel, K., Foley, K.M., Swall, J. 2008. A procedure for inter-comparing the skill of regional-scale air quality model simulations of daily maximum 8-hour ozone values. *Atmospheric Environment*, 42: 5403 – 5412.
- Gilliland, A. B., Hogrefe, C., Pinder, R. W., Godowitch, J., Foley, K. M., Rao, S.T. 2008. Dynamic evaluation of regional air quality models: Assessing changes in O₃ stemming from changes in emissions and meteorology. *Atmospheric Environment*, 42: 5110 – 5123.
- Foley, K. M. and Fuentes, M. 2008. A statistical framework to combine multivariate spatial data and physical models for hurricane surface wind prediction. *Journal of Agricultural, Biological & Environmental Statistics*, 13: 37 – 59.
- Foley, K. M. and Fuentes, M. 2008. Hurricane Wind Fields, Multivariate Modeling. *Encyclopedia of GIS*, Springer-Verlag, New York, pp. 448 – 461.
- Xie, L., Bao, S., Pietrafesa, L., Foley, K. and Fuentes, M. 2005. A real-time hurricane surface wind forecasting model: Formulation and verification. *Monthly Weather Review*, 134: 1355 – 1370.

SELECTED PRESENTATIONS (6 out of 6 from 2004 to present)

- Foley, K. M., Garcia, V., Rao, S. T., Holland, D. Providing better characterization of ambient air quality for exposure modeling and public health risk assessment. *17th Annual ISEA Conference*, Durham, October 2007.
- Foley, K. M., Swall, J. Statistical methods for model evaluation – moving beyond the comparison of matched observations and output for model grid cells, poster for *Models-3 Users' Conference*, Chapel Hill, October 2007.
- Foley, K. M., Fuentes, M. A Bayesian framework to combine multivariate spatial data and physical models for hurricane surface wind prediction. *166th Annual Joint Statistical Meeting*, Seattle, WA, August 2006.
- Foley, K. M., Fuentes, M. A multivariate spatial modeling framework for hurricane surface wind fields. *Eastern North American Region/International Biometric Society*, Tampa, FL, March 2006.



Foley, K.M. Multivariate Spatial Statistical Models for Coastal Ocean Prediction. *Statistics Department Student Seminar Series*, North Carolina State University, January 2006.

Foley, K. M. Statistical Data Assimilation Methods. *Statistical and Applied Mathematical Sciences Institute*, Durham, July 2004.

NARRATIVE

In my current position I implement statistical techniques to compare air quality model output to observational data for operational, dynamic, and probabilistic evaluation of the Community Multiscale Air Quality (CMAQ) modeling system. My other research interests include spatial and temporal statistical modeling, methods for data assimilation, and the analysis of public health data. An important aspect of my job is to consult with colleagues on various statistical methods and the use of statistical software.

**VALERIE C. GARCIA, BRANCH CHIEF**

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. Candidate in Forestry, North Carolina State University
M.S. in Forestry, 2004, North Carolina State University
B.S. in Information Systems Management, 1990, University of San Francisco

PROFESSIONAL EXPERIENCE

Chief, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
Deputy Director, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 2005–2008
Assistant Lab Director, USEPA/ORD/NERL, Research Triangle Park, NC, 2001–2005
Environmental Scientist, USEPA/ORD/NERL, Research Triangle Park, NC, 2000–2001
Budget Team Lead, USEPA/ORD/NERL, Research Triangle Park, NC, 1998–2000
Environmental Scientist, USEPA/ORD, Office of Science Policy, Washington, DC, 1997–1998
Resource Planning, USEPA/ORD, Resource Planning and Execution Staff, Washington, DC, 1995–1997
Contracting Officer, USEPA, Office of Administration and Resource Management, Washington, DC,
1990–1997
Contract Administrator, U.S. Navy, Strategic Weapons Program, Sunnyvale, CA, 1987–1990

SELECTED AWARDS AND HONORS

USEPA Silver Medal, 2008
USEPA Bronze Medal, 2008
NOAA Administrator's Award, 2007
USEPA Bronze Medal, 2004
USEPA Bronze Medal 1997
Office Personnel and Management, Executive Leadership Program, 1996
USEPA Bronze Medal, 1996
Government Executive Magazine, Technology Leadership Award, 1995
Government Computer News and General Services Administration, Stetson Award, 1995
USEPA Bronze Medal, 1995
General Services Administration, Program Management of Major Information Systems (Trail Boss), 1994
U.S. Navy, Meritorious Civilian Award, 1990
U.S. Navy, Navy Unit Commendation, 1990

SELECTED PUBLICATIONS (4 out of 4 from 2004 to present)

Garcia, V.C., N. Fann, R. Haeuber, P. Lorang. 2008. Assessing the Public Health Impact of Regional-Scale Air Quality Regulations, *EM*, 29-34.
Gego, E., P.S. Porter, Garcia, V.C., Hogrefe, C., Rao, S.T. 2008. Fusing Observations and Model Results for Creation of Enhanced Ozone Spatial Fields: Comparison of Three Techniques. Book Chapter 3.9, *Air Pollution Modeling and Its Application XIX*, C. Borrego and A.I. Miranda (eds.). Springer Science + Business Media B.V., 341-348.
Garcia, V.C., S. Tinkle, G. Foley. 2005. Integrated Earth Observations: Application to Air Quality and Human Health, Joint EPA/NIEHS GEOSS Report, Research Triangle Park, NC.
Garcia, V.C. 2004. Using GIS and LIDAR to Map Headwater Stream Networks in the Piedmont Ecoregion of North Carolina. Masters Thesis. North Carolina State University, Raleigh, North Carolina.
<http://www.lib.ncsu.edu/theses/available/etd-12012004-164943/>.

SELECTED PRESENTATIONS (8 out of 21 from 2003 to present)

Garcia, V.C. 2008. Assessing the Clean Air Interstate Rule, Session Chair and Presentation at USEPA/ORD Research Approaches for Assessing Public Health Impacts of Risk Management Decisions, Research Triangle Park, NC.



- Garcia, V.C. 2006. Integration of Satellite, Modeled, and Ground Based Aerosol Data for use in Air Quality and Public Health Applications. Session Chair and Presentation at the American Geophysical Union 2006 Joint Assembly, Baltimore, MD.
- Garcia, V.C. 2006. Science and Policy: Assessing the Impact of Regulation Policy. Presentation at the Eastern Tennessee Oxidant Study Conference, Oakridge, TN.
- Garcia, V.C., S. Tinkle (NIEHS). 2005. Integrated Earth Observations: Application to Air Quality and Human Health, Conference Co-Lead, Research Triangle Park, NC.
- Garcia, V.C. 2005. ESRI User Conference, Translating Earth Data into Knowledge, Earth Information Exchange, Demonstration, San Diego, CA.
- Garcia, V.C. 2005. Taking the Pulse of the Planet: A Demonstration of the EPA's GEOSS Remote Sensing Information Gateway. Presentation to Congressman Price, Research Triangle Park, NC.
- Garcia, V.C. 2004. 2004 Science Forum: Science and Innovation to Protect Health and Environment, Session Chair, Washington, D.C.
- Garcia, V.C. EPA 2003 Science Forum: Emerging Technology Session: Innovation to Advance the Detection of Threats and Optimize Environmental Decision Making, Session Chair, Washington, D.C.

NARRATIVE

In my current position, I lead a group of principal investigators in the planning, implementation, and execution of applied research to link atmospheric models to ecosystems and human health exposure models and approaches. My diverse background in leading programs in areas ranging from ecosystems to atmospheric science has laid the foundation for this current effort, which requires linking across research disciplines and media. My research in developing accountability indicators and linking air quality to human health further supports the integration of processes across the risk assessment/management paradigm. Past experience with Congressional and Agency budget planning and execution, science policy, and program management have further strengthened my foundation for leading scientific programs within the Atmospheric Modeling and Analysis Division.

**ROBERT C. GILLIAM, PHYSICAL SCIENTIST**

Applied Modeling Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

M.S. in Atmospheric Sciences, 2001, North Carolina State University
B.S. in Atmospheric Sciences, 1999, North Carolina State University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC,
2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 2003–2008
Environmental Meteorologist, State Climate Office of North Carolina, North Carolina State University,
Raleigh, NC, 2001–2003

SELECTED AWARDS AND HONORS

USEPA, NERL Special Achievement Award, NERL Goal 5: Future Issues, 2007
USEPA Bronze Medal Award for CMAQ Air Quality Modeling System, 2005
NOAA ARL ASMD, Cash in a Flash Award for Model Evaluation Toolkit, 2004

SELECTED PUBLICATIONS

Queen, A., Y. Zhang, R. Gilliam, and J. Pleim, 2008: Examining the sensitivity of MM5-CMAQ predictions to explicit microphysics schemes and horizontal grid resolutions, Part I--Database, evaluation protocol, and precipitation predictions, *Atmospheric Environment*. 42, 16, 3842-3855.
Appel, W., A. Gilliland, G. Sarwar, and R. C. Gilliam. Evaluation of the Community Multiscale Air Quality (CMAQ) Model Version 4.5: Uncertainties and Sensitivities Impacting Model Performance: Part I - Ozone. *Atmospheric Environment*. Elsevier Science Ltd, New York, NY, 41(40):9603-9613, (2007).
Cooter, E., R. Gilliam, W. Benjey, C. Nolte, J. Swall, and A. Gilliland, 2007: Examining the impact of changing climate on regional air quality over the U.S. *Air Pollution Modeling and its Application XVIII* First ed. C. Borrego and E. Renner, Eds., Elsevier, 633-647.
Gilliam, R.C., C. Hogrefe, and S.T. Rao, 2006, New Methods For Evaluating Meteorological Models Used In Air Quality Applications, *Atmospheric Environment*, 40(26), 5073-5086
Hogrefe, C., P.S. Porter, E. Gego, A. Gilliland, R. Gilliam, J. Swall, J. Irwin, and S.T. Rao. 2006, Temporal features in observed and simulated meteorology and air quality over the eastern United States. *Atmospheric Environment*, 40(26), 5041-5055
Gilliam, R.C., A.H. Huber, and S. Raman, 2005: Metropolitan scale transport and dispersion from the New York World Trade Center following September 11, 2001. Part I: An evaluation of the CALMET meteorological model, *Pure and Applied Geophysics* 162(10):1981–2003 (2005).
Gilliam, R.C., A.H. Huber, and S. Raman, 2005: Metropolitan scale transport and dispersion from the New York World Trade Center following September 11, 2001. Part II: An application of the CALPUFF plume model. *Pure and Applied Geophysics* 162(10):2005–2028 (2005).
Cooter, E., R. Gilliam, A. Gilliland, and J. Swall, 2005. An examination of the downscaled regional climate model (RCM) scenarios for assessing air quality response to climate variability and change. U.S. Environmental Protection Agency, Washington, DC, EPA/600/X-05/023 (internal report).
Gilliam, R.C., Raman, S., Niyogi, D.: 2004, 'Observational and numerical study on the influence of large-scale flow direction and coastline shape on sea-breeze evolution', *Boundary-Layer Meteorology* 111(2), 275-300, 2004
Huber, A.H., Georgopoulos, Gilliam, R.C., P., Stenchikov, G., Wang, S-W, Kelly, B., Feingersh, H., Modeling Air Pollution from the Collapse of the World Trade Center and Assessing the Potential Impacts on Human Exposure. EM, February 2004.

SELECTED PRESENTATIONS

Gilliam, R.C and J. Pleim: Assessment of the boundary layer meteorology of WRF using the Atmospheric Model Evaluation Tool (AMET), WRF Users workshop, June 23-26, 2008.



- Gilliam, R.C, J. Pleim and A. Xiu, 2007: Implementation of the Pleim-Xiu Land Surface Model and Asymmetric Convective Model in the WRF Model, WRF Users workshop, June 11-14, 2007.
- Gilliam, R.C., and Appel, W., The Atmospheric Model Evaluation Tool. EPA Science Forum 2006: Your Health, Your Environment, Your Future, May 16-18, 2006, Washington, DC.
- Gilliam, R. C., W. Appel, and S. Phillips, 2005: The Atmospheric Model Evaluation Tool (AMET): Meteorology Module, 5th Annual CMAS Conference, September 26-28, 2005, Chapel Hill, NC.

NARRATIVE

My areas of focus are meteorological modeling, interfacing meteorological models to various air quality models, and meteorological model evaluation and the relationship of meteorological model errors to air quality model performance. Other experience includes the development of tools for analyzing meteorological data, with a strong emphasis on meteorological model evaluation. One significant project has been the development of a model evaluation toolkit to better discern the relationship between errors in our meteorological models and errors in air quality models. Other projects involve evaluating climate model simulations that are used to understand how potential changes in climate may impact future air quality. Recent work has focused on the development and application of a "new generation" meteorological model, the Weather Research and Forecasting model (WRF), for use by our air quality modeling system.

**ALICE B. GILLILAND, SUPERVISORY PHYSICAL SCIENTIST**

Applied Modeling Branch
Atmospheric Modeling and Analysis Division

EDUCATION/TRAINING

Ph.D. in Atmospheric Sciences, 1997, Georgia Institute of Technology
B.S. in Applied Biology, 1992, Georgia Institute of Technology

PROFESSIONAL EXPERIENCE

Chief, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC,
2008–present
Chief, Model Evaluation and Applications Research Branch, NOAA Atmospheric Sciences Modeling
Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2004–2008
Acting Chief, Model Evaluation and Applications Research Branch, NOAA Atmospheric Sciences
Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2003–2004
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 1999–2004

**SELECTED AWARDS AND HONORS**

NOAA Administrator's Award, 2008
USEPA Silver Medal, 2008
USEPA/ORD Bronze Medal, 2008
NOAA Administrator's Award, 2007
USEPA/NERL Special Achievement Award, 2006

SELECTED PUBLICATIONS (19 out of 32 from 1998 to present)

- Pinder, R.W., R.C. Gilliam, K.W. Appel, K. Foley, S.L. Napelenok, A.B. Gilliland, Efficient Probabilistic Estimates of Ozone Concentration Using an Ensemble of Model Configurations and Direct Sensitivity Calculations, in internal review at *Environ. Sci. & Techn.*
- Napelenok, S.L., R.W. Pinder, A.B. Gilliland, R.V. Martin, A method for evaluating spatially-resolved NO_x emissions using Kalman filter inversion, direct sensitivities, and space-based NO₂ observations, *Atmospheric Chemistry and Physics (ACP)*, *Atmos. Chemistry and Physics*, in press.
- Pinder, R.W., A.B. Gilliland, and R.L. Dennis, The Environmental Impact of Atmospheric NH₃ Emissions under Present and Future Conditions in the Eastern United States, *Geophysical Research Letters*, 35, 1-6, 2008.
- Appel, K.W., P.V. Bhave, A.B. Gilliland, G. Sarwar, S. J. Roselle, Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: Sensitivities impacting model performance; Part II - particulate matter, *Atmos. Env.* doi:10.1016/j.atmosenv.2008.03.036, 2008.
- Levy II, H., D. Shindell, A.B. Gilliland, M.D Schwarzkopf, L.W. Horwitz, T. Wigley, R. Stouffer, and A. Waple, Climate Projections Based on Emission Scenarios for Long-lived and Short-lived Radiatively Active Gases and Aerosols, U.S. Climate Change Science Program Synthesis and Assessment Product 3.2., 2008.
- Gilliland, A.B., C. Hogrefe, R.W. Pinder, J.M. Godowitch, K.L. Foley, and S.T. Rao, Dynamic Evaluation of Regional Air Quality Models: Assessing Changes in O₃ Stemming from Changes in Emissions and Meteorology, *Atmospheric Environment*, doi:10.1016/j.atmosenv.2008.02.018, 2008.
- Nolte, C., A.B. Gilliland, C. Hogrefe, Linking global to regional models to investigate future climate impacts on U.S. regional air quality 1.Surface ozone concentrations, *Journal of Geophysical Research-Atmospheres*, 10.1029/2007JD008497, 2008.
- Godowitch, J.L., A.B. Gilliland, R. Draxler, S.T. Rao, Modeling Assessment of Point Source NO_x Emission Reductions on Ozone Air Quality in the Eastern United States, *Atmospheric Environment*, 42, 87-100, 2008.
- Appel, K.W., A.B. Gilliland, G. Sarwar, and R. Gilliam, Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: Sensitivities impacting model performance; Part I - ozone, *Atmospheric Environment*, 41, 9603-9615, 2007.



- Roy, B., R. Mathur, A.B. Gilliland, and S. Howard, Comparison of CMAQ-based aerosol properties with IMPROVE, MODIS and AERONET data, *Journal of Geophysical Research-Atmospheres*, 10.1029/2006JD008085, 2007.
- Gégo, E., P.S. Porter, A. Gilliland and, S.T. Rao, Observation-based assessment of the impact of nitrogen oxides emissions reductions on ozone air quality over the eastern United States, *Journal of Applied Meteorology and Climatology*, 46(7): 994-1008, 2007.
- Pinder, R.W., P.J. Adams, S.N. Pandis, A.B. Gilliland, Temporally resolved ammonia emission inventories: Current estimates, evaluation tools, and measurement needs, *Journal of Geophysical Research-Atmospheres*, 111, doi:10.1029/2005JD006603, 2006.
- Gilliland, A.B., K.W. Appel, R. Pinder, S.J. Roselle, and R.L. Dennis, Seasonal NH₃ emissions for an annual 2001 CMAQ simulation: inverse model estimation and evaluation, *Atmospheric Environment*, 4986-4998. 2006.
- Jacob, D.J. and A.B. Gilliland, Modeling the impact of air pollution on global climate change, *EM*, 24-26, 2005.
- Lintner, B.R., A.B. Gilliland, I.Y. Fung, Mechanisms of convection-induced modulation of passive tracer interhemispheric transport interannual variability, *Journal of Geophysical Research – Atmospheres*, 10.1029/2003JD004306, 2004.
- Gilliland, A.B., R.L. Dennis, S.J. Roselle, T.E. Pierce, Seasonal NH₃ emission estimates for the Eastern United States using ammonium wet concentrations and an inverse modeling method, *Journal of Geophysical Research-Atmospheres*, 108, NO. D15, 4477, 10.1029/2002JD003063, 2003.
- Gilliland, A.B., T.J. Butler, G.E. Likens, Monthly and annual bias in weekly (NADP/NTN) versus daily (AIRMoN) precipitation chemistry data in the Eastern U.S.A., *Atmospheric Environment*, 36, 5197-5206, 2002.
- Walsh, K. and A.B. Gilliland, Regional variations in sulfate and nitrate aerosols on annual, seasonal, and synoptic time scales, *Journal of the Air and Waste Management Association*, 51, 1339-1345, 2001.
- Gilliland, A.B. and D.E. Hartley, Interhemispheric transport and the role of convective parameterizations, *Journal of Geophysical Research - Atmospheres*, 103, 22,039-22,045, 1998.

SELECTED PRESENTATIONS

- Presentation: Modeling Nitrate Concentrations and Deposition: Sensitivities to Cloud Treatment and Surface Temperature, National Atmospheric Deposition Program Annual Meeting, September 11, 2007.
- Presentation: Evaluating Regional-scale Air Quality Models, 29th NATO-SPS International Technical Meeting, Aveiro, Portugal, September 25, 2007.
- Presentation (contributing author): Using linked global and regional models to simulate U.S. air quality in the year 2050, 6th Annual CMAS Conference, October 1, 2007.
- Presentation (Invited): Inverse Model Estimation of Seasonal NH₃ Emissions, AAAR Specialty Conference on Particulate Matter and the Supersites Program, Atlanta, GA, February 7-11, 2005.
- Presentation (contributing author): Improvements to Regional Air Quality Modeling from Recent Advances in Ammonia Emission Inventory Development. AAAR Specialty Conference on Particulate Matter and the Supersites Program, Atlanta, GA, February 7-11, 2005.

NARRATIVE

My area of expertise is the evaluation and application of regional-scale photochemical air quality models, such as the Community Multiscale Air Quality (CMAQ) model. For the past five years, I have led AMAD's evaluation program, where we have extended evaluation efforts to assess air quality model responses to emission changes, to evaluate emissions via inverse modeling methods, to develop ensemble modeling approaches to address model uncertainty, and to perform other tasks that further the use of model evaluation to improve the model and model inputs. During this time, I have also led a new research application on climate impacts on regional air quality. This project involved collaboration across ORD (National Center for Environmental Assessment, National Risk Management Research Laboratory, and National Exposure Research Laboratory) as well as with universities (Harvard University, Carnegie Mellon University). This project resulted in an ORD interim assessment report on climate impacts on air quality, and also contributed to the NOAA-led Climate Change Science Program's Synthesis and Assessment Product 3.2. Emerging needs now require expansion of this project into a larger program to consider both regional-scale climate and air quality interactions and potential impacts of future climate on ecosystems and water resources.

JAMES M. GODOWITCH, RESEARCH PHYSICAL SCIENTIST

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Meteorology, 1976, Pennsylvania State University
B.S. in Meteorology, 1972, Pennsylvania State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1976–2008
Meteorologist Intern, NOAA/EPA Meteorology Division, Research Triangle Park, NC, summers 1973–1975

SELECTED AWARDS AND HONORS

USEPA/ORD Bronze Medal Award, 2008, Evaluating the Effectiveness of the NO_x SIP Call Program
USEPA/ORD Bronze Medal Award, 2005, CMAQ Model Development Team
USEPA/ORD Bronze Medal Award, 1992, ROMNET program
Fellowship, Japan Society for the Promotion of Science Exchange Program, 1992

SELECTED PUBLICATIONS (15 of 25 since 1985)

- Godowitch, J.M., C. Hogrefe, S.T. Rao, 2008. Diagnostic analyses of a regional air quality model: Changes in modeled processes affecting ozone and chemical-transport indicators from NO_x point source emission reductions. *J. Geophysical Research*, 113, doi:10.1029/2007JD009537.
- Godowitch, J.M., A.B. Gilliland, R.R. Draxler, S.T. Rao, 2008. Modeling assessment of point source NO_x emission reductions on ozone air quality in the eastern United States. *Atmospheric Environment*, 42, 87-100.
- Gilliland, A.B., C. Hogrefe, R.W. Pinder, J.M. Godowitch, K.L. Foley, S.T. Rao, 2008. Dynamic evaluation of regional air quality models: Assessing changes in O₃ stemming from changes in emissions and meteorology. *Atmospheric Environment*, 42, 5110-5123. doi:10.1016/j.atmosenv.2008.02.018
- Gego, E., A. Gilliland, J. Godowitch, S.T. Rao, P.S. Porter, C. Hogrefe, 2008. Modeling analyses of the effects of changes in nitrogen oxides emissions from the electric power sector on ozone levels in the eastern United States. *J. Air & Waste Manage.* 58:580-588, DOI:10.3155/1047-3289.58.4.580
- Godowitch, J., A. Gilliland, E. Gego, R. Draxler, S.T. Rao, 2007. Integrated observational and modeling approaches for evaluating the effectiveness of ozone control policies. *Air Pollution Modeling and Its Applications XVIII, Developments in Environmental Science, Vol. 6, Chap. 2.15, p.230-242*, Carlos Borrego and Eberhard Renner (Editors), Elsevier Ltd. Publications, books.elsevier.com, ISSN:1473-8177/DOI:10.1016/S1474-8177(07)06011-1.
- Stein, A.F., V. Isakov, J. Godowitch, R.R. Draxler, 2007. A hybrid modeling approach to resolve pollutant concentrations in an urban area. *Atmospheric Environment*, 41, 9410-9426.
- Gillani, N.V. and J.M. Godowitch, 1999. Plume-in-grid treatment of major point source emissions. Chap. 9, *Science algorithms of the EPA Models-3 Community Multiscale Air Quality modeling system*. Edited by D.W. Byun and J. Ching, EPA/600/R-99/030, NERL, Research Triangle Park, NC (1999).
- Benjey, W.G., J.M. Godowitch, and G. Gipson, 1999: Emission Subsystem. Chap. 4, *Science Algorithms of the EPA Models-3 Community Multiscale Air Quality Modeling System*. Edited by D.W. Byun and J. Ching. EPA-600/R-99/030, Research Triangle Park, NC 27711.
- Godowitch, J.M., 1990. Vertical turbulent fluxes of ozone and related deposition parameters over agricultural and forested landscapes. *Boundary-Layer Meteorol.*, 50, 375-404.
- Godowitch, J.M., 1989. Evaluation and sensitivity analyses of the MESOPUFF II modeling system with CAPTEX measurements. EPA/600/3-89/056, NTIS PB-89-198253.
- Godowitch, J.M., J.K.S. Ching, and J.F. Clarke, 1987. Spatial variation of the evolution and structure of the urban boundary layer. *Boundary-Layer Meteorol.*, 38, 249-272.
- Godowitch, J.M., 1987. Analyses of PEM-2 model evaluation results for short-term urban particulate matter. EPA/600/3-87/022, NTIS PB87-199677.



- Clarke, J.F., J. Ching, J.M. Godowitch, F.S. Binkowski, 1987. Surface layer turbulence in an urban area. *Modeling the Urban Boundary Layer*, American Meteorol. Soc., Boston, MA, p. 166-199.
- Godowitch, J.M., 1986. Characteristics of vertical turbulent velocities in the urban convective boundary layer, *Boundary- Layer Meteorol.*, 35, 387-407.
- Godowitch, J.M., J.K.S. Ching, and J.F. Clarke, 1985: Evolution of the nocturnal inversion layer at an urban and nonurban location. *J. Appl. Climate & Appl. Meteorol.*, 24, 791-804.

SELECTED PRESENTATIONS (11 of 24 since 1990)

- Godowitch, J.M., 2008. Assessing multi-year changes in modeled and observed NO_x concentrations. 7th Annual CMAS conference, October 6-8, 2008, Chapel Hill, NC.
- Gilliland, A.B., J.M. Godowitch, C. Hogrefe, S.T. Rao, 2007. Evaluating regional-scale air quality models. NATO International Tech. Meeting on Air Pollution Modeling and Its Application, Sept. 24-28, 2007, Aveiro, Portugal.
- Godowitch, J.M., R.R. Draxler, 2006. Linking the CMAQ and HYSPLIT modeling systems: Interface program and example application. Fifth Annual CMAS conference, October 16-18, 2006, Chapel Hill, NC.
- Godowitch, J.M., 2005. Development and application of the CMAQ plume-in-grid model. Fourth Annual CMAS Models-3 users conference, September 26-28, 2005, Chapel Hill, NC.
- Godowitch, J.M., 2004. Simulations of aerosols and photochemical species with the CMAQ plume-in-grid modeling system. Third Annual CMAS Models-3 users conference, Oct. 18-20, 2004, Chapel Hill, NC.
- Godowitch, J.M., 2003. Modeling photochemistry and aerosols in pollutant plumes with the CMAQ plume-in-grid approach. AAAR – Particulate Matter: Atmospheric Sciences, Exposure and the Fourth Colloquium on PM and Human Health, Mar. 31-Apr. 4, 2003, Pittsburgh, PA.
- Godowitch, J.M., 2002. Photochemical and aerosol modeling with the CMAQ plume-in-grid approach, Preprint volume, 12th Joint Conference on Applications of Air Pollution Meteorology, May 20-24, 2002, Norfolk, VA, Preprints, Amer. Meteorol. Soc., Boston, MA, p. 69-70.
- Godowitch, J.M., 2001. Results of photochemical simulations of subgrid scale point source emissions with the Models-3 CMAQ modeling system. Millennium Symposium on Atmospheric Chemistry, Jan. 14-18, 2001, Albuquerque, NM, Preprints, Amer. Meteorol. Soc., Boston, MA, p. 43-49.
- Godowitch, J.M. and J.O. Young, 2000. Photochemical simulations of point source emissions with the Models-3 CMAQ plume-in-grid approach. 93rd Annual A&WMA Conference, June 18-22, 2000, Salt Lake City, UT, Paper 00-668, 14 pp., Preprints, A&WMA, Pittsburgh, PA..
- Godowitch, J.M., N. Gillani, A. Biazar, Y. Wu, and R. Imhoff, 1999. Photochemical plume-in-grid simulations of major point sources in the Community Multiscale Air Quality (CMAQ) modeling system. Preprints, Symposium On Interdisciplinary Issues in Atmos. Chemistry, Jan. 10-15, 1999, Dallas, TX, American Meteorological Society, Boston, MA, p.121-124.
- Godowitch, J.M., 1996. Investigation of photochemical modeling of point source pollutants with Eulerian and Lagrangian plume approaches. AMS/AWMA Ninth Joint Conference on Applications of Air Pollution Meteorology, Atlanta, GA, Jan. 28-Feb. 2, 1996.

NARRATIVE

My research efforts over the past 20 years have centered primarily on the development, application, and evaluation of Eulerian and Lagrangian air quality models on urban to regional scales. Recently, I have been using the Community Multiscale Air Quality (CMAQ) model to investigate the impact of recent real-world emission changes and meteorological variations on surface ozone concentrations in the eastern U.S. I have also participated in a model evaluation team effort to advance and apply a variety of evaluation approaches. In particular, my current work involves using dynamic evaluation to examine modeled and observed changes in concentrations over multiyear periods, and diagnostic methods to investigate various physical processes and chemical production through comparisons of modeled meteorological parameters and concentrations to available measurements. My research project within the CMAQ model development effort was to incorporate and evaluate a sub-grid plume (plume-in-grid) module capable of realistically treating the dynamic, photochemical, and aerosol processes governing concentrations in the plumes emanating from major point sources with high rates of nitrogen oxide (NO_x) and sulfur oxide (SO_x) emissions.

DAVID K. HEIST, PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division


EDUCATION/TRAINING

Ph.D. in Mechanical Engineering, 1994, Cornell University
B.S. in Mechanical Engineering, 1988, Lehigh University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2003–2008
Research Scientist, ManTech Environmental Technology, Inc., Research Triangle Park, NC, 1999–2003
Visiting Postdoctoral Research Fellow, Department of Chemical Engineering, University of Illinois, Urbana, IL, 1997–1999
Research Fellow, Environmental Flow Research Laboratory, University of Surrey, UK, 1994–1997

SELECTED AWARDS AND HONORS

USEPA, NERL Special Achievement Award, 2006

SELECTED PUBLICATIONS (peer-reviewed)

- Heist, D.K., Perry, S.G. and Brixey, L.A. The effect of roadway configurations on the dispersion of traffic-related pollution: a wind-tunnel study (in review, to be submitted to *Atmospheric Environment*).
- Heist, D.K., Richmond-Bryant, J., Brixey, L.A., Bowker, G.E., Perry, S.G. and Wiener, R.W. The effect of a tall tower on flow and dispersion through a model urban neighborhood. Part 1: Flow characteristics. (submitted to *Journal of Environmental Monitoring*).
- Brixey, L.A., Richmond-Bryant, J., Heist, D.K., Bowker, G.E., Perry, S.G. and Wiener, R.W. The effect of a tall tower on flow and dispersion through a model urban neighborhood. Part 2: Pollutant dispersion. (submitted to *Journal of Environmental Monitoring*).
- Bowker, G.E., Gillette, D.A., Bergametti, G., Marticorena, B. and Heist, D.K. (2008) Fine-scale simulations of aeolian sediment dispersion in a small area in the northern Chihuahuan Desert. *Journal of Geophysical Research-Earth Surfaces*, 113, F02S11.
- Smolarkiewicz, P.K., Sharman, R., Weil, J., Perry, S.G., Heist, D. and Bowker, G.E. (2007) Building resolving large-eddy simulations and comparison with wind tunnel experiments. *Journal of Computational Physics*, 227: 633-653.
- Bowker, G.E., Gillette, D., Bergametti, G., Marticorena, B. and Heist, D.K. (2007) Sand flux simulations at a small scale over a heterogeneous mesquite area of the northern Chihuahuan Desert, *Journal of Applied Meteorology and Climatology* 46(9):1410-1422.
- Perry, S.G., Heist, D.K., Thompson, R.S., Snyder, W.H., Lawson, R.E. Jr. (2004) Wind tunnel simulation of flow and pollutant dispersal around the World Trade Center site, *Environmental Manager*, Feb. 2004: 31-34.
- Vette, A., Gavett, S., Perry, S., Heist, D., Huber, A., Lorber, M., Liou, P., Georgopoulos, P., Rao, S.T., Petersen, W., Hicks, B., Irwin, J. and Foley, G. (2004) Environmental research in response to 9/11 and homeland security, *Environmental Manager*, Feb. 2004: 14-22.
- Heist, D.K., Eisner, A.D., Mitchell, W., Wiener, R.W. (2003) Airflow around a child-size manikin in a low-speed wind environment, *Aerosol Science and Technology*, 37: 303-314.
- Heist, D.K., Richmond-Bryant, J., Eisner, A. D. and Conner, T. (2003) Development of a versatile aerosol generation system for use in a large wind tunnel, *Aerosol Science and Technology*, 37:293-301.
- Baldauf, R W., Wiener, R.W. and Heist, D.K. (2002) Methodology for conducting neighborhood-scale air quality monitoring studies, *J. Air & Waste Manag. Assoc.*, 52:1433-1442, 2002.
- Eisner, A.D., Heist, D.K., Drake, Z.E., Mitchell, W. and Wiener, R.W. (2002) On the impact of the human (child) microclimate on passive aerosol monitor performance, *Aerosol Science and Technology*, 36:803-813.

Heist, D.K., Tolocka, M.P., Vanderpool, R.W., Peters, T.M., Chen, F.-L. and Wiener, R.W. (2001) Changes in operating procedures for achieving aerosol concentration uniformity for PM_{2.5} and PM₁₀ sampler testing, *Aerosol Science and Technology*, 34:430-432.

SELECTED PRESENTATIONS

- Baldauf, R., Bowker, G., Heist, D., Perry, S., Thoma, E., Long, T., Hagler, G., Khlystov, A., and Brixey, L. The Influence of Roadway Configuration on Near-Road Air Quality. Presented at the Annual Conference of AWMA, Portland OR, June 26, 2008.
- Heist, D.K., Perry, S.G., Brixey, L.A., and Bowker, G.E.. Wind Tunnel Simulations of Pollution from Roadways. Physmod 2007 - International Workshop on Physical Modelling of Flow and Dispersion Phenomena. Orléans, France. August 29th - 31, 2007.
- Richmond-Bryant, J., Brixey, L.A., Heist, D.K., Perry, S.G., Bowker, G.E. and Wiener, R.W. The Impact of Building Topography on Aerosol Dispersion in an Urban Street Canyon. Presented at International Aerosol Conference 2006 (AAAR), St Paul, MN, September, 2006.
- Bowker, G.E., Heist, D.K., Perry, S.G., Brixey, L.A., Thompson, R.S. and Wiener, R.W. Preprints, 28th NATO/CCMS International Technical Meeting on Air Pollution Modelling and its Application, May 15–19, 2006, Leipzig, Germany. NATO/CCMS, 58–59, 2006.
- Perry, S.G., Snyder, W.H., Heist, D.K., Thompson, R.S., Lawson, R.E., Bowker, G.E., and Brixey, L.A. The EPA Fluid Modeling Facility's contributions to the understanding of atmospheric dispersion. NOAA/EPA Golden Jubilee Symposium on Air Quality Modeling and Its Applications, Durham, NC, Sept. 19-21, 2005.
- Heist, D.K., Brixey, L.A., Perry, S.G., Bowker, G.E. The effect of tall buildings on residence times in arrays of buildings. PhysMod 2005 - International Workshop on Physical Modeling of Flow and Dispersion Phenomena, pp. 18-19, London, ON, Canada, August, 24-26, 2005.
- Bowker, G.E., Gillette, D.A., Heist, D.K., Perry, S.G., Using the QUIC model (Quick Urban & Industrial Complex) to study air flow and dispersion patterns in deserts. Pluto New Horizons Interagency Nuclear Safety Review Panel Particle Resuspension Technical Interchange Meeting. Cape Canaveral Air Force Station, Florida. March 2005.
- Heist, D.K., Perry, S.G., Bowker, G.E. Evidence of enhanced vertical dispersion in the wakes of tall buildings in wind tunnel simulations of lower Manhattan, paper 7.5 in the Fifth Symposium on the Urban Environment, Vancouver, BC, Canada, August, 2004.
- Bowker, G.E., Perry, S.G., Heist, D.K. Comparison of Airflow Patterns Between the QUIC Model and an Atmospheric Wind Tunnel for a Two Dimensional Building Array and a Multi city Block Region near the World Trade Center Site in Lower Manhattan, paper J5.4 in the Fifth Symposium on the Urban Environment, Vancouver, BC, Canada, August, 2004.
- Snyder, W.H., Heist, D.K., Perry, S.G., Thompson, R.S. and Lawson R.E. Wind-tunnel simulations to assess dispersion around the world trade center site. PhysMod 2003 - International Workshop on Physical Modeling of Flow and Dispersion Phenomena, Prato, Italy, August, 24-26, 2003.

NARRATIVE

My main research area is the study of flow and dispersion in urban areas with a recent emphasis on dispersion of pollutants near major roadways. The research is focused on physical models studied in the meteorological wind tunnel at the Fluid Modeling Facility to provide a better physical understanding of flow and dispersion and to provide databases for use in developing and evaluating numerical models. Our recent work involves the Near Roadway and School Infiltration project, studying the effect that various roadway configurations have on the dispersion of traffic-related pollutants. We have also performed several site-specific studies, including an examination of dispersion from the World Trade Center site in lower Manhattan and a study of dispersion toward the Pentagon from nearby locations.

JEROLD A. HERWEHE, RESEARCH PHYSICAL SCIENTIST

Applied Modeling Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Atmospheric Science, 2000, University of Alabama in Huntsville
M.S. in Meteorology, 1984, Iowa State University
B.S. in Meteorology, 1979, Iowa State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC, 2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2005–2008
Physical Scientist, NOAA/OAR/ARL/Atmospheric Turbulence and Diffusion Division, Oak Ridge, TN, 1989–2005
Research Meteorologist, Oak Ridge Associated Universities, assigned to NOAA/OAR/ARL/ATDD, Oak Ridge, TN, 1988–1989
Meteorological Computer Specialist, Oak Ridge Associated Universities, assigned to NOAA/OAR/ARL/ATDD, Oak Ridge, TN, 1987–1988
Research Assistant, Applied Research Corporation, assigned to the Atmospheric Chemistry and Dynamics Branch, NASA/Goddard Space Flight Center, Greenbelt, MD, 1985–1987
Research Assistant, Applied Research Corporation, assigned to the Oceans and Ice Branch, NASA/Goddard Space Flight Center, Greenbelt, MD, 1984–1985
Research Assistant, Department of Earth Sciences, Iowa State University, Ames, IA, 1980–1984
Teaching Assistant, Department of Earth Sciences, Iowa State University, Ames, IA, 1979–1980

SELECTED PUBLICATIONS (12 out of 14 from 1980 to present)

- Ching, J., J. Herwehe, and J. Swall, 2006: On joint deterministic grid modeling and sub-grid variability conceptual framework for model evaluation. *Atmos. Environ.*, 40, 4935-4945.
- Herwehe, J. A., 2000: *A Numerical Study of the Effects of Large Eddies on Trace Gas Measurements and Photochemistry in the Convective Boundary Layer*. Ph. D. Dissertation, University of Alabama in Huntsville, Huntsville, Alabama, 242 pp.
- Norris, W. B., R. T. McNider, A. Song, and J. A. Herwehe, 1998: The role of averaging time in interpreting observations made in a convective boundary layer (CBL). In *Measurement of Toxics and Related Pollutants: Proceedings of a Specialty Conference, September 1-3, 1998, in Cary, North Carolina*, Vol. I, p. 120-131. Published by the Air and Waste Management Association, December 1998, 587 pp.
- Frost, G. J., M. Trainer, G. Allwine, M. P. Buhr, J. G. Calvert, C. A. Cantrell, F. C. Fehsenfeld, P. D. Goldan, J. Herwehe, G. Hübler, W. C. Kuster, R. Martin, R. T. McMillen, S. A. Montzka, R. B. Norton, D. D. Parrish, B. A. Ridley, R. E. Shetter, J. G. Walega, B. A. Watkins, H. H. Westberg, and E. J. Williams, 1998: Photochemical ozone production in the rural southeastern United States during the 1990 Rural Oxidants in the Southern Environment (ROSE) program. *J. Geophys. Res.*, 103, 22,491-22,508.
- Nappo, C. J., R. M. Eckman, K. S. Rao, J. A. Herwehe, and R. L. Gunter, 1998: *Second Order Closure Integrated Puff (SCIPUFF) Model Verification and Evaluation Study*. NOAA Technical Memorandum ERL ARL-227, June 1998, 63 pp.
- Crawford, T. L., J. A. Herwehe, T. P. Meyers, and K. R. Birdwell, 1994: *Airborne Energy and Trace Species Flux Measurements over Lake Michigan: July 22-26, 1991*. NOAA Technical Memorandum ERL ARL-207, December 1994, 22 pp.
- Porch, W. M., W. E. Clements, and J. A. Herwehe, 1992: Analysis of tethered balloon-borne measurements in Mexico City: September 1990 and February 1991. Los Alamos National Laboratory Technical Report, LA-UR-92-1295, 31 pp.
- Nappo, C. J., K. S. Rao, and J. A. Herwehe, 1989: Pollutant transport and diffusion in katabatic flows. *J. Appl. Meteor.*, 28, 617-625.

- Thompson, A. M., R. W. Stewart, M. A. Owens, and J. A. Herwehe, 1989: Sensitivity of tropospheric oxidants to global chemical and climate change. *Atmos. Environ.*, 23, 519-532.
- Stewart, R. W., A. M. Thompson, M. A. Owens, and J. A. Herwehe, 1989: Comparison of parameterized nitric acid rainout rates using a coupled stochastic-photochemical tropospheric model. *J. Geophys. Res.*, 94, 5219-5226.
- Hicks, B. B., K. S. Rao, R. J. Dobosy, R. P. Hosker, Jr., J. A. Herwehe, and W. R. Pendergrass, 1989: *TRIAD: A Puff-Trajectory Model for Reactive Gas Dispersion with Application to UF₆ Releases into the Atmosphere*. NOAA Technical Memorandum ERL ARL-168, February 1989, 136 pp.
- Nappo, C. J., J. A. Herwehe, and A. M. Thompson, 1989: Observations of ozone profiles in the developing convective boundary layer. In *Ozone in the Atmosphere: Proceedings of the Quadrennial Ozone Symposium 1988 and Tropospheric Ozone Workshop, Göttingen, Federal Republic of Germany, 4-13 August 1988*, p. 477-480, R. D. Bojkov and P. Fabian, Eds. A. DEEPAK Publishing, 822 pp.

SELECTED PRESENTATIONS (9 out of 23 from 1986 to present)

- Herwehe, J. A., 2008: Comparisons of the CMAQ and WRF/Chem models for a 2006 eastern U.S. case study. Presented at the 7th Annual CMAS Conference, Chapel Hill, North Carolina, 6-8 October 2008.
- Herwehe, J. A., Y. Pan, and Y. Zhang, 2008: Implementation of the CB05 chemical mechanism into WRF/Chem. Presented at the 9th WRF Users' Workshop, Boulder, Colorado, 23-27 June 2008.
- Herwehe, J. A., 2008: The Weather Research and Forecasting with Chemistry (WRF/Chem) model: Description, CB05 implementation, and tests. AMAD-AMDB Seminar, United States Environmental Protection Agency, Research Triangle Park, North Carolina, May 2008.
- Herwehe, J. A., 2006: The NOAA-EPA national air quality forecasting system. Presented at the East Tennessee Ozone Study 2006 Science Workshop, 17-18 May 2006, Pollard Technology Conference Center, Oak Ridge, Tennessee.
- Herwehe, J. A., J. K. S. Ching, and J. L. Swall, 2004: Stochastic description of subgrid pollutant variability in CMAQ. In *3rd Annual CMAS Models-3 Users' Conference, 18-20 October 2004, Chapel Hill, North Carolina*, Carolina Environmental Program and Community Modeling and Analysis System Center at the University of North Carolina at Chapel Hill.
- Herwehe, J. A., J. K. S. Ching, and J. L. Swall, 2004: Quantifying subgrid pollutant variability in Eulerian air quality models. In *13th Joint Conference on the Applications of Air Pollution Meteorology with the Air and Waste Management Association, 23-27 August 2004, Vancouver, BC, Canada*, American Meteorological Society.
- Herwehe, J. A., R. T. McNider, A. P. Biazar, and R. K. Decker, 2002: Initial application of a coupled LES-photochemical model to examine near-source ozone production from industrial emissions. In *15th Symposium on Boundary Layers and Turbulence, 15-19 July 2002, Wageningen, The Netherlands*, p. 233-236, American Meteorological Society, 691 pp.
- Herwehe, J. A., and R. T. McNider, 2001: Use of a new coupled LES-photochemical model to evaluate typical air quality modeling assumptions. Presented at the 2001 International Conference on Future Directions in Air Quality Research, Research Triangle Park, North Carolina, February 12-15, 2001.
- Herwehe, J. A., R. T. McNider, and M. J. Newchurch, 2000: A numerical study of the effects of large eddies on photochemistry in the convective boundary layer. In *14th Symposium on Boundary Layer and Turbulence, 7-11 August 2000, Aspen, Colorado*, p. 235-238, American Meteorological Society, 641 pp.

NARRATIVE

Until 2005, the majority of my research focused on boundary layer meteorology, turbulence, and diffusion of airborne pollutants, with a particular emphasis on developing and applying a numerical model for large-eddy simulation (LES) with on-line coupled photochemistry (the LESchem model) to study fine-scale reactive turbulence. Since a 2005 transfer from Oak Ridge, TN, to Research Triangle Park, NC, I have directed my research toward becoming the Division's resident expert on the Weather Research and Forecasting with coupled chemistry model (WRF/Chem), applying WRF/Chem in regional- to continental-scale air quality case studies, and evaluating WRF/Chem against air quality observations and the Division's new coupled WRF-CMAQ modeling system.



STEVEN HOWARD, IT SPECIALIST

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

B.S. Mathematics, 1976, Pembroke State University

PROFESSIONAL EXPERIENCE

IT Specialist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC,
2008–present

IT Specialist, NOAA Atmospheric Sciences Modeling Division (in partnership with
USEPA/NERL), Research Triangle Park, NC, 1998–2008

Mathematician and Computer Specialist, U.S. Army Corps of Engineers, 1978–1998

NARRATIVE

My area of expertise is the development of software programs for analyzing and comparing data sets from various monitoring networks with atmospheric model results. This analysis is used for model evaluations and validations during the various phases of model development.

WILLIAM T. HUTZELL, RESEARCH PHYSICAL SCIENTIST

Atmospheric Model Development Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Earth and Atmospheric Sciences, 1994, Georgia Institute of Technology
 M.S. in Physics, 1989, University of Wyoming
 B.S. in Astronomy and Physics, 1982, University of Maryland

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC,
 1998–present
 Meteorologist, Environmental Sciences Program, U.S. Department of the Interior, Minerals Management
 Service, New Orleans, LA, 1996–1998.

SELECTED AWARDS AND HONORS

USEPA Bronze Medal as a member of the Multi-Pollutant model team, 2008
 USEPA/NERL Special Achievement Award, 2007
 USEPA Bronze Medal as a member of the Community Multiscale Air Quality (CMAQ) modeling team,
 2005

SELECTED PUBLICATIONS (1999 to present)

Hutzell, W. T. and D. J. Luecken (2008), Transport and fate of emissions for several toxic metals over the
 United States. *Sci. Tot. Envir.*, 396, 164-179.
 Luecken, D. J., W. T. Hutzell and G. Gipson (2006). Development and analysis of air quality modeling
 simulations for hazardous air pollutants. *Atm. Envir.*, 40, 5087-5096.
 Cooter, E. J.; Hutzell, W. T.; Foreman, W. T.; Majewski, M. S (2002). A Regional Atmospheric Fate and
 Transport Model for Atrazine, Part II: Evaluation. *EST*, 36, 4593-4599.
 Cooter, E. J., and Hutzell W. T. (2002). A Regional Atmospheric Fate and Transport Model for Atrazine,
 Part I: Development and Implementation. *EST*, 36, 4091-4098.
 Hutzell, W. T. (2005). Modeling the fate and transport of naphthalene emissions over a continental and
 urban scales. *Eos Trans. AGU*, 86(52), Fall Meet. Suppl., Abstract A51E-0127.
 Hutzell, W. T., D. J. Luecken, J. K. S. Ching (2004). Simulating urban air toxics over continental and
 urban scales. 3rd Annual CMAS Models-3 User's Conference, Chapel Hill, North Carolina, October
 18-20.
 Hutzell, W. T. (2004). Biogenic sources of formaldehyde and acetaldehyde during summer and winter
 conditions. *Eos Trans. AGU*, 85(47), Fall Meet. Suppl., Abstract A52B-06.
 Hutzell, W. T., G. L. Gipson, G. Pouliot and T. Pierce (2003). A Biogenic Role in Exposure to Two Toxic
 Compounds. *Eos Trans. AGU*, 84(46), Fall Meet. Suppl., Abstract A32A-0126.
 Hutzell, W. T. (2002). A regional model for PCDD/F's based on a photochemical model for air quality and
 particulate matter. *Eos Trans. AGU*, 83(47), Fall Meet. Suppl., Abstract A52B-0117.
 Hutzell, W. T. and E. Cooter (2000). Predicting Atrazine concentrations and deposition with a regional
 model for photochemistry and particulate matter. International Symposium on Measurement of Toxics
 and Related Air Pollutants. Research Triangle Park, North Carolina September 12-14.
 Hutzell, W. T. (2000). Factors influencing the deposition of a compound that partitions between gas and
 atmospheric particulate phases. *Eos Trans. AGU*, 81 (48), Fall Meet. Suppl., Abstract A11A-07.
 Hutzell, W. T. (1999). Estimating Transport and Deposition of a Semi-Volatile Compound with a Regional
 Photochemical Model. Fall Meeting of the American Geophysical Union, San Francisco, CA,
 December 12-17.

SELECTED PRESENTATIONS (2004 to present)

Hutzell, W.T., S.J. Roselle, A.G. Carlton, and O. Russell Bullock (2008). Changes to the Multi-Pollutant
 version in the CMAQ 4.7. 7th Annual CMAS Conference, Chapel Hill, NC.
 Hutzell, W. T., G. Pouliot and D. J. Luecken (2006). Changes to the Chemical Mechanisms for Hazardous
 Air Pollutants in CMAQ version 4.6. 5th Annual CMAS Conference, Chapel Hill, NC.



- Hutzell, W. T. (2004). Biogenic sources of formaldehyde and acetaldehyde during summer and winter conditions. Fall Meeting of the American Geophysical Union, San Francisco, CA.
- Hutzell, W. T., D. J. Luecken, and J. K. S. Ching (2004). Simulating Urban Air Toxics over Continental and Urban Scales. 3rd Annual CMAS Models-3 Users' Conference, Chapel Hill, NC.

NARRATIVE

My research develops and evaluates computer models for the air concentration and deposition of hazardous air pollutants (HAPs). These activities require researching scientific literature, developing conceptual models, and implementing them within numerical models for air quality. To evaluate the products, I locate observations and compare them with model predictions. Success requires collaborating with other scientists both within and outside of EPA. These skills have been used on models for atrazine (a pesticide), dioxins, furans, aldehydes, and chlorinated hydrocarbon compounds.

VLADILEN ISAKOV, RESEARCH PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Atmospheric Sciences, 1998, University of Nevada
 M.S. in Meteorology, 1995, South Dakota School of Mines & Technology

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
 Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2004–2008
 Air Pollution Specialist, California Air Resources Board, Sacramento, CA, 2000–2004
 Scientific Subject Matter Specialist, DynTel, Research Triangle Park, NC, 1998–2000
 Postdoctoral Research Associate, Desert Research Institute, Reno, NV, 1996–1998

SELECTED AWARDS AND HONORS

USEPA Bronze Medal, 2008, for Commendable Service in recognition of the Near Roadway Research Team “for their collaborative efforts in understanding mobile source impacts in the near road environment”
 NOAA On-The-Spot Award, 2007
 USEPA/NRMRL Cross-Organizational Teamwork Award for the Near-Road Research Team, 2007
 USEPA/NERL Special Achievement Award (Goal 5 – Anticipate Future Environment Issues, for successfully linking the CMAQ modeling system with two human exposure models), 2006
 NOAA Cash-in-your-Account Award, 2005

SELECTED PUBLICATIONS (peer-reviewed, from 2005 to present)

Isakov, V., J. Touma, J. Burke, D. Lobdell, T. Palma, A., Rosenbaum, H., Özkaynak. Combining Regional and Local Scale Air Quality Models with Exposure Models for Use in Environmental Health Studies. *J. A&WMA* (accepted)

Venkatram, A., V. Isakov, R. Seila, R. Baldauf. Modeling the impact of traffic emissions to air toxics concentrations near roadways. *Atmospheric Environment* (in review).

Baldauf, R., E. Thoma, A. Khlystov, V. Isakov, G. Bowker, T. Long, R. Snow. Impacts of noise barriers on near-road air quality. *Atmospheric Environment*. 42: 7502–7507 (2008).

Isakov, V., H. Özkaynak. In *Air Pollution Modeling and its Applications XIX*; Borrego, C., 511 Ed.; Springer Science & Business Media B.V., The Netherlands, pp 616–624. (2008)

Cook, R., V. Isakov, J. Touma, W. Benjey, J. Thurman, E. Kinnee, D. Ensley. Resolving Local Scale Emissions for Near Road Modeling Assessments. *J. A&WMA*. 58: 451–461. (2008).

Baldauf, R., E. Thoma, V. Isakov, T. Long, J. Weinstein, I. Gilmour, S. Cho, A. Khlystov, F. Chen, J. Kinsey, M. Hays, R. Seila, R. Snow, R. Shores, D. Olson, B. Gullett, S. Kimbrough, N. Watkins, P. Rowley, J. Bang, D. Costa. Near road air quality and particle toxicity: summary of methods. *J. A&WMA*. 58: 865–878 (2008).

Thoma, E.D., R.C. Shores, V. Isakov, R.W. Baldauf. Characterization of Near Road Pollutant Gradients Using Path-Integrated Optical Remote Sensing. *J. A&WMA* 58: 879–890 (2008).

Stein, A.F., V. Isakov, J. Godowitch, R. R. Draxler. A hybrid approach to resolve pollutant concentrations in an urban area. *Atmospheric Environment*. 41: 9410–9426 (2007).

Venkatram, A., V. Isakov, E. Thoma, R. Baldauf. Analysis of air quality data near roadways using a dispersion model. *Atmospheric Environment*. 41: 9481–9497 (2007).

Bowker, G.E., R. Baldauf, V. Isakov, A. Khlystov, W. Petersen. The effects of roadside structures on the transport and dispersion of ultrafine particles from highways. *Atmospheric Environment*. 41: 8128–8139 (2007).

Isakov, V., J. Touma, A. Khlystov. A Method of Assessing Air Toxics Concentrations using Mobile Platform Measurements. *J. A&WMA*. 57: 1286–1295 (2007).



- Isakov, V., J. Irwin, and J. Ching. Using CMAQ for Exposure Modeling and Characterizing the Sub-Grid Variability for Exposure Estimates. *Journal of Applied Meteorology and Climatology*. 46: 1354-1371 (2007).
- Isakov, V., A. Venkatram, J. Touma, D. Koračin, and T. L. Otte. Evaluating the Use of Outputs from Comprehensive Meteorological Models in Air Quality Modeling Applications. *Atmospheric Environment*. 41: 1352-2310 (2007).
- Koračin, D., A. Panorska, V. Isakov, J. S. Touma, and J. Swall. A Statistical Approach for Estimating Uncertainty in Dispersion Modeling: an Example of Application in Southwestern U.S. *Atmospheric Environment*. 41: 617-628 (2007).
- Touma, J. S., V. Isakov, A. Cimorelli, B. Anderson, and R. Brode. Using Prognostic Model Generated Meteorological Data in the AERMOD Dispersion Model: An Illustrative Application in Philadelphia. *J. A&WMA*. 57: 586-595 (2007).
- Isakov, V., Graham, S., Burke, J., H. Özkaynak. Linking air quality and exposure modeling. *EM Magazine*. 9: 26-29 (2006).
- Isakov, V., and A. Venkatram. Resolving neighborhood scale in air toxics modeling: a case study in Wilmington, California. *J. A&WMA*. 56: 559-568 (2006).
- Touma, J. S., V. Isakov, J. Ching, and C. Seigneur. Air quality modeling of hazardous pollutants: current status and future directions. *J. A&WMA*. 56: 547-558 (2006).
- Yuan, J., A. Venkatram and V. Isakov. Dispersion from ground-level sources in a shoreline urban area. *Atmospheric Environment* 40: 1361-1372 (2006).
- Venkatram, A., V. Isakov, D. Pankratz, and J. Yuan. Relating plume spread to meteorology in urban areas. *Atmospheric Environment* 39: 371-380 (2005).

SELECTED PRESENTATIONS (from 2005 to present)

- Isakov, V. and Özkaynak, H. "A modeling methodology to support the assessment of public health impacts of air pollution reduction programs" at the 29th NATO International Technical Meeting on Air Quality in Aveiro, Portugal, on 24-28 Sept. 2007.
- Isakov, V., Invited talk at the international conference "Air Quality Assessment for Europe: From local to continental scale" in Prague, Czech Republic, on 10 Nov. 2006
- Isakov, V., Ching, J., Irwin, J., Palma, T., Thurman, J. "Linking the CMAQ Modeling System to a Human Exposure Model in an Urban Area" at the international conference: NOAA/EPA Golden Jubilee Symposium in Research Triangle Park, NC, on 20-21 Sept. 2005

NARRATIVE

My research over the past 20 years has focused on performing atmospheric modeling and data analysis for applications relating to air quality and risk analysis. This has included development and application of spatially resolved models for particulate matter (PM) and toxic pollutants. This research complements ongoing efforts within EPA that involve application of more refined exposure assessment methods to investigate the impacts of PM, air toxics, and near-roadway pollutant on human health. My emphasis during the past five years was to provide to EPA and the modeling community with modeling techniques to resolve local-scale phenomena, perform model evaluation and uncertainty analysis, and assess linkages between air quality and exposure models. Currently, my role in the Division is to provide scientific leadership in the area of urban-scale modeling and linking air quality and exposure modeling.

**DEBORAH J. LUECKEN, RESEARCH PHYSICAL SCIENTIST**

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

M.S. in Chemical Engineering, 1984, University of California, Los Angeles
B.S. in Chemical Engineering, 1982, Washington University in St. Louis
B.A. in Liberal Arts, 1982, Oberlin College

PROFESSIONAL EXPERIENCE

Research Physical Scientist and Workgroup Leader, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2002–present
Acting Branch Chief, USEPA/ORD/NERL/HEASD/ACPB, Research Triangle Park, NC, 2000–2002
Physical Scientist, USEPA/ORD/NERL/HEASD, Research Triangle Park, NC, 1994–2000
Team Leader, North Carolina Supercomputing Center, Environmental Programs Group, Research Triangle Park, NC, 1992–1994
Staff Engineer, Radian Corporation, Air Quality Modeling Group, Research Triangle Park, NC, 1991–1992
Research Engineer, Battelle Pacific Northwest Laboratory, Atmospheric Sciences Department, Richland, WA, 1984–1991

SELECTED AWARDS AND HONORS

USEPA/ORD Honor Award, Bronze Medal, 2007
USEPA/NERL Special Achievement Award, Goal 1, 2007
USEPA Bronze Medal, 2005

SELECTED PUBLICATIONS (11 out of 27 from 1986 to present)

Sarwar, G., Luecken, D., and G. Yarwood, "Development of an updated chlorine mechanism and assessment of the effect of industrial chlorine emissions on ozone predictions in the western United States." Submitted to *Environmental Modeling and Software*, April, 2008.
Luecken, D.J., Phillips, S., Sarwar, G., Jang, C. "Effects of using the CB05 vs. SAPRC99 vs. CB4 chemical mechanism on model predictions: ozone and gas-phase photochemical precursor concentrations," *Atmospheric Environment*, 42: 5805-5820, 2008.
Hutzell, W.T. and D.J. Luecken, "Fate and transport of emissions for several toxic metals over the United States," submitted to *Science of the Total Environment*, 396: 164-179, 2008.
Luecken, D.J. and M.R. Mebust, "Technical challenges involved in implementation of VOC reactivity-based control of ozone," *Env. Sci. Tech.*, 42: 1615-1622, 2008.
Luecken, D.J. and A.J. Cimorelli, "Co-dependencies of reactive Air Toxic and criteria pollutants on emission reductions," accepted pending minor revision, *J. of Air and Waste Management Assoc*, 58: 693-701, 2008.
Sarwar, G., D.J. Luecken, G. Yarwood, G.Z. Whitten, and W. Carter. "Impact of an Updated Carbon Bond Mechanism on Predictions from the Community Multiscale Air Quality Model," *Journal of Applied Meteorology*, 47: 3-14, 2008.
Luecken, D.J. and W.T. Hutzell, "Concentrations of toxic air pollutants in the U.S. simulated by an air quality model," in *Air Pollution Modeling and its Application XVII*, eds. C. Borrego and A.-L. Norman, Springer publishing, New York, NY, pp. 87-96, 2007.
Luecken, D.J., W.T. Hutzell and G.L. Gipson, "Development and analysis of air quality modeling simulations for hazardous air pollutants," *Atmospheric Environment*, 40: 5087-5096, 2006.
Tonnesen, G.S., and D.J. Luecken, "Intercomparison of Photochemical Mechanisms using Response Surfaces and Process Analysis," *Air Pollution Modeling and its Application XIV*, ed. Gryning, S.-V. and Schiermeier, F.S., Kluwer, New York, 2001.
Luecken, D.J., G.S. Tonnesen, and J.E. Sickles, "Differences in NO_y Speciation Predicted by Three Photochemical Mechanisms," *Atmospheric Environment*, 33: 1073-1084, 1999.
Luecken, D.J., C.M. Berkowitz, and R.C. Easter, "Influences of Cloud and Rain Processes on the Transatlantic Transport of Sulfur Species," In *Precipitation Scavenging and Atmosphere-Surface Exchange*, ed. S.E. Schwartz, pp. 1771-1782. Hemisphere Publishing Corp., Washington, 1992.

**SELECTED PRESENTATIONS** (10 out of 18 from 2000 to present)

- Luecken, D.J. "Comparison of Atmospheric Chemical Mechanisms for Regulatory and Research Applications" NATO Advanced Research Workshop on Simulation and Assessment of Chemical Processes in a Multiphase Environment, October 1, 2007, Alushta, Ukraine.
- Isukapalli, S.S.; J. E. Langstaff; D. J. Luecken and P. G. Georgopoulos, "Comparative evaluation of population exposure modeling approaches for reactive and nonreactive air pollutants," presented at the International Society of Exposure Analysis Annual Conference, October 15-18, Durham, NC, USA.
- Luecken, D.; A. Cimorelli; C. Stahl; and D. Tong, "Evaluating the effects of emission reductions on multiple pollutants simultaneously," NATO International Technical Meeting on Air Pollution and its Applications, September 28, 2007, Aveiro, Portugal.
- Luecken, D.; S. Phillips; C. Jang; and N. Possiel, "Effects of using the CB05 vs. SAPRC99 vs. CB4 Chemical mechanism on model predictions," International Conference on Chemical Mechanisms, December 6, 2006, Davis, CA, USA
- Luecken, D. and W. Hutzell, "Large-scale predictions of mobile source contributions to concentrations of toxic air pollutants," CRC Mobile Source Air Toxics Workshop, October 24, 2006, Phoenix, AZ, USA.
- Luecken, D., "Interdependencies of multi-pollutant control strategies in an air quality model," Air and Waste Management Association Annual Conference, June 21, 2006, New Orleans, LA, USA.
- Stahl, C.; A. Cimorelli and D. Luecken, "Philadelphia Air Toxics Study: Evaluation of Risk Management Options using MIRA," Society of Environmental Toxicology and Chemistry (SETAC) annual meeting, November 13-17, 2005, Baltimore, MD.
- Luecken, D., "The Reactivity Research Working Group within NARSTO: history and technical findings," NARSTO Executive Assembly, April 11 - 12, 2005, Las Vegas, NV, USA.
- Luecken, D. and W. Hutzell, "Concentrations of Toxic Air Pollutants in the U.S. Simulated by an Air Quality Model," NATO/CCMS Meeting on Air Pollution Modeling and its Application, October 25, 2004, Banff, Alberta, Canada.
- Luecken, D. J. and G. S. Tonnesen, "Choosing a chemical mechanism for regulatory and research air quality modeling applications," 7th US-German Workshop, October 10, 2002, Bad Breisig, Germany.

NARRATIVE

My individual research mission is to participate in developing and implementing improved, multipollutant, multiphase descriptions of atmospheric chemistry in order to answer questions relating to the production and control of secondary photochemical pollutants in the troposphere. I use these mechanisms in 3-D atmospheric models to analyze and improve our understanding of the behavior of complex chemical interactions in the atmosphere.

ROHIT MATHUR, BRANCH CHIEF

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Chemical Engineering, 1991, University of Kentucky
M.S. in Chemical Engineering, 1988, University of Kentucky
B.E. in Chemical Engineering, 1986, Birla Institute of Technology & Science,
India

PROFESSIONAL EXPERIENCE

Chief, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present
Adjunct Associate Professor, Department of Marine, Earth and Atmospheric Sciences, North Carolina State University, Raleigh, NC, 1998–present
Chief, Atmospheric Model Development Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2007–2008
Chief, Air Quality Forecast Research Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2005–2007
Physical Scientist, Atmospheric Model Development Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2004–2005.
Research Associate Professor, Carolina Environmental Program, University of North Carolina, Chapel Hill, NC, 2003–2004.
Research Scientist, Environmental Programs Group, MCNC, Research Triangle Park, NC, 1992–2002.
Senior Science Specialist, Computer Sciences Corporation, Research Triangle Park, NC, 1991–1992

SELECTED AWARDS AND HONORS

USEPA Bronze Medal for Development of the Multipollutant Version of CMAQ, 2008
NOAA Administrator's Award, 2007
University of Kentucky, Graduate Fellowship, 1990

SELECTED PUBLICATIONS (18 out of 50 from 1990 to present)

- A.G. Carlton, B.J. Turpin, K.E. Altieri, S.P. Seitzinger, R. Mathur, S.J. Roselle, R.J. Weber, CMAQ Model Performance Enhanced when In-Cloud SOA is Included: Comparison of OC Predictions with Measurements, *Environ. Sci. Technol.*, in press, 2008.
- D. Kang, R. Mathur, S.T. Rao, and S. Yu, Bias-adjustment techniques for improving ozone air quality forecasts, *Journal of Geophysical Research-Atmospheres*, in press, 2008.
- G. Sarwar, S.J. Roselle, R. Mathur, W. Appel, R.L. Dennis, and B. Vogel, A comparison of CMAQ HONO predictions with observations from the Northeast Oxidant and Particle Study, *Atmos. Environ.*, 42, 5760-5770, 2008.
- R. Mathur, Estimating the Impact of the 2004 Alaskan Forest Fires on Episodic Particulate Matter Pollution over the Eastern United States through Assimilation of Satellite Derived Aerosol Optical Depth in a Regional Air Quality Model, *Journal of Geophysical Research-Atmospheres*, 113, D17302, doi:10.1029/2007JD009767, 2008.
- R. Mathur, S. Yu, D. Kang, and K. Schere, Assessment of the Winter-time Performance of Developmental Particulate Matter Forecasts with the Eta-CMAQ Modeling System, *J. Geophysical Research*, 113, D02303, doi:10.1029/2007JD008580, 2008.
- S. Yu, R. Mathur, K. Schere, D. Kang, J. Pleim, J. Young, D. Tong, G. Pouliot, S. McKeen, and S.T. Rao, Evaluation of real-time PM_{2.5} forecasts and process analysis of PM_{2.5} formation over the eastern U.S. using the Eta-CMAQ forecast model during the 2004 ICARTT study, *Journal of Geophysical Research-Atmospheres*, 113, D06204, doi:10.1029/2007JD009226, 2008.
- D. Tong, R. Mathur, K. Schere, D. Kang, and S. Yu, The use of air quality forecasts to assess impacts of air pollution on crops: Methodology and case study, *Atmospheric Environment*, 41, 8772-8784, doi:10.1016/j.atmosenv.2007.07.060, 2007.
- S. Yu, R. Mathur, K. Schere, D. Kang, J. Pleim, and T. Otte, A detailed evaluation of the Eta-CMAQ forecast model performance for O₃, its related precursors, and meteorological parameters during the

- 2004 ICARTT study, *Journal of Geophysical Research-Atmospheres*, 112, D12S14, doi:10.1029/2006JD007715, 2007.
- B. Roy, R. Mathur, A. Gilliland, A comparison of CMAQ based aerosol properties with IMPROVE, MODIS, and AERONET data, *J. Geophysical Research*, 112, D14301, doi:10.1029/2006JD008085, 2007.
- S. Yu, P. Bhawe, R. Dennis, and R. Mathur, Seasonal and regional variations of primary and secondary organic aerosols over the continental United States: semi-empirical estimates and model evaluation, *Environmental Science and Technology*, 41, 4690-4697, 2007.
- D. Kang, R. Mathur, K. Schere, S. Yu and B. Eder, New Categorical Metrics for Air Quality Model Evaluation, *Journal of Applied Meteorology and Climatology*, doi:10.1175/JAM2479.1, 46, 549-555, 2007.
- S. McKeen, S.H. Chung, J. Wilczak, G. Grell, I. Djalalova, S. Peckham, W. Gong, V. Bouchet, S. Menard, R. Moffet, Y. Tang, G. R. Carmichael, R. Mathur, and S. Yu, The evaluation of several PM_{2.5} forecast models using data collected during the ICARTT/NEAQS 2004 field study, *J. Geophysical Research*, 112, D10S20, doi:10.1029/2006JD007608, 2007.
- S. Yu, R. Mathur, D. Kang, K. Schere, B. Eder, J. Pleim, Performance and diagnostic evaluation of ozone predictions by the Eta-Community Multiscale Air Quality Forecast System during the 2002 New England Air Quality Study, *Journal of the Air and Waste Management Association*, 56, 1459-1471, 2006.
- R. Mathur et al., The Multiscale Air Quality Simulation Platform (MAQSIP): Initial Applications and Performance for Tropospheric Ozone and Particulate Matter, *Journal of Geophysical Research*, 110, D13308, doi:10.1029/2004JD004918, 2005.
- T. L. Otte, G. Pouliot, J. E. Pleim, J. O. Young, K. L. Schere, D. C. Wong, P. C. S. Lee, M. Tsidulko, J. T. McQueen, P. Davidson, R. Mathur, H.-Y. Chuang, G. DiMego, and N. L. Seaman, Linking the Eta Model with the Community Multiscale Air Quality (CMAQ) Modeling System to build a national air quality forecasting system, *Weather and Forecasting*, 20, 367-384, 2005.
- D. Kang, V. Aneja, R. Mathur, J.D. Ray, Observed and modeled VOC chemistry under high VOC/NO_x conditions in Southeast U.S. national parks, *Atmospheric Environment*, 38, 4969-4974, 2004.
- R. Mathur and R.L. Dennis, Seasonal and Annual Modeling of Reduced Nitrogen Compounds Over the Eastern United States: Emissions, Ambient Levels, and Deposition Amounts, *Journal of Geophysical Research*, 108(D15), 4481, doi:10.1029/2002JD002794, 2003.
- A.M. Fiore, D.J. Jacob, R. Mathur, and R. Martin Application of Empirical Orthogonal Functions to Evaluate Ozone Simulations with Regional and Global Models, *Journal of Geophysical Research*, 108(D14), 4431, doi:10.1029/2002JD003151, 2003.

SELECTED PRESENTATIONS (4 out of 60 from 1990 to present)

- R. Mathur, "An Assessment of the Performance of NAM-CMAQ Air Quality Forecasts with Measurements from Surface Networks and Specialized Field Campaigns", Invited Talk at the *Special Session on Evaluation of Air Quality Models and Assessment of Emission Inventories Using Bottom-Up and Top-Down Approaches*, Fall Meeting of the American Geophysical Union, San Francisco, December, 2007.
- R. Mathur, "Modeling Fate and Transport of Tropospheric Nitrogen Compounds", Invited Briefing to the EPA Science Advisory Board, Integrated Nitrogen Committee, Washington, DC, June, 2007.
- R. Mathur, "Status and Progress in Particulate Matter Forecasting", Plenary talk *NARSTO Workshop on PM Process Modeling*, Boulder, CO, June 27-30, 2006.
- R. Mathur, "Use of remote sensing air quality information in regional scale air pollution modeling: Current use and requirements", Invited Talk at the *Community Workshop on Air Quality Remote Sensing from Space: Defining an Optimum Observing Strategy*, National Center for Atmospheric Research, Boulder, CO, February 21, 2006.

NARRATIVE

My research deals with the development of methods to represent the physical and chemical behavior of atmospheric pollutants in comprehensive modeling frameworks. Through a multidisciplinary approach involving physical, numerical, and computational modeling, my work has focused on continually enhancing the science in air quality models through exploring the development of novel modeling methodologies.

**J. DAVID MOBLEY, DEPUTY DIRECTOR**

Office of the Director
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

B.S. in Mechanical Engineering, 1970, North Carolina State University

PROFESSIONAL EXPERIENCE

Deputy or Associate Director, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC, 2002–present

Acting or Associate Director, USEPA/OAQPS Emissions, Modeling, and Analysis Division, Research Triangle Park, NC, 1997–2002

Leader, USEPA/OAQPS Emission Factor and Inventory Group, Research Triangle Park, NC, 1991–1997
Branch Chief, USEPA Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, 1987–1991

Environmental Engineer, USEPA Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, 1976–1987

Environmental Engineer, City of Richmond, Richmond, VA, 1973–1976

Environmental Engineer, USEPA Mobile Source Pollution Control Program, Ann Arbor, MI, 1970–1973

SELECTED AWARDS AND HONORS

Member, Science Advisory Board, Houston Advanced Research Center, 2006-present

Embassy Science Fellow to New Zealand, January-May 2008

USEPA, Exceptional/Outstanding ORD Technical Assistance to the Regions or Program Offices, 2008

Air and Waste Management Association Fellow, 1999; Director, 2006-2008; and Vice President, 2008

USEPA, Scientific & Technological Achievement Awards, 1984, 2008

Contributor, Intergovernmental Panel for Climate Change and their Award of the Nobel Peace Prize, 2007

USEPA Bronze Medals, 1983, 1986, 1988, 1993, 1994, 1996, 1998, 2001, 2005, 2006, 2007

USEPA/NERL Special Achievement Award, Science Integration to Solve Environmental Problems, 2007

USEPA Excellence in Response Award to 09/11/01 Attacks, 2002

USEPA Gold Medal for PM_{2.5} Monitoring Program Implementation, 2000

Commendation, Ozone Transport Assessment Group of the Environmental Council of the States, 1997

Federal Engineer of the Year by the Professional Society of Engineers, 1993

Member, American Society of Mechanical Engineers; also Local Chapter President, 1984

Pollution Engineering Magazine 5-Star Award for Technology Development, 1982

Registered Professional Engineer

SELECTED PUBLICATIONS (15 out of 16 from 2003 to present)

Mobley, D. and P. Gurnsey. New Zealand's Innovative Approach to Emissions Trading for Addressing Global Climate Change. *EM: Air and Waste Management Association's Magazine for Environmental Managers*, Air & Waste Management Association, Pittsburgh, PA, , 14-19, (2008).

Roy, D., G. Pouliot, D. Mobley, T. Pace, T. Pierce, A. Soja, J. Szykman, and J. Al-Saadi. Development of Fire Emissions Inventory Using Satellite Data. Chapter 2, *Air Pollution Modeling and its Application XIX*. Springer, New York, NY, 217-225, (2008).

Mobley, D., L. Beck, G. Sarwar, A. Reff, and M. Houyoux. SPECIATE - EPA's Database for Speciated Emission Profiles, *Air Pollution Modeling and its Application XIX*. Springer, New York, NY, p 665-666, (2008).

Pouliot, G., T. Pace, D. Roy, T. Pierce, and D. Mobley. Development of a Biomass Burning Emissions by Combining Satellite and Ground-based Information. *Journal of Applied Remote Sensing*. SPIE/International Society for Optical Engineering, Bellingham, WA, 2(1):021501, (2008).

Rao, S., R. Dennis, V. Garcia, A. Gilliland, R. Mathur, D. Mobley, T. Pierce, AND K. Schere. Summary Report of Air Quality Modeling Research Activities for 2006. U.S. Environmental Protection Agency, Washington, D.C., EPA/600/R-07/103 (NTIS PB2008-110094), 2008.

Chow, J.C., J.L. Watson, H.J. Feldman, J.E. Nolen, B. Wallerstein, G. Gidy, P.J. Lioy, D. Mobley, K. Baugues, and J.D. Bachmann. 2007 Critical Review Discussion--Will The Circle Be Unbroken: A



- History of the U.S. National Ambient Air Quality Standards. *Journal of the Air and Waste Management Association*, Vol 57 (10): 1151-1163, October 2007.
- Mobley, D., Coordinator, SPECIATE 4.0—Speciation Database Development Documentation, EPA/600/R-06/161, November 2006.
- Miller, C.A., G. Hidy, J. Hales, C. Kolb, A. Werner, B. Haneke, D. Parrish, C. Frey, L. Rojas-Bracho, M. Deslauriers, B. Pennell, D. Mobley. *Air Emission Inventories in North America: A Critical Assessment*, Vol 56, No. 8, p 1115-1129, August 2006.
- Pennell, W.T. and D. Mobley. The Case for Improving Emission Inventories in North America. *EM: Air and Waste Management Association's Magazine for Environmental Managers*, p 24-27, January 2006.
- Mobley, D., Coordinator, Improving Emission Inventories for Effective Air Quality Management Across North America: A NARSTO Assessment, NARSTO-05-01, August 2005.
- Mobley, J.D., and S. Cadle. Innovative Methods For Emission Inventory Development and Evaluation: Workshop Summary. *Journal of the Air and Waste Management Association*, Vol 54, No. 11, p 1422-1439, November 2004.
- Hidy, G.M., J.D. Mobley and S. Cadle. Innovative Methods for Emission Inventory Development and Evaluation: Workshop Synthesis. *EM: Air and Waste Management Association's Magazine for Environmental Managers*, p 31-34, November 2004.
- Werner, A.S. and D. Mobley. Emissions Inventories: Then Now, and Tomorrow. *EM: Air and Waste Management Association's Magazine for Environmental Managers*, p 41-45, Jan 2005.
- Benkovitz, C., H. Akimoto, J. Corbett, D. Mobley, J. Oliver, J. Aardenne, and V. Vestreng. *Compilation of Regional to Global Inventories of Anthropogenic Emissions. Chapter 2, Emission of Atmospheric Trace Compounds*. Kluwer Academic Publishers, Hingham, MA, p 17-69, 2004.
- Mobley, D., Editor, Innovative Methods for Emission Inventory Development and Evaluation, NARSTO Emission Inventory Workshop, Austin, TX, October 14-17, 2003. U.S. Environmental Protection Agency. EPA/600/R-03/008, October 2003.

SELECTED PRESENTATIONS (2003 to present)

- Mobley, D., SPECIATE—EPA's Database of Speciated Emission Profiles. Presented at AWMA Webcast, February 22, 2007; AWMA Annual Conference and Exhibition, June 28, 2007; and 29th International Technical Meeting, NATO, Aveiro, Portugal, September 25, 2007.
- Mobley, D., Development of a Fire Emission Inventory Using Satellites, 29th International Technical Meeting, NATO, Aveiro, Portugal, September 25, 2007.
- Mobley, D., Improving Emission Inventories for Effective Air Quality Management Across North America – A NARSTO Assessment. Mexico Emission Inventory Workshop, Mexico City, Mexico, February, 2003; Air Quality Research Subcommittee of the Committee on Environment and Natural Resources, Washington, DC, January 15, 2004; EPA Science Forum, Washington, DC, June, 2004; NARSTO Executive Assembly Meeting, Washington, DC, April 2004; AAAR PM Supersites Program, February 7-11, 2005, Atlanta, GA; NARSTO Executive Assembly Meeting, Las Vegas, NV, April 11, 2005; EPA Emission Inventory Conference, Las Vegas, NV, April 12, 2005; EPA Science Forum 2005, Washington, DC, May 16-18, 2005; AWMA Annual Conference and Exhibition, Minneapolis, MN, June 23, 2005; and House Science Committee, US Congress, Washington, DC, October 21, 2005; AWMA Research Triangle Park Chapter Meeting, Research Triangle Park, NC, March 2006.
- Mobley, D., Chair and Organizer, NARSTO Emission Inventory Workshop, Innovative Methods for Emission Inventory Development and Evaluation. Austin, TX, October 14-17, 2003.
- Mobley, D., Persistent Bioaccumulative Toxic Emissions in the US. Long Range Transport Workshop, Ann Arbor, MI, September 16-17, 2003.

NARRATIVE

My work supports the development of advanced air quality models that can simulate the transport and fate of pollutants in the atmosphere, including the Community Multiscale Air Quality (CMAQ) Model. EPA and the general air pollution community use these models to understand the magnitude of the air pollution problem and to develop emission control policies and regulations. I also support activities to develop international emission inventories and to characterize emissions from key source categories, and serve as CoChair of the Emissions Committee of NARSTO, a public-private partnership to promote policy-relevant research on air quality issues. Through these actions, I promote the development and application of air quality models that enhance national air quality management programs.

SERGEY L. NAPELENOK, PHYSICAL SCIENTIST

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Environmental Engineering, 2006, Georgia Institute of Technology
M.S. in Civil Engineering, 2001, Georgia Institute of Technology
B.S. in Civil Engineering, 2000, Washington State University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2006–2008
Graduate Research Assistant, Department of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta, GA, 2000–2006
Technical Assistant II, Laboratory for Atmospheric Research (LAR), Washington State University, Pullman, WA, 1996–2000

SELECTED AWARDS AND HONORS

First Place Young Researchers EURASAP AWARD, 29th NATO/SPS International Technical Meeting on Air Pollution Modelling and its Application, Aveiro, Portugal, 2007
Georgia Institute of Technology Presidential Fellowship, 2000-2005
American Meteorological Society Fellowship, 2000

SELECTED PUBLICATIONS (peer-reviewed journal articles)

Carlton, A.G., P.V. Bhave, S.L. Napelenok, R.W. Pinder, G. Sarwar, G. Poulliot, E.O. Edney, Improved treatment of secondary organic aerosol in CMAQ, (*in preparation*)
Pinder, R.W., R.C. Gilliam, K.W. Appel, S.L. Napelenok, A.B. Gilliland. Efficient probabilistic estimates of surface ozone concentration using an ensemble of model configurations and direct sensitivity calculations, *Environ. Sci. Technol.*, (*in review*).
Napelenok, S.L., R.W. Pinder, A.B. Gilliland, R.V. Martin. A method for evaluating spatially-resolved NO_x emissions using Kalman filter inversion, direct sensitivities, and space-based NO₂ observations, *Atmos. Chem. Phys.*, 8, 5603-5614, 2008.
Liao, K.-J., E. Tagaris, S.L. Napelenok, K. Manomaiphiboon, J.-H. Woo, P. Amar, S. He, A.G. Russell. Current and future linked responses to ozone and PM_{2.5} to emissions controls, *Environ. Sci. Technol.*, 42(13), 4670-4675, 2008.
Napelenok, S.L., D.S. Cohan, M.T. Odman, S. Tonse. Extension and evaluation of sensitivity analysis capabilities in a photochemical model, *Environ. Model. Softw.*, 23(8), 994-999, 2008.
Liao, K.-J., E. Tagaris, K. Manomaiphiboon, S.L. Napelenok, J.-H. Woo, S. He, P. Amar, A.G. Russell. Sensitivities of ozone and fine particulate matter formation to emissions under the impact of potential future climate change. *Environ. Sci. Technol.*, 41(24), 8355-8361, 2007.
Napelenok, S.L., F.D. Habermacher, F.H. Akhtar, Y. Hu, A.G. Russell. Area of influence (AOI) sensitivity analysis: application to Atlanta, Georgia. *Atmos. Environ.*, 41(27), 5605-5617, 2007.
Habermacher, F.D., S.L. Napelenok, F. Akhtar, Y. Hu, A.G. Russell. Area of Influence (AOI) development: Fast generation of receptor-oriented sensitivity fields based on inversion of source-oriented sensitivities. *Environ. Sci. Technol.*, 41(11), 3997-4003, 2007.
Napelenok, S.L., D.S. Cohan, Y. Hu, A.G. Russell. Decoupled direct 3D sensitivity analysis for particulate matter (DDM-3D/PM). *Atmos. Environ.*, 40(32), 6112-6121, 2006.

SELECTED PRESENTATIONS

Napelenok, S.L., P.V. Bhave, A.G. Carlton. Status of Particulate Matter Processes in CMAQ (platform presentation). EPRI Model Development Meeting, Palo Alto, CA, 20, May, 2008.
Napelenok, S.L., R.W. Pinder, A.B. Gilliland, R.V. Martin. Integrating Kalman filter inverse modeling and direct sensitivities to evaluate NO_x emission inventory biases based on satellite-derived NO₂ columns (poster presentation). American Geophysical Union Fall Meeting, 10-14 December, 2007.



- Napelenok, S.L., D.S. Cohan, M.T. Odman, Y. Hu, A.G. Russell. Source apportionment using direct sensitivities (platform presentation). International Aerosol Modeling Algorithms Conference, 5-7 December, 2007.
- Napelenok, S.L., R.W. Pinder, A.B. Gilliland, R.V. Martin. Resolving NO_x Emissions Inventory Biases Using Discrete Kalman Filter Inversion, Direct Sensitivities, and Satellite-Based NO₂ Columns (platform presentation). 28th NATO/CCMS International Technical Meeting on Air Pollution Modelling and its Application, Aveiro, Portugal, 24-28 September, 2007.
- Napelenok, S.L., F.D. Habermacher, F.H. Akhtar, Y. Hu, A.G. Russell, Development of the Area of Influence Method and Application to Georgia (platform presentation). American Association for Aerosol Research (AAAR) 2006 Annual Conference, St. Paul, Minnesota, 10-15 September, 2006.
- Napelenok, S.L., D.S. Cohan, Y. Hu, A.G. Russell, Implementation of the Direct Decoupled Method (DDM) into the CMAQ model for aerosol species (platform presentation). American Association for Aerosol Research (AAAR) International Specialty Conference – Particulate Matter Supersites Program and Related Studies, Atlanta, GA, 7-11 February, 2005.
- Napelenok, S.L., S.M. O'Neill, B.K. Lamb, E.J. Allwine, D. Stock, Modeling the Upwind Pollutant Source Footprint Along Backward Trajectories Using the MM5/CALMET/CLAPUFF Modeling System (platform presentation). American Meteorological Society, 3rd Symposium on the Urban Environment, Davis, CA, 2000.

NARRATIVE

My research interests center on development of photochemical air quality models and their application to studying air pollutant control strategies, health impacts, and climate interactions. I have been involved in a wide of range projects, including model sensitivity and uncertainty analysis using instrumented models; integrating satellite observations with modeling results; development of emission inventories; regional source apportionment; analysis of future climate scenarios; and interpreting modeling results for other policy applications.

**CHRISTOPHER G. NOLTE, PHYSICAL SCIENTIST**

Applied Modeling Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. in Environmental Engineering Science, 2001, California Institute of Technology
M.S. in Environmental Engineering Science, 1994, California Institute of Technology
B.S. in Physics, 1991, Stanford University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2005–2008
NERL Postdoctoral Fellow, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC, 2003–2005

SELECTED AWARDS AND HONORS

USEPA NERL Special Achievement Award, 2007
NOAA Atmospheric Sciences Modeling Division CIYA award, 2006
USEPA Superior Accomplishment Recognition Award, 2004

SELECTED PUBLICATIONS (11 out of 11 from 1997 to present)

Weaver, C.P., X.-Z. Liang, ..., C. Nolte, ... A preliminary synthesis of modeled climate change impacts on U.S. regional ozone concentrations. *Bull. Amer. Meteor. Soc.*, in review (2008).
Nolte, C., A. Gilliland, and C. Hogrefe, Linking global and regional models to simulate U.S. air quality in the year 2050. *Air Pollution Modeling and its Application XIX*, C. Borrego and A.I. Miranda, Eds., Elsevier, 559-567 (2008).
Nolte, C.G., C. Hogrefe, A.B. Gilliland, and L.J. Mickley, Linking global to regional models to assess future climate impacts on surface ozone levels in the United States. *J. Geophys. Res.*, 113, D14307 (2008).
Nolte, C.G., P.V. Bhawe, J.R. Arnold, R.L. Dennis, K.M. Zhang, and A.S. Wexler, Modeling urban and regional aerosols—Application of the CMAQ-UCD aerosol model to Tampa, a coastal urban site. *Atmos. Environ.*, 42:3179-3191 (2008).
Cooter, E.J., R. Gilliam, W. Benjey, C. Nolte, J. Swall, and A. Gilliland, Examining the impact of changing climate on regional air quality over the U.S. *Air Pollution Modeling and its Application XVIII*, C. Borrego and E. Renner, Eds., Elsevier, 633-647 (2007).
Nolte, C.G., J.J. Schauer, G.R. Cass, and B.R.T. Simoneit, Trimethylsilyl derivatives of organic compounds in source samples and in fine atmospheric particulate matter. *Environ. Sci. Technol.* 36:4273-4281 (2002).
Nolte, C.G., J.J. Schauer, G.R. Cass, and B.R.T. Simoneit, Highly polar organic compounds present in wood smoke and in the ambient atmosphere. *Environ. Sci. Technol.* 35:1912-1919 (2001).
Nolte, C.G., J.J. Schauer, G.R. Cass, and B.R.T. Simoneit, Highly polar organic compounds present in meat smoke. *Environ. Sci. Technol.* 33:3313-3316 (1999).
Nolte, C.G., M.P. Fraser, and G.R. Cass, Gas phase C₂-C₁₀ organic acids concentrations in the Los Angeles atmosphere. *Environ. Sci. Technol.* 33:540-545 (1999).
Simoneit, B.R.T., J.J. Schauer, C.G. Nolte, D.R. Oros, V.O. Elias, M.P. Fraser, W.F. Rogge, and G.R. Cass, Levoglucosan, a tracer for cellulose in biomass burning and atmospheric particles. *Atmos. Environ.* 33:173-182 (1999).
Nolte, C.G., P.A. Solomon, T. Fall, L.G. Salmon, and G.R. Cass, Seasonal and spatial characteristics of formic and acetic acids concentrations in the southern California atmosphere. *Environ. Sci. Technol.* 31:2547-2553 (1997).

SELECTED PRESENTATIONS (13 out of 17 from 2004 to present)

Gilliland, A. B., K. Foley, C. Nolte, and S. Howard, "Future Climate Scenarios, Atmospheric Deposition and Precipitation Uncertainty," NADP Technical Meeting and Scientific Symposium, October 16, 2008.



- Nolte, C. G., S. J. Roselle, and F. S. Binkowski, "Implementation of an Online Photolysis Module in CMAQ 4.7," 7th Annual CMAS Users Conference, Chapel Hill, NC, October 7, 2008 (poster).
- Kelly, J. T., P. V. Bhave, U. Shankar, K. M. Foley, and C. G. Nolte, "Implementation of a Dynamically Interactive Coarse Mode in CMAQv4.7," 7th Annual CMAS Users Conference, Chapel Hill, NC, October 7, 2008 (poster).
- Nolte, C., Linking Global and Regional Models to Simulate Future U.S. Air Quality. EPA Region 3 Climate Change and Particulate Matter Spring Conference, Philadelphia, PA, April 30, 2008 (invited presentation).
- Nolte, C., A. Gilliland, C. Hogrefe, and L. Mickley, Using Linked Global and Regional Models to Simulate U.S. Air Quality in the Year 2050. EPA Region 9 Workshop on the Impacts of Climate Change on Air Quality in the Pacific Southwest, San Francisco, CA, October 11, 2007 (invited presentation).
- Nolte, C., P. Bhave, R. Dennis, J. Arnold, K.M. Zhang, and A. Wexler, Application of the CMAQ-UCD aerosol model to a coastal urban site. 6th Annual CMAS Users' Conference, Chapel Hill, NC, October 3, 2007.
- Nolte, C., A. Gilliland, C. Hogrefe, and L. Mickley, Linking Global and Regional Models to Simulate U.S. Air Quality in the Year 2050. 29th NATO International Technical Meeting on Air Pollution Modeling and its Application, Aveiro, Portugal, September 28, 2007.
- Tong, D., Nolte, C., R. Mathur, and K. Schere, Climate Impacts on U.S. Crop Production—An Air Quality Perspective. American Geophysical Union fall meeting, San Francisco, CA, December 14, 2006.
- Gilliland, A., C. Nolte, C. Hogrefe, E. Cooter, and R. Gilliam, Modeling Ozone and PM_{2.5} Sensitivities to Future Climate. Climate Change Science Program Synthesis and Assessment Product 3.2 workshop, Princeton, NJ, October 30, 2006.
- Nolte, C., E. Cooter, R. Gilliam, W. Benjey, J. Swall, A. Gilliland, L. Mickley, P. Adams. The Impact of Climate Change on Regional Air Quality. EPA Science Forum 2006: Your Health, Your Environment, Your Future, Washington, DC, May 16-18, 2006 (poster).
- Cooter, E., R. Gilliam, A. Gilliland, W. Benjey, J. Swall, C. Nolte. Examining the Impact of Climate Change and Variability on Regional Air Quality over the U.S. Climate Change Science Program workshop, November 14, 2005 (poster).
- Nolte, C.G., P.V. Bhave, R.L. Dennis, K.M. Zhang, A.S. Wexler, M.C. Evans, and N.D. Poor, Evaluation of the CMAQ-AIM model against size- and chemically-resolved impactor data at a coastal urban site, American Association for Aerosol Research Particulate Matter Supersites Conference, February 12, 2005.
- Nolte, C.G., P.V. Bhave, R.L. Dennis, K.M. Zhang, and A.S. Wexler, Using CMAQ-AIM to Evaluate the Gas-Particle Partitioning Treatment in CMAQ, Community Modeling and Analysis System Models-3 Users' Conference, Chapel Hill, NC, October 19, 2004.

NARRATIVE

Climate change may significantly impact future air quality in the United States. To help address this issue, I am researching methods to downscale meteorological outputs from global climate models to regional scales for use with NERL's Community Multiscale Air Quality (CMAQ) model. I am also analyzing future emissions scenarios developed under a range of assumptions about technological change, economic growth, and environmental policy and how they may affect U.S. regional air quality.

TANYA L. OTTE, PHYSICAL SCIENTIST

Applied Modeling Branch
Atmospheric Modeling and Analysis Division


EDUCATION/TRAINING

M.S. in Meteorology, 1994, Pennsylvania State University
B.S. in Earth and Atmospheric Sciences, 1991, Rutgers University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC, 2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1998–2008
(Supervisory) Meteorologist, Air Force Weather Agency, Offutt Air Force Base, NE, 1995–1998

SELECTED AWARDS AND HONORS

U.S. Department of Commerce Silver Medal, 2005
Community Modeling and Analysis System Award of Appreciation, 2005
USEPA Bronze Medal, 2004
USEPA Bronze Medal, 1999
U.S. Air Force Commendation, 1998
U.S. Air Force Outstanding Leadership Award, 1998
U.S. Air Force Notable Achievement Award, 1998
U.S. Air Force Merewether Award (most significant technical contribution to weather support mission), 1997
Air Weather Service Civilian of the Year, 1996
Air Force Global Weather Central Civilian of the Year, 1996
U.S. Air Force Notable Achievement Award, 1995

SELECTED PUBLICATIONS (since 1999)

- Otte, T. L., 2008: The impact of nudging in the meteorological model for retrospective air quality simulations. Part I: Evaluation against national observation networks. *Journal of Applied Meteorology and Climatology*, 47, 1853-1867.
- Otte, T. L., 2008: The impact of nudging in the meteorological model for retrospective air quality simulations. Part II: Evaluating collocated meteorological and air quality observations. *Journal of Applied Meteorology and Climatology*, 47, 1868-1887.
- Pleim, J. E., J. O. Young, D. Wong, R. C. Gilliam, T. L. Otte, and R. Mathur, 2008: Two-way coupled meteorology and air quality modeling. Chapter 2, *Air Pollution Modeling and its Application XIX*. Springer, New York, NY, 235-242.
- Tang, Y., P. Lee, M. Tsidulko, H.-C. Huang, J. T. McQueen, G. J. DiMego, L. K. Emmons, R. B. Pierce, A. M. Thompson, H.-M. Lin, D. Kang, D. Tong, S. Yu, R. Mathur, J. E. Pleim, T. L. Otte, G. Pouliot, J. O. Young, K. L. Schere, P. M. Davidson, and I. Stajner, 2008: The impact of chemical lateral boundary conditions on CMAQ predictions of tropospheric ozone over the continental United States. *Environmental Fluid Mechanics*, doi:10.1007/s10652-008-9092-5.
- Yu, S., R. Mathur, K. Schere, D. Kang, J. Pleim, and T. L. Otte, 2007: A comprehensive evaluation of the Eta-CMAQ forecast model performance for O₃, its related precursors, and meteorological parameters during the 2004 ICARTT study. *Journal of Geophysical Research*, 112, D12S14, doi:10.1029/2006JD007715.
- Isakov, V., A. Venkatram, J. Touma, D. Koraćin, and T. L. Otte, 2007: Evaluating the use of outputs from comprehensive meteorological models in air quality modeling applications. *Atmospheric Environment*, 41, 1689–1705.
- Otte, T. L., G. Pouliot, J. E. Pleim, J. O. Young, K. L. Schere, D. C. Wong, P. C. S. Lee, M. Tsidulko, J. T. McQueen, P. Davidson, R. Mathur, H.-Y. Chuang, G. DiMego, and N. L. Seaman, 2005: Linking the Eta Model with the Community Multiscale Air Quality (CMAQ) Modeling System to build a national air quality forecasting system. *Weather and Forecasting*, 20, 367–384.

- Otte, T. L., A. Lacser, S. Dupont, and J. K. S. Ching, 2004: Implementation of an urban canopy parameterization in a mesoscale meteorological model. *Journal of Applied Meteorology*, 43, 1648–1665.
- Dupont, S., T. L. Otte, and J. K. S. Ching, 2004: Simulation of meteorological fields within and above urban and rural canopies with a mesoscale model (MM5). *Boundary-Layer Meteorology*, 113, 111–158.
- Schwede, D. B., S. K. LeDuc, and T. L. Otte, 2001: Using meteorological model output as a surrogate for on-site observations to predict deposition velocity. *Water, Air, and Soil Pollution: Focus*, 1, 59–66.
- Pleim, J. E., A. Xiu, P. L. Finkelstein, and T. L. Otte, 2001: A coupled land-surface and dry deposition model and comparison to field measurements of surface heat, moisture, and ozone fluxes. *Water, Air, and Soil Pollution: Focus*, 1, 243–252.
- Otte, T. L., N. L. Seaman, and D. R. Stauffer, 2001: A heuristic study on the importance of anisotropic error distributions in data assimilation. *Monthly Weather Review*, 129, 766–783.
- Otte, T. L., 1999: Using MM5 version 2 with Models-3/CMAQ: A user's guide and tutorial. EPA-600/R-99/065, July 1999, 46 pp.
- Otte, T. L., 1999: Developing meteorological fields. Science Algorithms of the EPA Models-3 Community Multiscale Air Quality (CMAQ) Modeling System. D. W. Byun and J. K. S. Ching, Eds. EPA-600/R-99/030, March 1999, 3-1 – 3-17.

SELECTED PRESENTATIONS (since 2007)

- Otte, T. L., 2008: A Nudging Strategy for Mesobeta-Scale WRF Simulations Suitable for Retrospective Air Quality Modeling: Preliminary Results. Joint Session of the 15th Joint Conference on the Applications of Air Pollution Meteorology with the A&WMA and 10th Conference on Atmospheric Chemistry, 88th Annual American Meteorological Society Meeting, New Orleans, LA.
- Otte, T. L., 2008: The impact of nudging in the meteorological model for retrospective air quality simulations. Joint Session of the 15th Joint Conference on the Applications of Air Pollution Meteorology with the A&WMA and 10th Conference on Atmospheric Chemistry, 88th Annual American Meteorological Society Meeting, New Orleans, LA.
- Otte, T. L., and R. C. Gilliam, 2007: A nudging strategy for mesobeta-scale WRF simulations suitable for retrospective air quality modeling: Preliminary results. 6th Annual CMAS Conference, Chapel Hill, NC.
- Otte, T. L., 2007: The impact of nudging in the meteorological model for retrospective CMAQ simulations. 7th Annual Ad-Hoc Meteorological Modeling Meeting, Boulder, CO.
- Deng, A., D. R. Stauffer, J. Dudhia, T. Otte, and G. K. Hunter, 2007: Update on analysis nudging FDDA in WRF-ARW. 8th WRF Users' Workshop, Boulder, CO.
- Otte, T. L., L. J. Reynolds, A. Huffman, T. E. Pierce, and R. R. Draxler, 2007: On the use of observations from a dense mesonet to improve short-term, high-resolution mesoscale model forecasts. AMS 14th Symposium on Meteorological Observations and Instrumentation, San Antonio, TX.

NARRATIVE

I specialize in numerical weather prediction and applications of meteorological modeling for air quality modeling research, particularly at the regional and local scales. My research has included developing and applying data assimilation techniques for mesoscale meteorological models, developing an urban canopy parameterization for mesogamma-scale meteorological modeling, and developing a key component of the NOAA-EPA National Air Quality Forecasting (AQF) System. After more than 15 years of experience with them, I am considered a resident expert on the PSU/NCAR Mesoscale Model (MM5) and the Weather Research and Forecasting (WRF) Model, two international community-based meteorological models that are widely used for air quality applications. I am a member of the team that developed a data assimilation capability for WRF, and I lead an internal workgroup that focuses on meteorological modeling development and application as related to air quality modeling. I am the primary developer of the Meteorology-Chemistry Interface Processor (MCIP), a preprocessor to the Community Multiscale Air Quality (CMAQ) modeling system. I am also a key member of the team that is developing a two-way coupled version of WRF and CMAQ. My future research activities will involve applications for global and climatic impacts on air quality and ecosystems, further development and application of WRF, refinements to MCIP, and other meteorological modeling activities.

STEVEN G. PERRY, RESEARCH PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. in Meteorology, 1985, Pennsylvania State University
M.S. in Meteorology, 1977, Pennsylvania State University
B.S. in Physics/Math, 1974, Austin Peay State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Team Lead, Fluid Modeling Facility,
Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC 1985–2008
Air Quality Planning Meteorologist, North Carolina Division of Environmental Management, Raleigh, NC,
1981–1985

SELECTED AWARDS AND HONORS

USEPA/NERL Special Achievement Award, 2006, for high level of commitment and dedication to ensure the health and safety of NERL's Fluid Modeling Facility
USEPA Scientific and Technological Achievement Award (STAA), 2003, for journal article on the newly developed AgDRIFT aerial spray drift model. Bird, S.L., S.G. Perry, S.L. Ray, and M.E. Teske. Evaluation of the AgDISP Aerial Spray Drift Algorithms in the AgDRIFT Model. *Environmental Toxicology and Chemistry* 21(3):672-681 (2002).
USEPA James Ackerman Award, 1999, "For exemplary collaboration with the pesticide industry's Spray Drift Task Force to provide cost-effective methods for evaluating risk to the spray drift of pesticides"
NOAA Air Resources Laboratory Scientific Accomplishment of the Year Award, 1999, "For collaborative efforts among NOAA, EPA, the American Meteorological Society, and academia to incorporate the latest planetary boundary layer concepts into the applied air dispersion model, AERMOD"
USEPA Bronze Medal, 1997, "For developing, in conjunction with industry, spray drift assessment tools and methods which facilitate pesticide labeling resulting in reduced off-site drift of pesticides"
Centennial Fellow, College of Earth and Mineral Sciences, The Pennsylvania State University, 1996: In celebration of 100 years, Penn State's College of Earth and Mineral Sciences honored 100 of its graduates who have made significant contributions to their fields during their careers.

SELECTED PUBLICATIONS

Heist, D.K., S.G. Perry, L. A. Brixey, 2008: The effect of roadway configurations on the dispersion of traffic-related pollution: a wind-tunnel study (in review, to be submitted to *Atmospheric Environment*).
Perry, S. G., and W. H. Snyder, 2008: Dynamic response to daytime mixed-layer depths to complex terrain: Laboratory simulations. (in review, for submission to *Environmental Fluid Mechanics*)
Heist, D. K., J. Richmond-Bryant, L. A. Brixey, G. E. Bowker, S. G. Perry, and R. W. Wiener, 2008: The effect of a tall tower on flow and dispersion through a model urban neighborhood. Part 1: Flow characteristics. (submitted to *Journal of Environmental Monitoring*).
Brixey, L. A., J. Richmond-Bryant, D. K. Heist, G. E. Bowker, S. G. Perry, and R. W. Wiener, 2008 The effect of a tall tower on flow and dispersion through a model urban neighborhood. Part 2: Pollutant dispersion. (submitted to *Journal of Environmental Monitoring*).
Smolarkiewicz, P. K., R. Sharman, J. Weil, S. Perry, D. Heist, and G. Bowker. 2007: Building resolving large-eddy simulations and comparison with wind tunnel experiments. *J. Computational Physics*, 227 633–653.
Cimorelli, A. J., S. G. Perry, A. Venkatram, J. C. Weil, R. J. Paine, R. B. Wilson, R. F. Lee, W. D. Peters, and R. W. Brode, 2005: AERMOD: A dispersion model for industrial source applications Part I: General model formulation and boundary layer characterization. *J. Appl. Meteor.*, 44, 682-693.
Perry, S. G., A. J. Cimorelli, J. C. Weil, A. Venkatram, R. J. Paine, R. B. Wilson, R. F. Lee, and W. D. Peters, 2005: AERMOD: A dispersion model for industrial source applications Part II: Model performance against seventeen field-study databases. *J. Appl. Meteor.*, 44, 694-708.



- Perry, S. G., D. K. Heist, R. S. Thompson, W. H. Snyder, and R. E. Lawson, Jr., 2004: Wind Tunnel Simulations of Flow and Pollutant Dispersal around the World Trade Center Site. *Environmental Manager*, February, 2004, 31-34.
- Vette, A., S. Gavett, S. Perry, D. Heist, A. Huber, M. Lorber, P. Liroy, P. Georgopoulos, S. T. Rao, W. Petersen, B. Hicks, J. Irwin, and G. Foley, 2004: Environmental Research in Response to 9/11 and Homeland Security. *Environmental Manager*, February, 2004, 14-22.
- Venkatram, A., R. Brode, A. Cimorelli, R. Lee, R. Paine, S. Perry, W. Peters, J. Weil, R. Wilson, 2001: A complex terrain dispersion model for regulatory applications. *Atmos. Environ.*, 35, 4211-4221.
- Bird, S. L., S. G. Perry, S. L. Ray, M. E. Teske, 2001: Evaluation of the AgDRIFT aerial spray drift model. *Environ. Toxicology Chemistry*, 21, 672-681.
- Teske, M. E., S. L. Bird, D. M. Esterly, T. B. Curbishley, S. L. Ray, S. G. Perry, 2001: AgDRIFT: A model for estimating near-field spray drift from aerial applications. *Environ. Toxicology Chemistry*, 21, 659-671.

SELECTED PRESENTATIONS

- Perry, S.G., "Research Activities at the USEPA's Fluid Modeling Facility with wind tunnel demonstration of dispersion of urban roadway pollutants", Fluid Modeling Facility, Research Triangle Park, NC. September, 19, 2007. Provided to the Assistant Secretary of Commerce and Director of the National Oceanic and Atmospheric Administration.

NARRATIVE

My research focuses on the study of atmospheric boundary layer flows as they relate to the near-field transport, dispersal, and deposition of atmospheric pollutants. Much of my work at EPA has been directed toward the development of applied computer algorithms for simulating pollutant movement and fate, many of which have been adopted by the Agency for formal regulatory analyses. This has included the development of EPA's current refined regulatory models for rural and urban areas (AERMOD model) and for complex terrain applications (CTDMPLUS model), as well as the methodologies for estimating impacts from open-pit surface coal mine operations. Other work has included modeling applications related to agricultural pesticides (AgDRIFT model). For the past eight years I have been the team science lead at EPA's Fluid Modeling Facility. Recent laboratory studies have been designed and conducted to investigate flow, turbulence, and dispersion in urban canopies. My current and near-future research will address improving our understanding of the complex flows around urban and suburban roadways through our laboratory studies, and developing improved numerical modeling tools for roadway exposures.

THOMAS E. PIERCE, BRANCH CHIEF

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Atmospheric Sciences, 1984, North Carolina State University
B.S. in Meteorology, 1979, North Carolina State University

PROFESSIONAL EXPERIENCE

Chief, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Chief, Air-Surface Processes Modeling Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2003–2008
Acting Director, USEPA/ORD/NERL/Ecosystems Research Division, Athens, GA, 2007
Chief, Modeling Systems Analysis Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2001–2003
Research Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1985–2001
Air Quality Meteorologist, Martin Marietta, Columbia, MD, 1984–1985
Environmental Meteorologist, NUS Corporation, Gaithersburg, MD, 1982–1984
Meteorology Intern, Environmental Operations Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA), Research Triangle Park, NC, 1978–1982

SELECTED AWARDS AND HONORS

USEPA Award for Exceptional/Outstanding ORD Technical Assistance to the Regions or Program Offices, 2008, “for improving the National Emission Inventory by developing and delivering a more accurate and cost-efficient method for estimating emissions of biomass burning”
NOAA Administrator’s Award, 2007, “for visionary leadership in the development of cross-agency partnerships to apply a ‘one-atmosphere’ air quality model which promotes meaningful and cost-effective national policies to protect human health and the environment”
USEPA Bronze Medals:
2005: team research achievement in development and evaluation of CMAQ
2001: for coordinating consensus approaches for generating emission inventory guidance
1999: CMAQ team award “for development of the Nation’s premier air quality model”
1998: outstanding support of the Agency’s Ozone Regional Transport Rule
1984: outstanding contributions to improvements in ozone modeling

SELECTED PUBLICATIONS (peer-reviewed)

Pouliot, G., T. Pace, B. Roy, T. Pierce et al. (2008) Development of a biomass burning emissions inventory by combining satellite and ground-based information, *J. Appl. Remote Sens.*, 2:021501, DOI:10.1117/1.2939551.
Roy, B., G. Pouliot, A. Gilliland, T. Pierce et al. (2007) Refining fire emissions for air quality modeling with remotely sensed fire counts: A wildfire case study, *Atmos. Environ.*, 41:655-665.
Widenmeyer, C., J. Greenberg, A. Guenther, B. Hopkins, K. Baker, C. Geron, P. Palmer, B. Long, J. Turner, G. Petron, P. Harley, T. Pierce et al. (2005) Ozarks Isoprene Experiment (OZIE): Measurements and modeling of the “isoprene volcano”, *J. Geophys. Res.*, doi:10.1029/2005JD005800.
Gilliland, A., R. Dennis, S. Roselle, and T. Pierce (2003) Seasonal NH₃ emission estimates for the eastern United States, *J. Geophys. Res.*: 108:4477, doi:10.1029/2002D003063, 2003.
Xu, Y., M. Wesley, and T. Pierce (2002) Estimates of biogenic emissions using satellite observations and influence of isoprene emission on O₃ formation over the eastern U.S., *Atmos. Environ.*, 36: 5819-5829.
Roelle, P., V. Aneja, B. Gay, C. Geron, and T. Pierce (2001) Biogenic nitric oxide emissions from cropland soils, *Atmos. Environ.*, 35:115-124.
Guenther, A., C. Geron, T. Pierce et al. (2000) Natural emissions of non-methane volatile organic compounds, CO, and oxides of nitrogen from North America, *Atmos. Environ.*, 32:2205-2230.

- Lewis, C., R. Stevens, R. Rasmussen, C. Cardelino, and T. Pierce (1999) Biogenic fraction of ambient VOC: Comparison of radiocarbon, chromatographic, and emission inventory estimates for Atlanta, Georgia. *J. Air & Waste Manag. Assoc.*, 49:299-307.
- Simpson, D., W. Winiwarter, G. Borjesson, S. Cindery, A. Ferreiro, A. Guenther, C. Hewitt, R. Janson, M. Khalil, S. Owen, T. Pierce, et al. (1999) Inventorying emissions from nature in Europe, *J. Geophys. Res.*, 104:8113-8152.
- Pierce, T., C. Geron, L. Bender, R. Dennis, G. Tonnesen, and A. Guenther (1998) Influence of increased isoprene emissions on regional ozone modeling, *J. Geophys. Res.*, 103:25611-25629.
- Kinnee, E., C. Geron, and T. Pierce (1997) United States land use inventory for estimating biogenic ozone precursor emissions, *Ecol. App.*, 7:46-58.
- Aneja, V., W. Robarge, L. Sullivan, T. Moore, T. Pierce, C. Geron, and B. Gay (1996) Seasonal variations of nitric oxide flux from agricultural soils in the United States, *Tellus*, 48B:626-640.
- Lamb, B., T. Pierce, D. Baldocchi, E. Allwine, S. Dilts, H. Westberg, C. Geron, A. Guenther, L. Klinger, P. Harley, and P. Zimmerman (1996) Evaluation of forest canopy models for estimating isoprene emissions, *J. Geophys. Res.*, 101:22787-22797.
- Geron, C., T. Pierce, and A. Guenther (1995) Reassessment of biogenic volatile organic compound emissions in the Atlanta area, *Atmos. Environ.*, 29:1569-1578.
- Guenther, A., C. Hewitt, D. Erickson, R. Fall, C. Geron, T. Gradedel, P. Harley, L. Klinger, M. Lerdau, W. McKay, T. Pierce, B. Scholes, R. Steinbrecher, R. Tallamraju, J. Taylor, and P. Zimmerman (1995) A global model of natural volatile organic compound emissions, *J. Geophys. Res.*, 100:8873-8892.
- Geron, C., A. Guenther, and T. Pierce, 1994: An improved model for estimating volatile organic compounds in the Eastern United States, *J. Geophys. Res.*, 99:12773-12791.
- Milford, J., D. Gao, A. Zafirakou, and T. Pierce (1994) Ozone precursor levels and responses to emissions reductions: Analysis of Regional Oxidant Model results, *Atmos. Environ.*, 28:2093-2104.
- Lamb, B., D. Gay, H. Westburg, and T. Pierce (1993) A biogenic hydrocarbon emission inventory for the U.S.A. using a simple forest canopy model, *Atmos. Environ.*, 27A:1673-1690.
- Novak, J., and T. Pierce (1993) Natural emissions of oxidant precursors, *Water, Air, & Soil Poll.*, 67:57-77.
- Roselle, S., T. Pierce, and K. Schere (1991) The sensitivity of regional ozone modeling to biogenic hydrocarbons, *J. Geophys. Res.*, 96:7341-7394.
- Pierce, T. and P. Waldruff (1991) PC-BEIS: A personal computer version of the biogenic emissions inventory system, *J. Air & Waste Manag. Assoc.*, 41:937-941.
- Turner, D., L. Bender, T. Pierce, and W. Petersen (1989) Air quality simulation models from EPA, *Environ. Software*, 4:52-61.
- Pierce, T. (1988) An air pollution climatology around an isolated point source using convective scaling parameters, *Atmos. Environ.*, 22:2463-2475.
- Pierce, T. (1986) An efficient algorithm for determining non-overlapping running averages, *Environ. Software*, 1:124-128.

NARRATIVE

My research over the past 25 years has centered on the incorporation of meteorological principles for the operational deployment of more reliable air quality simulation models. This has included developing local-scale dispersion models used by federal and state air quality managers for air quality permitting requirements under the Clean Air Act, and supporting regional chemical transport models (such as the Regional Oxidant Model [ROM] and the Community Multiscale Air Quality [CMAQ] modeling system). My primary focus during the past decade was to develop emission estimates that are driven by meteorological processes, such as biogenic emissions of hydrocarbons and nitric oxides from soils and vegetation, lightning-produced nitric oxides, ammonia emissions from natural landscapes and agricultural activities, and PM_{2.5} emissions from wildland fires and fugitive dust. Currently, my role in the Division is to provide scientific leadership to the Emissions and Model Evaluation Branch.

ROBERT W. PINDER, PHYSICAL SCIENTIST

Applied Modeling Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Engineering and Public Policy and Civil and Environmental Engineering, 2005, Carnegie Mellon University
M.Eng. in Electrical Engineering and Computer Science, 2000, Massachusetts Institute of Technology
B.S. in Electrical Engineering and Computer Science, 1999, Massachusetts Institute of Technology

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2006–2008
Postdoctoral researcher, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2005–2006
Software Engineer, Oracle Corporation, Application Technology Group, Redwood Shores, CA, 2000
Researcher, Digital Equipment Corp., High Performance Engineering Group, Nashua, NH, 1999

SELECTED AWARDS AND HONORS

Environmental Science and Technology Editor’s Choice Paper Award, Policy Analysis: First Runner-Up, 2008
NOAA Special Achievement Award, 2007
Young Scientists Summer Program of the International Institute for Applied Systems Analysis, Laxenburg, Austria, 2004

SELECTED PUBLICATIONS (13 out of 15 from 2004 to present)

Pinder, RW; Gilliland, AB; Dennis, RL. The Environmental Impact of NH₃ Emissions under Present and Future. *Geophysical Research Letters*, 35, L12808, 2008.
Gilliland, A.B.; Hogrefe, C.; Pinder, RW; Godowitch, JL; Rao, ST. Dynamic Evaluation of Regional Air Quality Models: Assessing Changes in O₃ Stemming from Emissions and Meteorology, *Atmospheric Environment*, 42, 5110-5123, 2008.
Boersma, K.F., Jacob, D.J., Eskes, H.J., Pinder, R.W. “Intercomparison of SCIAMACHY and OMI tropospheric NO₂ columns: observing the diurnal evolution of chemistry and emissions from space”, *J. Geophys. Res.*, 113, D16S26, doi:10.1029/2007JD008816. 2008.
Napelenok, S.L.; Pinder, R.W.; Gilliland, A.B.; Martin, R. V. A method for evaluating spatially-resolved NO_x emissions using Kalman filter inversion, direct sensitivities, and space-based NO₂ observations *Atmospheric Chemistry and Physics*, 8, 5603-5614. 2008.
Pinder, RW; Dennis, RL; Bhawe, PV. Observable indicators of the sensitivity of PM_{2.5} nitrate to emission reductions—Part I: Derivation of the adjusted gas ratio and applicability at regulatory-relevant time scales. *Atmospheric Environment*, 42(6), 1275-1286. 2008
Dennis, RL; Bhawe, PV; Pinder, RW. Observable indicators of the sensitivity of PM_{2.5} nitrate to emission reductions—Part II: Sensitivity to errors in total ammonia and total nitrate of the CMAQ-predicted non-linear effect of SO₂ emission reductions. *Atmospheric Environment*, 42(6), 1287-1300. 2008
Lane, TE, Pinder, RW, Shrivastava, M, Robinson, AL, Pandis, SN, “Source contributions to primary organic aerosol; Comparison of the results of a source-resolved model and the Chemical Mass Balance approach” *Atmospheric Environment*, 41(18): 3758-3776. 2007.
Gaydos, TM, Pinder, RW, Koo, B, Fahey, KM, Pandis, SN, “Development and Application of a Three-dimensional Aerosol Chemical Transport Model, PMCAMx+”, *Atmospheric Environment*, 41(12): 2594-2611. 2007.
Pinder, RW, Adams, PJ, Pandis, SN. “Ammonia emission controls as a cost-effective strategy for reducing atmospheric particulate matter in the Eastern US”. *Environmental Science and Technology* 41 (2): 380-386. 2007.



- Pinder, RW, Adams, PJ, Pandis, SN, Gilliland, AB. "Temporally Resolved Ammonia Emission Inventories: Current Estimates, Evaluation Tools, and Measurement Needs" *J. Geophysical Research* 111 (D16): D16310. 2006.
- Gilliland, AB, Appel, KW, Pinder, RW, Dennis, RL. "Seasonal NH₃ Emissions for the Continental United States: Inverse Model Estimation and Evaluation" *Atmospheric Environment* 40 (26): 4986-4998. 2006.
- Pinder, RW, Strader, R, Davidson, CI, and Adams, PJ. "A Temporally and Spatially Resolved Ammonia Emission Inventory for Dairy Cows in the United States" *Atmospheric Environment*. 38(23):3747-3756. 2004.
- Pinder, RW, Pekney, NJ, Davidson, CI and Adams, PJ. "A Process Based Model of Ammonia Emissions from Dairy Cows: Improved Temporal and Spatial Resolution." *Atmospheric Environment*. 38(9):1357-1365. 2004.

SELECTED PRESENTATIONS (5 out of 26 from 2003 to present)

- Pinder, RW, Napelenok, SL, Gilliland, AB, Martin, RV "Use of space-based tropospheric NO₂ observations in regional air quality modeling" TROPOMI Workshop, March 5-6, 2008, (*invited*)
- Pinder, RW; Gilliland, AB; Gilliam, R; Appel, W. "Evaluating uncertainty predictions using an ensemble of CMAQ model configurations" , 6th Annual CMAQ Conference, October 1-3, 2007
- Napelenok, SL, Pinder, RW, Gilliland, AB, Martin, RV "Developing a method for resolving NO_x emission inventory biases using discrete Kalman filter inversion, direct sensitivities, and satellite-based NO₂ columns" NATO ITM Meeting, Sept. 26, 2007
- Pinder, RW; Gilliland, AB; Dennis, RL. "Detecting Past and Future Trends in Nitrogen Deposition: A Modeling Study to Guide the Placement of Future Monitoring Sites" NADP Annual Meeting, September 11, 2007 (*invited*)
- Pinder, RW, Gilliland, AB, Dennis, RL. "The Impact of Winter NH₃ Emission Reductions on Inorganic Particulate Matter under Present Day Conditions and Future Regulated Reductions" Workshop on Agricultural Air Quality: State of the Science, Potomac, MD, June 5-8, 2006.

NARRATIVE

My work focuses on numerical and stochastic modeling of the fate, transport, and impacts of air pollution on human health and ecosystems. Topics of particular interest include ammonia, oxidized nitrogen, remote sensing, and ensemble modeling.

JONATHAN E. PLEIM, PHYSICAL SCIENTIST

Atmospheric Model Development Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Atmospheric Science, 1990, State University of New York at Albany
 M.S. in Atmospheric Science, 1981, State University of New York at Albany
 B.S. in Atmospheric Science, 1978, Cornell University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC,
 2008–present
 Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
 Research Triangle Park, NC, 1990–2008
 Air Quality Meteorologist, Environmental Research and Technology, Inc., Concord, MA, 1981–1987

SELECTED AWARDS AND HONORS

NOAA Silver Medal, 2005
 USEPA Bronze Medal, 2004

SELECTED PUBLICATIONS (17 out of 30 from 1983 to present)

Pleim, J. E., 2007, A Combined Local and Non-local Closure Model for the Atmospheric Boundary Layer. Part 1: Model Description and Testing, Accepted by *J. Appl. Meteor. and Clim.*,
 Pleim, J. E., 2007, A Combined Local and Non-local Closure Model for the Atmospheric Boundary Layer. Part 2: Application and Evaluation in a Mesoscale Model, Accepted by *J. Appl. Meteor. and Clim.*,
 Yu, S., R. Mathur, D. Kang, K. Schere, J. Pleim, and T.L. Otte, 2007, A comprehensive evaluation of the Eta-CMAQ forecast model performance for O₃, its related precursors, and meteorological parameters during the 2004 ICARTT study, accepted by *J. Geophys. Res.*, 112, D12S14, doi:10.1029/2006JD007715
 Pleim, J. E., 2006, A Simple, Efficient Solution of Flux-Profile Relationships in the Atmospheric Surface Layer, *J. Appl. Meteor. and Clim.*, 45, 341-347
 Fenn, M. E., J. O. Sickman, A. Bytnerowicz, D. W. Clow, N. P. Molotch, J. E. Pleim, G. S. Tonnesen, K. C. Weathers, P. E. Padgett, and D. H. Campbell. 2006. Methods for measuring atmospheric nitrogen deposition inputs in arid and montane ecosystems of western North America. In: A. H. Legge (ed.). *Developments in Environmental Science Series: Relating Atmospheric Source Apportionment to Vegetation Effects: Establishing Cause Effect Relationships*. Elsevier, Amsterdam.
 Yu, S., R. Mathur, D. Kang, K. Schere, B. Eder, J. Pleim, 2006, Performance and diagnostic evaluation of ozone predictions by the Eta-Community Multiscale Air Quality Forecast System during the 2002 New England Air Quality Study. *JAWMA*, 56, 1459-1467.
 McNider, R.T, W.M. Lapenta, A.P. Biazar, G.J. Jedlovec, J.E. Pleim, 2005, Retrieval of model grid scale heat capacity using geostationary satellite products: part 1- first case study application, *J. Appl. Meteor., Journal of Applied Meteorology*: Vol. 44, No. 9, pp. 1346–1360.
 Otte, T.L., G. Pouliot, J.E. Pleim, J.O. Young, K.L. Schere, D.C. Wong, P.C.S. Lee, M. Tsidulko, J.T. McQueen, P. Davidson, R. Mathur, H.-Y. Chuang, G. DiMego and N.L. Seaman. 2005: Linking the Eta Model with the Community Multiscale Air Quality (CMAQ) Modeling System to Build a National Air Quality Forecasting System. *Weather and Forecasting*: Vol. 20, No. 3, pp. 367–384.
 Daubbert, W., M. A. Carroll, D. Baumgardner, G. Carmichael, R. Cohen, T. Dye, J. Ellis, G. Grell, S. Grimmond, S. Hanna, J. Irwin, B. Lamb, S. Madronich, J. McQueen, J. Meagher, T. Odman, J. Pleim, H.P. Schmid, D. L. Westphal, 2004. Meteorological Research Needs for Improved Air Quality Forecasting: Report of the 11th Prospectus Development Team of the U.S. Weather Research Program. *Bulletin of the American Meteorological Society*: Vol. 85, No. 4, pp. 563–586.
 Pleim, J. E., and A. Xiu, 2003, Development of a land surface model. Part II: Data Assimilation. *J. Appl. Meteor.*, 42, 1811-1822 .
 Wu, Y., B. Bashers, P. L. Finkelstein, and J. E. Pleim, 2003, A Multilayer biochemical dry deposition model, 1, Model formulation. *J. Geophys. Res.*, 108(D1) 4013-4024.



- Wu, Y., B. Bashers, P. L. Finkelstein, and J. E. Pleim, 2003, A Multilayer biochemical dry deposition model, 2, Model evaluation, *J. Geophys. Res.*, 108(D1) 4024-4051.
- Pleim, J. E., A. Xiu, P. L. Finkelstein, and T.L. Otte, 2001, A coupled land-surface and dry deposition model and comparison to field measurements of surface heat, moisture, and ozone fluxes, *Water, Air, and Soil Pollution: Focus*, 1, 243-252.
- Xiu, A. and J. E. Pleim, 2001, Development of a land surface model part I: Application in a mesoscale meteorology model. *J. Appl. Meteor.*, 40, 192-209
- Pleim, J. E., P. L. Finkelstein, J. F. Clarke, and T. G. Ellestad, 1999, A Technique for Estimating Dry Deposition Velocities Based on Similarity with Latent Heat Flux. *Atm. Env.*, 33, 2257-2268.
- Pleim, J. E. and A. Xiu, 1995. Development and testing of a surface flux and planetary boundary layer model for application in mesoscale models. *J. Applied Meteorology*, 34, 16-32.
- Pleim, J. E., J. S. Chang, 1992. A non-local closure model for vertical mixing in the convective boundary layer. *Atm. Env.*, 26A, 965-981.

SELECTED PRESENTATIONS

- Pleim, J., J. Young, D. Wong, R. Gilliam, W. Hutzell, T. Otte, and J. Walker, 2007, A 2-way coupled meteorology and air quality modeling, B. Bi-directional surface chemical fluxes, *29th NATO/SPS International Technical Meeting on Air Pollution Modeling and Its Application, Aveiro, Portugal, September 24-28, 2007.*
- Pleim, J, 2007, PBL modeling for air quality models, *Joint Region 10 and States, NWAIRQUEST and NW Regional Modeling Consortium Meeting.*
- Pleim, J.E. and D.W. Byun, 2000, Application of a new land-surface, dry deposition, and PBL model in the Models-3 Community Multi-scale Air Quality (CMAQ) model system. Presented at the *Millennium NATO/CCMS International Technical Meeting on Air Pollution Modelling and its Application*, May 15-19, 2000 in Boulder, CO.
- Pleim, J. E., and A. Xiu, 2000, A New Land-Surface Model in MM5. Presented at the *Tenth PSU/NCAR Mesoscale Model User's Workshop*, June 21-22, 2000 in Boulder, CO.
- Pleim, J. E., 1999, Modeling stomatal response to atmospheric humidity, Preprints of the *13th Symposium on Boundary Layers and Turbulence*, January 10-15 1999, Dallas, TX, American Meteorological Society, Boston, MA.

NARRATIVE

My area of expertise is air quality and meteorology model development, particularly in the physical aspect of these models. In air quality models, such as the Community Multiscale Air Quality (CMAQ) modeling system and before that the Regional Acid Deposition Model (RADM), I have developed dry deposition models, bidirectional surface flux models, convective cloud models, and planetary boundary layer (PBL) models. In meteorology models (e.g., WRF, MM5, and MM4), I have developed land surface models and PBL models. These enhancements have helped improve the capabilities of air quality modeling systems that include both meteorology and air quality model components.

**GEORGE A. POULIOT, PHYSICAL SCIENTIST**

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. in Atmospheric Science, 2000, North Carolina State University
M.S. in Atmospheric Science, 1995, North Carolina State University
B.A. in Mathematics & Computing and Info Science, 1992, Saint Vincent College

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 2002–2008
Principal Systems Programmer, Dyntel Corporation, Research Triangle Park, NC, 2000–2002
Research Assistant, North Carolina State University, Raleigh, NC, 1993–2000
Summer Research, Mathematics and Computer Science Division, Argonne National Laboratory, Argonne,
IL, 1992
Summer Research, NASA Goddard Space Flight Center, Greenbelt, MD, 1991
Summer Research, NOAA National Weather Service, Camp Springs, MD, 1990

SELECTED AWARDS AND HONORS

USEPA, Exceptional/Outstanding ORD Technical Assistance to the Regions or Program Offices, National
Fire Emissions Inventory Team, 2008
NOAA Silver Medal for Air Quality Forecasting, 2005
USEPA Bronze Medal for “Commendable Service to the CMAQ Team,” 2005
USEPA/NERL award for FY-03 release of CMAQ, 2003
NOAA award for development and assessment of the Eta-CMAQ modeling system for providing national
air quality forecasts, 2003
American Meteorological Society/Hughes Information Technology Company Graduate Student
Fellowship, 1992

SELECTED PUBLICATIONS (7 out of 7 from 1996 to present)

Pouliot, G., T. Pierce, X. Zhang, S. Kondragunta, C. Wiedinmyer, T. Pace, D. Mobley “The Impact of
Satellite-derived biomass burning emission estimates on air quality” in *Remote Sensing of Fire:
Science and Application*, edited by Wei Min Hao, Proceedings of SPIE Vol. 7089 (SPIE, Bellingham
WA, 2008)

Pouliot, G., T. G. Pace, et al. (2008). "Development of a biomass burning emissions inventory by
combining satellite and ground-based information." *Journal of Applied Remote Sensing* 2(1):
021501-17.

Yu S., R. Mathur, K. Schere, D. Kang, J. Pleim, J. Young, D. Tong, G. Pouliot, S. A. McKeen, S. T. Rao
(2008), Evaluation of real-time PM 2.5 forecasts and process analysis for PM 2.5 formation over the
eastern United States using the Eta-CMAQ forecast model during the 2004 ICARTT study, *J.
Geophys. Res.*, 113, D06204,

Roy, B., G. A. Pouliot, et al. (2007). "Refining fire emissions for air quality modeling with remotely sensed
fire counts: A wildfire case study." *Atmospheric Environment* 41(3): 655-665.

Otte, T.L., G. Pouliot, J.E. Pleim, J.O. Young, K.L. Schere, D.C. Wong, P.C.S. Lee, M. Tsidulko, J.T.
McQueen, P. Davidson, R. Mathur, H.-Y. Chuang, G. DiMego, and N.L. Seaman. Linking the Eta
Model with the Community Multiscale Air Quality (CMAQ) modeling system to build a national air
quality forecasting system. *Weather and Forecasting* 20:367-384 (2005).

Semazzi, F.H.M., J. Scroggs, G. Pouliot, A. McKee Burrows, M. Norman, V. Poojary, Y. Tsai: On the
Accuracy of Semi Lagrangian Numerical Simulation of Internal Gravity Wave Motion in the
Atmosphere., *Journal of the Meteorological Society of Japan*, Vol. 83, No 5, pp. 851-869 (2005)

Semazzi, F.H.M., D. Webb and G. Pouliot, 1996: A study of trajectory uncentering in semi-Lagrangian
models. *Journal of the Meteorological Society of Japan*, 74, No. 5, 695-707. (1996)

**SELECTED PRESENTATIONS** (9 out of 37 from 2003 to present)

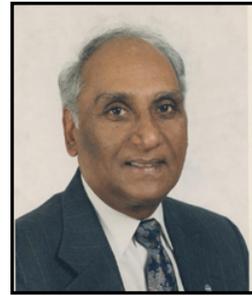
- Pouliot, G. "A Tale of Two Models: A comparison of the Biogenic Emission Inventory System (BEIS) and Model of Emissions of Gases and Aerosols from Nature (MEGAN)", Presented at 7th Annual CMAS Conference, Chapel Hill NC, Oct 6-8, 2008
- Pouliot, G., B. Roy, T. Pace, T. Pierce, & D. Mogley Development of a Biomass Burning Emissions Inventory by Combining Satellite and Ground-Based Information. Presented at 2007 EastFIRE Conference, Fairfax, VA, June 05 - 08, 2007.
- Pouliot, G., T. E. Pierce, and T. Pace. Developing Emission Inventories for Biomass Burning for Real-Time and Retrospective Modeling. Presented at 5th Annual CMAS Models-3 User's Conference, Chapel Hill, NC, October 16 - 18, 2006.
- Pouliot, G., T. Pierce and J. Vukovich. Wildland Fire Emission Modeling for CMAQ: An Update, at the 4th Annual CMAS Models-3 Users' Conference, September 26-28, 2005, Chapel Hill, NC Available at http://www.cmascenter.org/html/2005_conference/abstracts/2_6.pdf (2005)
- Pouliot, G., T. E. Pierce, W. G. Benjey, S. M. Oneill, and S. A. Ferguson. (Edmunds, WA) Wildland Fire Emissions Modeling: Integrating BlueSky and SMOKE. Presented at BlueSky Annual Meeting, Edmunds, WA, June 15 - 16, 2005.
- Pouliot, G., T. Pierce, and W. Benjey. Wildfire emission modeling: Integrating BlueSky and SMOKE. 14th Annual Emission Inventory Conference: Transforming Emission Inventories: Meeting Future Challenges Today, Las Vegas, Nevada, April 12-14, 2005. Available at: <http://www.epa.gov/ttn/chief/conference/ei14/session12/pouliot.pdf>.
- Pouliot, G. The emissions processing system for the Eta/CMAQ air quality forecast system. Preprints, 7th Conference on Atmospheric Chemistry, January 9-13, 2005, San Diego, California. American Meteorological Society, Boston, Paper No. 4.5 (2005).
- Otte, T.L., G. Pouliot, and J. Pleim. PREMAQ: A new preprocessor to CMAQ for air quality forecasting. Preprints, 3rd Annual Models-3 User's Conference, October 18-20, 2004, Chapel Hill, NC, Community Modeling and Analysis System, CD-ROM 7.1 (2004). available at: http://www.cmascenter.org/html/2004_workshop/abstracts_presentations.html
- Pouliot, G. and T. E. Pierce Jr. Emission Processing for an Air Quality Forecasting Model. Presented at International Emissions Inventory Conference, San Diego, CA, April 28-May 1, 2003.

NARRATIVE

My area of expertise is the development of emission inventories for air quality forecasting and regulatory retrospective modeling, especially those parts of the inventory that are meteorologically dependent. My emphasis has been on providing EPA, NOAA, and other members of the modeling community with practical tools for modeling wildfire and biogenic emissions.

S. TRIVIKRAMA (S.T.) RAO, DIRECTOR

Office of the Director
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D. in Atmospheric Science, 1973, State University of New York at Albany

PROFESSIONAL EXPERIENCE

Director, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC, 2008–present

Adjunct Professor, Department of Marine, Earth and Atmospheric Sciences,
North Carolina State University, Raleigh, NC, 2003–present

Director, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research
Triangle Park, NC, 2001–2008

Research Professor, Department of Earth and Atmospheric Sciences, University at Albany, Albany, NY,
1981–2004

Assistant Commissioner, New York State Department of Environmental Conservation, Albany, NY,
1996–2001

Director, Bureau of Air Research, New York State Department of Environmental Conservation, Albany,
NY, 1985–1996

Chief, Atmospheric Modeling Section, New York State Department of Environmental Conservation,
Albany, NY, 1974–1985

Research Associate, Department of Earth and Atmospheric Sciences, University at Albany, Albany, NY,
1973–1974

Senior Scientific Assistant, Institute of Tropical Meteorology, Government of India, Poona, India,
1966–1969

Lecturer, Department of Physics, Government Arts College, Nizamabad, India, 1965–1966

SELECTED AWARDS AND HONORS

EPA/ORD Bronze Medal Award, 2008

NOAA Administrator's Award, 2007

Member of the New York Academy of Sciences, 2007

Fellow of the American Meteorological Society, 2000

Frank A. Chambers Award, Air & Waste Management Association, 1999

Fellow of the Russian Academy of Sciences, 1999

Committee Member, National Academy of Sciences, National Research Council, 1984-1987, 1997-1999

Fellow of the Air & Waste Management Association, 1996

Certified Consulting Meteorologist, American Meteorological Society, 1980

SELECTED PUBLICATIONS (21 out of 200+ from 2003 to present)

"Influence of point source NO_x emission reductions on modeled processes governing ozone concentrations and chemical-transport indicators" (J.M. Godowitch, C. Hogrefe, and S.T. Rao), Submitted to *Journal of Geophysical Research*, 2007

"Diagnostic analyses of a regional air quality model: Changes in modeled processes affecting ozone and chemical-transport indicators from NO_x point source emission reductions", *Journal of Geophysical Research*, 113, D19303, doi:10.1029/2007JD009537, 2008

"Modeling analysis of the effects of changes in nitrogen oxides emissions from the electric power sector on ozone air quality in the eastern United States" (E. Gego, P.S. Porter, A. Gilliland, C. Hogrefe, and S.T. Rao), *Journal of the Air & Waste Management Association*, 58 (4): 580-588, April 2008

"Dynamic evaluation of air quality models: Assessing the changes in air quality stemming from changes in weather and emissions" (A. Gilliland, C. Hogrefe, R. Pinder, J. Godowitch, and S.T. Rao), *Atmospheric Environment*, 42: 5110-5123, June 2008

"Observation-based assessment of the impact of nitrogen oxides emissions reductions on ozone air quality over the eastern United States" (E. Gego, P.S. Porter, A. Gilliland, and S.T. Rao), *Journal of Applied Meteorology and Climatology*, Vol. 46, pp 994-1008, 2007

"Long-range transport and transboundary pollution" (S.T. Rao, C. Hogrefe, and T. Holloway), *World Atlas of Air Pollution*, Arnold Press, UK, 2008.



- "New methods for evaluating meteorological models used in air quality applications" (R. Gilliam, C. Hogrefe, and S.T. Rao), *Atmospheric Environment*, 40(26): 5073-5086, 2006.
- "Temporal features in observed and simulated meteorology and air quality over the eastern United States" (C. Hogrefe, P.S. Porter, E. Gego, A. Gilliland, R. Gilliam, J. Swall, J. Irwin, and S.T. Rao), *Atmospheric Environment*, 40(26): 5041-5055, 2006.
- "Air quality and climate change: Dual challenges for the 21st century" (W. Pennell, J. Scheraga, S.T. Rao, and G. Foley), *EM Magazine*, October 2005.
- "Assessing the compatibility of sulfate, nitrate, and ammonium concentrations measured by three air quality monitoring networks in the United States" (E. Gego, C. Hogrefe, P.S. Porter, J. Irwin, and S.T. Rao), *Pure and Applied Geophysics*, 162: 1-21, August 2005.
- "Examination of model predictions at different grid resolutions" (E. Gego, C. Hogrefe, G. Kallos, A. Voudouri, J. Irwin, and S.T. Rao), *Environ. Fluid Mechanics*, 5: 63-85, March 2005.
- "Boundary-layer evolution and its influence on ground-level ozone concentrations" (G.A. Athanassiadis, S.T. Rao, J.Y. Ku, and R. Clark), *Environmental Fluid Mechanics*, 2:339-357, 2003.
- "Assessing the effects of trans-boundary pollution between Ontario, Canada and New York, USA" (E. Brankov, R. Henry, K. Civerolo, W. Hao, S.T. Rao, P.K. Misra, R. Bloxam, and N. Reid), *Environ. Poll.*, 123:403-411, 2003.
- "Analysis of ambient, precipitation-weighted, and lake sulfur concentrations in the Adirondack region of New York" (K. Civerolo, E. Brankov, S.T. Rao, K. Roy, G.P. Lewis, and P. Galvin), *Environ. Poll.*, 123:337-345, 2003.
- "Spatial and temporal variations in the trace elemental data over the northeastern United States" (G. Athanassiades and S.T. Rao), *Environ. Poll.*, 123:439-449, 2003.
- "Evaluating the performance of regional-scale meteorological models: Effect of clouds simulation on temperature prediction" (Liu, G., C. Hogrefe, and S. T. Rao), *Atmos. Env.*, 37:1425-1433, 2003.
- "A comparison of four techniques for separating different time scales in atmospheric variables" (Hogrefe, C., S. Vempaty, S. T. Rao, and P. S. Porter), *Atmos. Env.*, 37:313-325, 2003.
- "The airshed for ozone and fine particle pollution in the northeastern United States" (K. Civerolo, H. Mao, and S.T. Rao) *Pure and Applied Geophysics*, 160:81-105, 2003.
- "Summertime characteristics of the planetary boundary layer over the eastern United States and relationships to ambient ozone levels" (S.T. Rao, J.Y. Ku, S. Berman, K. Zhang, H. Mao) *Pure and Applied Geophysics*, 160:21-55, 2003.
- "An approach for the aggregation of aerodynamic surface parameters in calculating the turbulent fluxes over heterogeneous surface in atmospheric models" (D.T. Mihailovic, S.T. Rao, C. Hogrefe, and R. Clark), *Environmental Fluid Mechanics*, 2 (4):315-337, 2003.
- "Probabilistic assessment of regional scale ozone pollution in the eastern United States" (Gego, E., C. Hogrefe, S.T. Rao, and P. S. Porter), NATO Science Series, Kluwer Academic Publishers, 2003.

NARRATIVE

I am responsible for the development and implementation of the Division's atmospheric research programs. I am also responsible for building cross-agency collaborative research programs and for managing the Division's resources, and I am accountable for program delivery. My extensive background, ranging from scientific to management to education experience, enables me to develop high-quality atmospheric research programs and to transition research to applications in a timely manner. I am actively involved in international research partnerships and collaborations involving scientists from academia and industry.

SHAWN J. ROSELLE, RESEARCH PHYSICAL SCIENTIST

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Atmospheric Science, 1991, North Carolina State University
B.S. in Meteorology, 1985, North Carolina State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1989–2008
Scientific Programmer/Analyst, Computer Sciences Corp. (USEPA contractor), Research Triangle Park, NC, 1986–1989
Meteorological Technician, NOAA/NESDIS/NCDC, Asheville, NC, 1985–1986

SELECTED AWARDS AND HONORS

USEPA Bronze Medal, 2008, CMAQ Multipollutant Model Team: For exceptional accomplishments in developing, applying, and evaluating the CMAQ multipollutant air quality model for assessing co-benefits of potential emissions management strategies
USEPA/NERL Special Achievement Award, 2007, Goal 1 – Support the Agency’s Mission: Multipollutant Model Development Team
USEPA Bronze Medal, 2004, CMAQ TEAM: The Community Multiscale Air Quality Modeling Team was recognized for the development and application of the Nation’s premier numerical air quality simulation model
USEPA Bronze Medal, 2003, ORD Five-year PM Accomplishments Team: In recognition of outstanding effort in preparation of the ORD Five-Year PM Accomplishments Reports
USEPA Bronze Medal, 1999, for outstanding team research achievement in the development and evaluation of the Models-3 Computational Framework and the Community Multiscale Air Quality Modeling System

SELECTED PUBLICATIONS (11 out of 49 from 1989 to present)

- Appel, K.W., P.V. Bhave, A.B. Gilliland, G. Sarwar, and S.J. Roselle, Evaluation of the Community Multiscale Air Quality (CMAQ) Model Version 4.5: Uncertainties and sensitivities impacting model performance; Part II - particulate matter, *Atmos. Environ.* 42, 6057-6066, 2008.
- Sarwar, G. S.J. Roselle, R. Mathur, W. Appel, R.L. Dennis, and B. Vogel, A comparison of CMAQ HONO predictions with observations from the Northeast Oxidant and Particle Study. *Atmos. Environ.* 42, 5760-5770, 2008.
- Pour-Biazar, A., R.T. McNider, S.J. Roselle, R. Suggs, G. Jedlovec, D.W. Byun, S. Kim, C.J. Lin, T.C. Ho, S. Haines, B. Dornblaser, and R. Cameron, Correcting photolysis rates on the basis of satellite observed clouds, *J. Geophys. Res.*, 112, D10302, doi:10.1029/2006JD007422, 2007.
- Mathur, R., U. Shankar, A.F. Hanna, M.T. Odman, J.N. McHenry, C.J. Coats, K. Alapaty, A. Xiu, S. Arunachalam, D.T. Olerud Jr., D.W. Byun, K.L. Schere, F.S. Binkowski, J.K.S. Ching, R.L. Dennis, T.E. Pierce, J.E. Pleim, S.J. Roselle, and J.O. Young, Multiscale Air Quality Simulation Platform (MAQSIP): Initial applications and performance for tropospheric ozone and particulate matter, *J. Geophys. Res.*, 110, D13308, doi:10.1029/2004JD004918, 2005.
- Yu, S., R. Dennis, S. Roselle, A. Nenes, J. Walker, B. Eder, K. Schere, J. Swall, and W. Robarge, An assessment of the ability of three-dimensional air quality models with current thermodynamic equilibrium models to predict aerosol NO₃⁻, *J. Geophys. Res.*, 110, D07S13, doi:10.1029/2004JD004718, 2005.
- Gilliland, A.B., R.L. Dennis, S.J. Roselle, and T.E. Pierce, Seasonal NH₃ emission estimates for the eastern United States based on ammonium wet concentrations and an inverse modeling method, *J. Geophys. Res.*, 108(D15), 4477, doi:10.1029/2002JD003063, 2003.
- Binkowski, F. and S.J. Roselle, Models-3 Community Multiscale Air Quality (CMAQ) model aerosol component, 2. Model description, *J. Geophys. Res.*, 108(D6), 4183, doi:10.1029/2001JD001409, 2003.

Mebust, M.R., B.K. Eder, F.S. Binkowski, and S.J. Roselle, Models-3 Community Multiscale Air Quality (CMAQ) model aerosol component, 2. Model evaluation, *J. Geophys. Res.*, 108(D6), 4184, doi:10.1029/2001JD001410, 2003.

Roselle, S.J. and K.L. Schere, Modeled Response of Photochemical Oxidants to Systematic Reductions in Anthropogenic VOC and NO_x Emissions, *J. Geophys. Res.*, 100, 22,929-22,941, 1995.

Roselle, S.J., Effects of Biogenic Emission Uncertainties on Regional Photochemical Modeling of Control Strategies, *Atmos. Environ.*, 28, 1757-1772, 1994.

Roselle, S.J., T.E. Pierce, and K.L. Schere, The Sensitivity of Regional Ozone Modeling to Biogenic Hydrocarbons, *J. Geophys. Res.*, 96, 7371-7394, 1991.

SELECTED PRESENTATIONS (13 out of 28 from 1989 to present)

Roselle, S., W. Appel, K. Foley, P. Bhave, J. Pleim, R. Mathur, T. Otte, R. Gilliam, G. Sarwar, C. Nolte, A. Gilliland, R. Pinder, and J. Swall, 2008, Incremental Testing of Updates to the Community Multiscale Air Quality (CMAQ) Modeling System Version 4.7, 7th Annual CMAS Conference, Chapel Hill, NC.

Roselle, S., D. Luecken, W. Hutzell, R. Bullock, G. Sarwar, and K. Schere, 2007, Development of a Multipollutant Version of the Community Multiscale Air Quality (CMAQ) Modeling System, 6th Annual CMAS Conference, Chapel Hill, NC.

Roselle, S.J., 2006, CMAQ Model Development: Current Model Configuration and Future Plans, ACCENT-CMAS Training Workshop on Air Quality Modeling, Sofia, Bulgaria.

Roselle, S.J., 2006, Application and Evaluation of CMAQ in the United States: Air Quality Forecasting and Retrospective Modeling, ACCENT-CMAS Training Workshop on Air Quality Modeling, Sofia, Bulgaria.

Schere, K., S. Roselle, and F. Binkowski, 2000, U.S. EPA's Multipollutant Models-3/Community Multiscale Air Quality Model (CMAQ), NARSTO Tropospheric Aerosols Symposium, Queretaro, Mexico.

Roselle, S.J., J.E. Pleim, K.L. Schere, A.F. Hanna, and J.-C.C. Jang, 1997, Development and Testing of an Improved Photolysis Rate Model for Regional Photochemical Modeling, Air & Waste Management Association's 90th Annual Meeting & Exhibition, Toronto, Canada.

Roselle, S.J., 1996, Archiving of SOS Data, Southern Oxidants Study (SOS) Nashville Data Analysis Workshop, Raleigh, NC.

Roselle, S.J., and K.L. Schere, 1994, Predicted Response of Regional Ozone to Across-the-Board Reductions in Anthropogenic VOC and NO_x Emissions, Fourth US/FRG/EC Workshop on Photochemical Ozone Problem and Its Control: On Urban, Regional, and Global Scale, Charleston, SC.

Roselle, S.J., 1993, Regional precursor emissions and modeled ozone distribution, Southern Oxidant Study Data Analysis Workshop, Denver, CO.

Roselle, S.J., and K.L. Schere, 1993, Results from the ROM Emission-Matrix Reduction Simulations, Southern Oxidant Study Data Analysis Workshop, Denver, CO.

Roselle, S.J., and K.L. Schere, 1993, Modeled Response of Photochemical Oxidants to Systematic Reductions in Anthropogenic VOC and NO_x Emissions, AWMA International Specialty Conference on Regional Photochemical Measurement and Modeling Studies, San Diego, CA.

Roselle, S.J., K.L. Schere, and S.-H. Chu, 1992, Estimates of Ozone Response to Various Combinations of NO_x and VOC Emission Reductions in the Eastern United States, Quadrennial Ozone Symposium, Charlottesville, VA.

Roselle, S.J. and K.L. Schere, 1990, Sensitivity of the EPA Regional Oxidant Model to Biogenic Hydrocarbon Emissions, 83rd Air & Waste Management Association Annual Meeting, Pittsburgh, PA.

NARRATIVE

My area of expertise is development, testing, evaluation, and application of air quality models. As a principal investigator, my research areas include the Community Multiscale Air Quality (CMAQ) modeling system's cloud model, the CMAQ photolysis rate model, and a diagnostic version of CMAQ that tracks sulfate formation pathways in the modeled atmosphere. I maintain the CMAQ model code archive and assist other team members in integration of code into the full model. I coordinate updates to the modeling system, develop schedules for model releases, and serve as liaison between the CMAQ Model Development and Evaluation Teams. In the past, I assisted in the integration of aerosol modules into our air quality models, and I continue to be a consultant on current aerosol module improvements. I have also conducted model sensitivity studies, including tests to understand the effects of emissions uncertainties on model results and emission control strategies.

GOLAM SARWAR, PHYSICAL SCIENTIST

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Civil Engineering (Air Resources), University of Texas at Austin
M.S. in Mechanical Engineering, University of Texas at Austin
M.S. in Mechanical Engineering, Bangladesh University of Engineering and Technology
B.S. in Mechanical Engineering, Bangladesh University of Engineering and Technology

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2003–present
Research Engineer, The University of Texas at Austin, Austin, TX, 2002–2003
Graduate Research Assistant, CEER, The University of Texas at Austin, Austin, TX, 2000–2002
Staff Environmental Engineer, Dow Chemical Corporation, Hahnville, LA, 1998–2000
Environmental Engineer, Texas Commission on Environmental Quality, TX, 1992–1998

SELECTED AWARDS AND HONORS

USEPA/ORD Bronze Medal, 2008
USEPA/AMD Superior Accomplishment Recognition Award, 2007
USEPA/ORD Bronze Medal, 2006
USEPA/NERL Special Achievement Award, 2006
USEPA/AMD Superior Accomplishment Recognition and Team Award, 2006
USEPA/AMD Superior Accomplishment Recognition Award, 2005
USEPA/AMD Superior Accomplishment Recognition Award, 2004
Merit scholarship, Bangladesh University of Engineering and Technology, 1983-1987

SELECTED PUBLICATIONS (since 1991)

Sarwar, G., V. M. Torres, and R. L. Corsi, 2008. Measurement of volatile organic compounds from industrial cooling waters, submitted to *Environmental Progress*.

Sarwar, G., D. Luecken, G. Yarwood, G. Whitten, B. Carter, 2008. Impact of an updated Carbon Bond mechanism on air quality using the Community Multiscale Air Quality modeling system: preliminary assessment. *J. of Applied Meteorology & Climatology*, 47, 3-14.

Sarwar, G., S. Roselle, R. Mathur, W. Appel, R. L. Dennis, B. Vogel, 2008. A Comparison of Community Multiscale Air Quality (CMAQ) Modeling System Predictions with Observations from the North East Oxidant and Particle Study, *Atmospheric Environment*, 42, 5760-5770.

Appel, K.W., P. V. Bhave, A. B. Gilliland, G. Sarwar, S. J. Roselle, 2008. Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: Uncertainties and sensitivities impacting model performance; Part II - particulate matter, *Atmospheric Environment*, 42, 6057-6066

Luecken, D.J., S. Phillips, G. Sarwar, and C. Jang, 2007. Effects of using the CB05 vs. SAPRC99 vs. CB4 chemical mechanism on model predictions: ozone and gas-phase photochemical precursor concentrations, *Atmospheric Environment*, doi:10.1016/j.atmosenv.2007.

Appel, K.W., A. B. Gilliland, G. Sarwar, R. C. Gilliam, 2007. Evaluation of the Community Multiscale Air Quality (CMAQ) model version 4.5: Uncertainties and sensitivities impacting model performance; Part I – ozone, *Atmospheric Environment*, doi:10.1016/j.atmosenv.2007.

Sarwar, G. and P. Bhave, 2007. Modeling the effect of chlorine emissions on atmospheric ozone across the eastern United States. *J. of Applied Meteorology and Climatology*, 46, 1009-1019.

Sarwar, G. and R. Corsi, 2007. The effects of ozone/limonene reactions on indoor secondary organic aerosols, *Atmospheric Environment*, 41, 959-973.

Sarwar, G., R. Corsi, J. Banks, K. Kinney, 2005. Ammonia emissions from pine and oak forest floors in east Texas, *Atmospheric Environment*, 39: 7137-7153.

Hubbard, H.F, B.K Coleman, G. Sarwar, R.L. Corsi, 2005. Effects of an ozone generating air purifier on indoor secondary particles in three residential buildings, *Indoor Air*, 15: 432-444.



- Sarwar, G., Olson, D., Corsi, R., Weschler, C., 2004. Indoor fine particles: the role of terpene emissions from consumer products, *J. of Air & Waste Management Association*, 54: 367-377.
- Sarwar, G., Corsi, R., Allen, D., Weschler, C., 2003. The significance of secondary organic aerosol formation and growth in buildings: experimental and computational evidence, *Atmospheric Environment*, 37: 1365-1381.
- Sarwar, G., Corsi, R., Kimura, Y., Allen, D., Weschler, C., 2002. Hydroxyl radicals in indoor environments, *Atmospheric Environment*, 36: 3973-3988.
- Matthews, R., Sarwar, G., Hall, M., Filipe, D., Miller, D., Cernansky, N., 1991. Predictions of cyclic variability in an SI engine and comparisons with experimental data, *SAE Technical Paper Series* 912345.

SELECTED PRESENTATIONS (since 2005)

- Pinder, R. W., P. V. Bhave, A. G. Carlton, R. L. Dennis, J. Godowitch, R. Mathur, S. L. Napelenok, J. Pleim, G. Sarwar, and S. Yu, 2007. CMAQ Simulated Oxidized Nitrogen: Recent Findings and Model Enhancements, 6th Annual CMAS Models-3 User's Conference, October, Chapel Hill, NC.
- Roselle, S., D. Leucken, W. Hutzell, R. Bullock, G. Sarwar, and K. Schere, 2007. Development of a Multipollutant Version of the Community Multiscale Air Quality (CMAQ) Model, the 6th Annual CMAS Models-3 User's Conference, October 1-3, Chapel Hill, NC.
- Sarwar, G., S. Roselle, R. Mathur, W. Appel, C. R. Philbrick, 2007. A comparison of Community Multiscale Air Quality (CMAQ) modeling system predictions with observations from the Northeast Oxidant and Particle Study, the Air & Waste Management Association Annual Conference, June 26-28, Pittsburgh, PA.
- Sarwar, G., R.L. Dennis, B. Vogel, 2007. The effect of heterogeneous reactions on model performance for nitrous acid, the 29th NATO/SPS International Technical Meeting on Air Pollution Modeling and its Application, September 24 -28, Aveiro, Portugal.
- Mobley, J. D., L. L. Beck, G. Sarwar, A. Reff, and M. Houyoux, 2007. SPECIATE - EPA's Database of Speciated Emission Profiles, the 29th NATO/SPS International Technical Meeting on Air Pollution Modeling and its Application, September 24 -28, Aveiro, Portugal.
- Bhave, P., G. Sarwar, W. Appel, and R. Dennis, 2006. Revised treatment of N₂O₅ hydrolysis in CMAQ, the 5th Annual CMAS Models-3 User's Conference, October, 2006 Chapel Hill, NC.
- Pleim, J., S. Roselle, P. Bhave, R. Bullock, W. Hutzell, D. Luecken, C. Nolte, G. Sarwar, K. Schere, J. Young, J. Godowitch, and W. Appel, 2006. The 2006 CMAQ release and plans for 2007, the 5th Annual CMAS Models-3 User's Conference, October 16-18, Chapel Hill, NC.
- Luecken, D. and G. Sarwar, 2006. Effects of using the CB05 versus the CB4 chemical mechanisms on model predictions, the 5th Annual CMAS Models-3 User's Conference, Chapel Hill, NC.
- Sarwar, G., D. Luecken, and G. Yarwood, 2006. Developing and implementing an updated chlorine chemistry into the Community Multiscale Air Quality model, 28th NATO/CCMS International Technical Meeting on Air Pollution Modeling and its Application, May 15-19, 2006, Leipzig, Germany. NATO/CCMS, 497-504.
- Sarwar, G and P. Bhave, 2005. Modeling the effect of chlorine emissions on atmospheric ozone and secondary organic aerosol concentrations across the United States, the EPA/NOAA Golden Jubilee Symposium, September 20-21, Durham, NC.
- Sarwar, G., D. Luecken, G. Yarwood, G. Whitten, and B. Carter, 2005. Implementing an updated Carbon Bond mechanism into the Community Multiscale Air Quality model, the 4th Annual CMAS Models-3 User's Conference, September 26-28, Chapel Hill, NC.
- Sarwar, G. and G. Gipson, 2005. The effect of chlorine emissions on tropospheric ozone in the US, the Air & Waste Management Association Annual Conference, June, Minneapolis, MN.

NARRATIVE

My research focuses on incorporating improved chemical kinetic mechanisms into the EPA's Community Multiscale Air Quality (CMAQ) modeling system. I develop, test, and refine the CMAQ modeling system for simulation of ozone, particles, and air toxics.

KENNETH L. SCHERE, SENIOR SCIENCE ADVISOR

Office of the Director
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

M.S. in Meteorology, 1975, Pennsylvania State University
B.S. in Atmospheric Sciences, 1973, Cornell University

PROFESSIONAL EXPERIENCE

Senior Science Advisor, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC, 2008–present
Senior Science Advisor, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2007–2008
Branch Chief, Atmospheric Model Development Branch, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1998–2007
Program Manager, USEPA North American Research Strategy for Tropospheric Ozone, Research Triangle Park, NC, 1995–1998
Meteorologist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA), Research Triangle Park, NC, 1975–1995

SELECTED AWARDS AND HONORS

USEPA/ORD Bronze Medal, 2008, for the CMAQ Multipollutant Model Team
NOAA Administrator's Award, 2007, for visionary leadership in the development of cross-agency partnerships to apply a "one atmosphere" air quality model which promotes meaningful and cost-effective national policies to protect human health and the environment
USEPA/NERL Special Achievement Award (High Performing Organization), 2006
NOAA Silver Medal, 2005, for building the nation's initial capability for numerical air quality forecasting
USEPA/ORD Bronze Medal, 2005, for CMAQ Team participation for its exceptional achievements in developing and evaluating the nation's premier numerical air quality model
USEPA/ORD Bronze Medal, 1999, for Models-3 CMAQ Development Team
USEPA Special Achievement Award, 1995, for helping with the formation of the NARSTO program
USEPA/ORD Bronze Medal, 1994, for research participation in the Southern Oxidants Study
USEPA/ORD Bronze Medal, 1994, for contributions to tropospheric ozone science

SELECTED PUBLICATIONS (11 out of 27 from 1983 to present)

- Yu, S., R. Mathur, D. Kang, K. Schere, and D. Tong, 2008: A study of the ozone formation by ensemble back trajectory-process analysis using the Eta-CMAQ forecast model over the northeastern U.S. during the 2004 ICARTT period. *Atmos. Environ.*, in press
- Yu, S., R. Mathur, K. Schere, D. Kang, J. Pleim, J. Young, D. Tong, G. Pouliot, S.A. McKeen, and S.T. Rao, 2008: Evaluation of real-time PM_{2.5} formation over the eastern United States using the Eta-CMAQ forecast model during the 2004 ICARTT study, *J. Geophys. Res.*, 113, D06204, doi:10.1029/2007JD009226.
- Mathur, R., S. Yu, D. Kang, and K.L. Schere, 2008: Assessment of the wintertime performance of developmental particulate matter forecasts with the Eta-Community Multiscale Air Quality modeling system, *J. Geophys. Res.*, 113, D02303, doi:10.1029/2007JD008580.
- Tong, D., R. Mathur, K. Schere, D. Kang, and S. Yu, 2007: The use of air quality forecasts to assess impacts of air pollution on crops: Methodology and case study, *Atmos. Environ.*, 41:8772-8784.
- Yu, S., R. Mathur, K. Schere, D. Kang, J. Pleim, and T. L. Otte, 2007: A detailed evaluation of the Eta-CMAQ forecast model performance for O₃, its related precursors, and meteorological parameters during the 2004 ICARTT study, *J. Geophys. Res.*, 112, D12S14, doi:10.1029/2006JD007715.
- D. Kang, R. Mathur, K. Schere, S. Yu and B. Eder, 2007: New Categorical Metrics for Air Quality Model Evaluation, *Journal of Applied Meteorology and Climatology*, 46:549-555.
- Yu, S., R. Mathur, D. Kang, K. Schere, B. Eder, and J. Pleim, 2006: Performance and diagnostic evaluation of ozone predictions by the Eta-Community Multiscale Air Quality Forecast System during the 2002 New England Air Quality Study. *Journal of the Air and Waste Management Association*, 56:1459-1471.



- Eder, B., D. Kang, R. Mathur, and K. Schere, 2006: An operational evaluation of the Eta-CMAQ air quality forecast model. *Atmospheric Environment*, 40(26):4894-4905.
- Byun, D., and K.L. Schere, 2006: Review of the Governing Equations, Computational Algorithms, and Other Components of the Models-3 Community Multiscale Air Quality (CMAQ) Modeling System. *Applied Mechanics Reviews* 59:51-77.
- Yu, S., R. Dennis, S. Roselle, A. Nenes, J. Walker, B. Eder, K. Schere, J. Swall, and W. Robarge, 2005: An assessment of the ability of three-dimensional air quality models with current thermodynamic equilibrium models to predict aerosol NO₃⁻, *J. Geophys. Res.*, doi:10.1029/2004JD004718.
- Otte, T. L., G. Pouliot, J. E. Pleim, J. O. Young, K. L. Schere, D. C. Wong, P. C. S. Lee, M. Tsidulko, J. T. McQueen, P. Davidson, R. Mathur, H.-Y. Chuang, G. DiMego, and N. L. Seaman, 2005: Linking the Eta Model with the Community Multiscale Air Quality (CMAQ) Modeling System to build a national air quality forecasting system. *Wea. Forecasting*, 20, 367-384.

SELECTED PRESENTATIONS (9 out of 65 from 1976 to present)

- Schere, K. Enhancing the Connectivity between Research and Applications- Air Pollution Meteorology and Atmospheric Chemistry Perspectives. 2008. AMS Annual Meeting, New Orleans, LA.
- Schere, K. AMS/EPA Workshop on the Evaluation of Regional-Scale Air Quality Modeling Systems (7-8 August 2007): A Summary. 2007. Meeting of Cooperation in Science and Technology in Europe, Istanbul, Turkey.
- Schere, K. Global Chemical Modeling – Relevance to Regional Air Quality Management. 2007. NOAA Atmospheric Chemical Modeling Workshop, Boulder, CO.
- Schere, K., and G. Sarwar. Accuracy and Cost Considerations in Choosing a Chemical Mechanism for Operational Use. 2006. International Conference on Atmospheric Chemical Mechanisms, Davis, CA at Univ. of California-Davis.
- Schere, K. Community Multiscale Air Quality (CMAQ) Model - Current Status and Plans. 2006 Meeting of Cooperation in Science and Technology in Europe, Riso, Denmark.
- Schere, K. Air Quality Model Evaluation-Forecasting and Retrospectives. 2006. NARSTO Workshop on Applications of Particulate Matter Models for Source Apportionment and Air Quality Management, Boulder, CO.
- Schere, K. Emergence of numerical air quality forecast models and their applications. 2006. American Meteorological Society Annual Meeting, Atlanta, GA.
- Schere, K. Air Quality Modeling for the Twenty-First Century . 2005. NOAA/EPA Golden Jubilee Symposium on Air Quality Modeling and Its Applications, R.T.P., NC.
- Schere, K. CMAQ Air Quality Modeling Developments. 2004. 29th Annual EPA-AWMA Information Exchange, Research Triangle Park, NC.

NARRATIVE

After working for NOAA at EPA's air quality research and development laboratories in Research Triangle Park, NC, for 33 years, I formally joined EPA in 2008. In my current position as the Senior Science Advisor in NERL's Atmospheric Modeling and Analysis Division, I am responsible for strategic and tactical research planning and implementation of Division programs. My research specialty has been the development and evaluation of urban- and regional-scale photochemical air quality simulation models. My experience ranges from simple photochemical box-type models, to urban airshed models, to regional-scale (1000-3000 km) grid models. From 1988 through 1993, I served as EPA's manager for the regional oxidant modeling research program, and guided the research applications of the Regional Oxidant Model. From 1994 to 2000, I was the Program Manager of EPA's integrated ozone research program, linking the research efforts in chemistry, modeling, monitoring/field studies, methods development, and emissions. I co-chaired a NARSTO team that produced a major state-of-science assessment document (2000) of tropospheric ozone pollution in North America. I was the Chief of EPA's Atmospheric Model Development Branch from 1998 to 2007, where I directed a group of 20 scientists in the development, application, and evaluation of the Models-3/Community Multiscale Air Quality (CMAQ) modeling system. I also serve on the Committee on Meteorological Aspects of Air Pollution of the American Meteorological Society, and the Committee on Mesoscale Meteorological Modeling Capabilities for Air Pollution and Dispersion Applications of the European Science Foundation.

DONNA B. SCHWEDE, PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Geology, 1985, Duke University
 B.S. in Geology, 1982, State University of New York at Cortland

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present
 Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1993–2008
 Programmer Analyst, Computer Sciences Corporation, Research Triangle Park, NC, 1987–1993
 Physical Science Teacher, Ravenscroft School, Raleigh, NC, 1984–1987

SELECTED AWARDS AND HONORS

USEPA Bronze Medal, 2008, “For informing nitrogen and mercury TMDL assessments through access to airshed model outputs”
 USEPA Bronze Medal, 2005, “The Community Multiscale Air Quality (CMAQ) Modeling Team is recognized for the development and application of the Nation’s premier numerical air quality simulation model”
 USEPA Bronze Medal, 2005, “The 3MRA Modeling Team is recognized for exemplary vision and partnership culminating in the Agency’s first comprehensive, national-scale multimedia risk assessment system”
 USEPA Office of Solid Waste and Emergency Response Team Excellence Award, 2004, “For outstanding documentation, briefing packages and timely responsiveness to support the SAB review of the 3MRA model”
 USEPA Office of Solid Waste and Emergency Response Science/Technical Achievement Award, 2001, “For exceptional efforts in developing the multipathway, multimedia, multiple receptor risk analysis tool for waste management policy development”
 USEPA Office of Solid Waste Team Excellence Award, 1999, “For exceptional and innovative contributions to the advancement of multimedia risk assessment methodologies to evaluate the management of hazardous and non-hazardous wastes”
 USEPA Bronze Medal, 1996, “For development of an air dispersion and deposition model to be used nationally for conducting routine indirect exposure assessments”

SELECTED PUBLICATIONS (12 out of 20 from 1989 to present)

Schwede, D., R. Dennis, M. Bitz. The Watershed Deposition Tool: A tool for incorporating atmospheric deposition in watershed analyses. Submitted to Journal of the American Water Resources Association.
 Wu, Y., J. Walker, C. Peters-Lidard, D. Schwede, R. Dennis, and W. Robarge. A new model of bi-directional ammonia exchange between the atmosphere and biosphere: 1. Ammonia stomatal compensation point. Accepted for publication in Journal of Agricultural and Forest Meteorology.
 Schwede, D., N. Collier, J. Dolph, T. Howe, M. Bitz. A New Tool for Analyzing CMAQ Modeling Results: Visualization Environment for Rich Data Interpretation (VERDI). 6th Annual CMAS Conference, October 1-3, 2007, Chapel Hill, North Carolina. (available at <http://www.cmascenter.org/conference/2007/agenda.cfm>)
 Wu, Y., J. T. Walker, Jr. K, C. Peters-Lidard, D. B. Schwede, R. L. Dennis, and W. Robarge (2006). Role Of Leaf Surface Water In The Bi-Directional Ammonia Exchange Between The Atmosphere And Terrestrial Biosphere. In Proceedings, Agricultural Air Quality: State of the Sciences, Potomac, MD, June 05 - 08, 2006. Ecological Society of America, Ithaca, NY, 1-9.
 Schwede, D., G. Pouliot, and T. Pierce. Changes to the biogenic emissions inventory system version 3 (BEIS3). 4th Annual CMAS Models-3 Users’ Conference, September 26-28, 2005, Chapel Hill, North Carolina. (available at <http://www.cmascenter.org/conference/2005/archive.cfm>)



- Schwede, D.B., S.K. LeDuc, and T.L. Otte. Using meteorological model output as a surrogate for on-site observations to predict deposition velocity. *Water, Air, and Soil Pollution: Focus* 1:59–66 (2001).
- Schwede, D.B., S.K. LeDuc, and T.L. Otte (2000): Using meteorological model output as a surrogate for on-site observations to predict deposition velocity. Proceedings, Sixth International conference on Air-Surface Exchange of Gases and Particles, Edinburgh, Scotland, July 3-7, 2000.
- Finkelstein, P.L., T.G. Ellestad, J.F. Clarke, T.P. Meyers, D.B. Schwede, E.O. Hebert, J.A. Neal (2000): Ozone and sulfur dioxide dry deposition to forests: Observations and model evaluation. *J. of Geophy. Res.*, 105, 15365-15377.
- Schwede, D.B., W.B. Petersen, and S.K. LeDuc. Simulating atmospheric exposure using an innovative meteorological sampling scheme. In *Air Pollution Modeling and Its Application XIV. Proceedings, Millennium NATO/CCMS International Technical Meeting on Air Pollution Modeling and Its Application, May 15–19, 2000, Boulder, Colorado*. Gryning, S.-E., and F.A. Schiermeier (Eds.). Kluwer Academic/Plenum Publishers, New York, 735–736 (2001).
- Cooter, E.J. and D.B. Schwede (2000): Sensitivity of the NOAA Multilayer Model to Instrument Error and Parameterization Uncertainty, *J. of Geophy. Res.*, 105, 6695-6707.
- Schwede, D.B., R.W. Brode, J.O. Paumier, and W.B. Petersen (1999): Simulating Atmospheric Exposure in a National Risk Assessment Using an Innovative Meteorological Sampling Scheme. Proceedings, Society of Environmental Toxicology and Chemistry 20th Annual Meeting, Philadelphia, Pennsylvania, November 14-18, 1999.
- Finkelstein, P.F., T. Ellestad, D. Schwede, E. Hebert, J. Clarke (1998): Dry deposition of SO₂ and Ozone to a deciduous forest during the 1997 growing season. AMS 23rd Agricultural and Forest Meteorology Conference, November 1998.

SELECTED PRESENTATIONS (6 out of 6 from 2005 to present)

- Juang, J-Y, and D. Schwede (2007). Utilizing the Mosaic Approach to Estimate Deposition Velocities in CMAQ Model. 6th Annual CMAS Conference, October 1-3, 2007, Chapel Hill, NC.
- Schwede, D., N. Collier, J. Dolph, T. Howe, M. Bitz. A New Tool for Analyzing CMAQ Modeling Results: Visualization Environment for Rich Data Interpretation (VERDI) (2007). 6th Annual CMAS Conference, October 1-3, 2007, Chapel Hill, NC.
- Dennis, R. L. and D. B. Schwede (2006). NADP 2006: Effects of Deposition in Coastal and Urban Environments, Norfolk, VA, October 24-26, 2006.
- Dennis, R. L., R. Mathur, D. B. Schwede, J. T. Walker, and W. Robarge (2006). The Fate And Transport Of Ammonia At The Local To Regional Level. Workshop on Agricultural Air Quality: State of the Science, Potomac, MD, June 05 - 08, 2006.
- Wu, Y., J. T. Walker, Jr. K, C. Peters-Lidard, D. B. Schwede, R. L. Dennis, and W. Robarge (2006). Role Of Leaf Surface Water In The Bi-Directional Ammonia Exchange Between The Atmosphere And Terrestrial Biosphere. Workshop on Agricultural Air Quality: State of the Sciences, Potomac, MD, June 05 - 08, 2006.
- Schwede, D., G. Pouliot, and T. Pierce (2005). Changes to the biogenic emissions inventory system version 3 (BEIS3). 4th Annual CMAS Models-3 Users' Conference, September 26-28, 2005, Chapel Hill, NC.

NARRATIVE

My current research focuses on the air-surface exchange of pollutants such as ozone, sulfur dioxide, nitric acid, and ammonia. Of particular interest is the development of modeling techniques to account for the bidirectional exchange of ammonia. My previous research centered on numerical plume modeling, particularly in complex terrain.

**HEATHER A. SIMON, POSTDOCTORAL FELLOW**

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Ph.D in Civil Engineering, 2008, University of Texas at Austin
M.S.E. in Environmental and Water Resources Engineering, 2006, University of Texas at Austin
B.S. in Earth Systems, 2001, Stanford University

PROFESSIONAL EXPERIENCE

Postdoctoral Fellow, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present
Graduate Research Assistant and Teaching Assistant, University of Texas at Austin, Austin, TX, 2004–2008
Permit Reviewer, Texas Commission on Environmental Quality, Air Permits Division, Austin, TX, 2002–2004

SELECTED AWARDS AND HONORS

University of Texas Thrust 2000 – Lymon Reese Endowed Graduate Fellowship in Engineering, 2004-2008
National Science Foundation Graduate Research Fellow, 2004-2007
Texas Commission on Environmental Quality Air Permits Division Employee of the Quarter, 2002

SELECTED PUBLICATIONS

Simon, H., Wittig, A. E., Allen, D. T., 2008. Fine particulate matter emissions inventories: comparisons of emissions estimates with observations from recent field programs, *Journal of the Air and Waste Management Association*, 58, 320-343.
Corsi, R. L., Siegel, J., Karamalegos, A., Simon, H., Morrison, G.C., 2007. Personal reactive clouds: introducing the concept of near-head chemistry, *Atmospheric Environment*, 41, 3161-3165.

SELECTED PRESENTATIONS

Simon, H., Kimura, Y., McGaughey, G., Allen, D. T., Lee, D., Byun, D., Roberts, J., Brown, S., Osthoff, H. 2007. Modeled Effects of Observed Nitryl Chloride Concentrations on Ozone Concentrations in the Houston Area. Poster presentation at the American Geophysical Union Fall Meeting, December 2007, San Francisco, CA.
Simon, H., Allen, D. T. 2006. Modeled Effects of Heterogeneous N₂O₅ Hydrolysis on Atmospheric Chemistry in the Houston Area. Air and Waste Management Association Annual Conference, June 2006, New Orleans, LA.
Simon, H., Wittig, A., Allen, D. T. 2005. Synthesis of Supersite Program Findings: Uncertainties in Emission Inventories. Poster Presentation at the American Association of Aerosol Research Annual Meeting, October 2005, Austin, TX.
Karamalegos, A., Simon, H., Zhao, P., Morrison, G., Siegel, J., Corsi, R.L. 2005. Personal Reactive Clouds: Introducing the Concept of Near Head Chemistry. Indoor Air 2005, Proceedings of the 10th International Conference on Indoor Air Quality and Climate, Beijing, China, September, 2004.

NARRATIVE

My research focuses on modeling atmospheric chemistry in regional photochemical modeling programs (the Comprehensive Air quality Model with extensions [CAMx] and the Community Multiscale Air Quality [CMAQ] model). Specific research interests include heterogeneous N₂O₅ chemistry, organic aerosol aging, secondary organic aerosol formation, and chlorine chemistry.

JOHN J. STREICHER, PHYSICAL SCIENTIST

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Graduate Studies in Engineering, 1987-1988, Clemson University
M.S. in Micrometeorology, 1987, University of British Columbia
B.S. in Physics, *magna cum laude*, 1980, University of Cincinnati

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present
Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 1993–2008
Scientific Programmer, Computer Sciences Corporation, Durham, NC, 1991–1993
Software Engineer, General Electric Corporation, Burlington, IA, 1988–1991
Physical Scientist, U.S. Dept of Agriculture, Clemson, SC, 1987–1988
Research Assistant, University of British Columbia, Vancouver, BC, 1983–1987
Physical Scientist, McDonnell-Douglas Corporation, St. Louis, MO, 1980–1983

SELECTED HONORS AND AWARDS

USEPA EMPACT Program, 2001, “In recognition of Outstanding Contributions to the Success of the
EMPACT Program”
U.S. Dept. of Commerce Bronze Medal, 1994, “For the Provision of Technical Support to Thailand in an
Air Pollution Emergency”

SELECTED PUBLICATIONS

Streicher, J.J., W.C. Culverhouse Jr., M.S. Dulberg, and R.J. Fornaro Modeling the Anatomical
Distribution of Sunlight, *Photochemistry and Photobiology* 79 (1) 2004.
Streicher, J.J., and K. Endres. Modeling Assessment of the Biological and Economic Impact of Increased
UV Radiation on Loblolly Pine in the Middle Atlantic States. in *Managing for Healthy Ecosystems*, Ed.
Rapport, Lasley, and Rolston. Lewis Publishers, 2003.
Estupinan, J.G., S. Raman, G.H. Crescenti, J.J. Streicher, and W.F. Barnard. Effects of Clouds and Haze
on UV-B Radiation. *Journal of Geophysical Research*, 101 (D11) 1996.
Lunetta, Ross S., J.F. Knight, H.W. Paerl, J.J. Streicher, B.L. Peierls, T. Gallo, J.G. Lyon, T.H. Mace, C.P.
Bozzelli. Measurement of Case II water color using AVIRIS Imagery in Pamlico Sound, North
Carolina, USA Accepted by *International Journal of Remote Sensing*, 2008.

NARRATIVE

My area of expertise is developing models of solar irradiance, and integrating those models into applied problems in photobiology and photochemistry. My current photochemistry application is in the development of a comprehensive radiance model that will be used to calculate spectral actinic flux in the Community Multiscale Air Quality (CMAQ) modeling system. The radiance model will incorporate atmospheric, geodesic, and physiographic independent variables. Recent photobiology applications have integrated radiative transfer models with 3-D graphic models of the human form to develop a comprehensive source-to-dose software platform to study the relationship of solar irradiance to skin cancers, cataract induction, and UV-induced immunosuppression. Photobiology applications with an ecological theme have included remote sensing image processing (also known as “atmospheric correction”) of upwelling radiance to derive surface reflectance, which is used for surface materials identification.

JENISE SWALL, STATISTICIAN

Applied Modeling Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Statistics and Decision Sciences, 1999, Duke University
M.S. in Statistics and Decision Sciences, 1996, Duke University
B.S. in Mathematics, 1994, Massachusetts Institute of Technology

PROFESSIONAL EXPERIENCE

Statistician, USEPA/ORD/NERL/AMAD/AMB, Research Triangle Park, NC, 2008–present
Statistician, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, NC, 2003–2008
Assistant Professor of Mathematics, Kenyon College, Gambier, OH, 2001–2003
Visiting Faculty Program, Los Alamos National Laboratory, Los Alamos, NM, 2002
Visiting Assistant Professor, Duke University, Durham, NC, 2000–2001
Assistant Applications Developer, SAS Institute, Cary, NC, 1996–1997

SELECTED AWARDS AND HONORS

USEPA/ORD Bronze Medal for Commendable Service Award, 2007, “Accountability: Evaluating the Effectiveness of the NO_x SIP Call Program in Improving Ozone Air Quality Over the Eastern U.S.”

SELECTED PUBLICATIONS (12 out of 12 from 1999 to present)

- Swall, J. L., K. M. Foley. The impact of incommensurability on model evaluation strategies: Moving beyond the comparison of matched observations and model grid cells. *Atmospheric Environment* (in press).
- Irwin, J., K. Civerlo, C. Hogrefe, K. Appel, K. Foley, J. Swall, 2008. A procedure for inter-comparing the skill of regional-scale air quality model simulations of daily maximum 8-hour ozone values. *Atmospheric Environment*, Vol. 42, No. 21, 5403-5412.
- Cooter, E.J., J. Swall, R. Gilliam, 2007. Comparison of 700 hPa NCEP-R1 and AMIP-R2 wind patterns over the continental U.S. using cluster analysis. *Journal of Applied Meteorology and Climatology*, Vol. 46, No. 11, pp. 1744-1758.
- Cooter, E., R. Gilliam, W. Benjey, C. Nolte, J. Swall, and A. Gilliland. Examining the impact of changing climate on regional air quality over the U.S. *Developments in Environmental Science*, Chp. 6.1, Vol. 6, 2007.
- Zheng, J., J.L. Swall, W.M. Cox, and J.M. Davis, 2007. Interannual variation in meteorologically adjusted ozone levels in the eastern United States: a comparison of two approaches. *Atmospheric Environment*, Vol. 41, No. 4, 705-716
- Koračin, D., A. Panorska, V. Isakov, J. Touma, and J. Swall, 2007. A statistical approach for estimating uncertainty in dispersion modeling: An example of application in southwestern U.S. *Atmospheric Environment*, Vol. 41, No. 3, 617-628
- Swall, J.L. and J.M. Davis, 2006. A Bayesian statistical approach for the evaluation of CMAQ. *Atmospheric Environment*, Vol. 40, No. 26, 4883-4893.
- Ching, J., J. Herwehe, and J. Swall, 2006. Paradigm using joint deterministic grid modeling and sub-grid variability stochastic descriptions as a template of model evaluation. *Atmospheric Environment*, Vol. 40, No. 26, 4935-4945.
- Hogrefe, C., P.S. Porter, E. Gego, A. Gilliland, R. Gilliam, J. Swall, J. Irwin, and S.T. Rao, 2006. Temporal features in observed and predicted meteorology and air quality over the Eastern United States. *Atmospheric Environment*, Vol. 40, No. 26, 5041-5055.
- Davis, J.M. and J.L. Swall, 2006. An examination of the CMAQ simulations of the wet deposition of ammonium from a Bayesian perspective. *Atmospheric Environment*, Vol. 40, No. 24, 4562-4573.
- Yu, S., R. Dennis, S. Roselle, A. Nenes, J. Walker, B. Eder, K. Schere, J. Swall, and W. Robarge, 2005. An assessment of the ability of 3-D air quality models with current thermodynamic equilibrium models to predict aerosol NO₃⁻. *Journal of Geophysical Research*, 110, D07S13, doi:10.1029/2004JD004718.



Higdon, D., J. Swall, and J. Kern. Non-Stationary Spatial Modeling. *Bayesian Statistics 6*, Oxford University Press, 1999

SELECTED PRESENTATIONS (8 out of 8 from 2004 to present)

Swall, J. and K. Foley. "The impact of incommensurability on model evaluation strategies: Moving beyond the comparison of matched observations and model grid cells", March 2008

Foley, K.M. and J. Swall. "Statistical methods for model evaluation – moving beyond the comparison of matched observations and output for model grid cells", poster, 2007 CMAS Models-3 Users' Conference, October 2007

Swall, J., "Exploratory analysis of the relationship between ozone predictions by CMAQ and meteorological factors", U.S. EPA Atmospheric Modeling Division seminar series, March 2007

Swall, J., "Some recent work in the analysis of ozone time series", U.S. EPA Atmospheric Modeling Division seminar series, March 2006

Swall, J., "Some statistical issues in the evaluation of air quality models", North Carolina State University environmental statistics seminar series, September 2005

Davis, J., and Swall, J., "A statistical evaluation of CMAQ simulations of the wet deposition of ammonium", U.S. EPA Atmospheric Modeling Division seminar series, June 2005

Swall, J., and Davis, J. "Bayesian statistical approaches for the evaluation of CMAQ", poster, 2004 CMAS Models-3 Users' Conference, October 2004

Swall, J., "Nonstationary spatial modeling of environmental data using a process convolution approach", Joint Statistical Meetings, August 2004

NARRATIVE

My research interests lie mainly in the area of Bayesian statistical modeling, with a particular concentration on spatial processes. My work focuses on the development and application of appropriate spatial and/or temporal statistical modeling techniques for evaluations of the Community Multiscale Air Quality (CMAQ) model and for analyses based on monitoring data.



ALFREIDA TORIAN, IT SPECIALIST

Emissions and Model Evaluation Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

B.S. in Mathematics, 1978, Fayetteville State University

PROFESSIONAL EXPERIENCE

IT Specialist, USEPA/ORD/NERL/AMAD/EMEB, Research Triangle Park, NC,
2008–present

IT Specialist, NOAA Atmospheric Sciences Modeling Division (in partnership with
USEPA/NERL), Research Triangle Park, NC, 1999–2008

Computer Specialist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL),
Research Triangle Park, 1990–1999

Computer Programmer, Meteorology Division, NOAA Air Resources Laboratory, Research Triangle Park,
NC, 1982–1989

NARRATIVE

My area of expertise is the development and updating of databases for analyzing and comparing data sets from various monitoring networks with atmospheric model results. This analysis is used for model evaluations and validations during the various phases of model development.

JAWAD S. TOUMA, PHYSICAL SCIENTIST

Atmospheric Exposure Integration Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

M.S. in Atmospheric Science, 1970, University of Missouri–Columbia
B.S. in Meteorology, 1968, San Jose State University

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD/AEIB, Research Triangle Park, NC, 2008–present

Physical Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA), Research Triangle Park, NC, 1984–2008.

SELECTED PUBLICATIONS (2006 to present)

Ozkaynak, H., Palma, T., Touma, J.S., and J. Thurman. Modeling Population Exposures to Outdoor Sources of Hazardous Air Pollutants. *Journal of Exposure Science and Environmental Epidemiology* 18(1): 45-58 (2008).

Cook, R., V. Isakov, J. Touma, W. Benjey, J. Thurman, E. Kinnee, D. Ensley. Resolving Local Scale Emissions for Near Road Modeling Assessments. *J. A&WMA*. 58: 451-461. (2008).

Isakov, V., J. Touma, A. Khlystov. A Method of Assessing Air Toxics Concentrations using Mobile Platform Measurements. *J. A&WMA*. 57: 1286-1295 (2007).

Isakov, V., A. Venkatram, J. Touma, D. Koračin, and T. L. Otte. Evaluating the Use of Outputs from Comprehensive Meteorological Models in Air Quality Modeling Applications. *Atmospheric Environment*. 41: 1352-2310 (2007).

Koračin, D., A. Panorska, V. Isakov, J. S. Touma, and J. Swall. A Statistical Approach for Estimating Uncertainty in Dispersion Modeling: an Example of Application in Southwestern U.S. *Atmospheric Environment*. 41: 617-628 (2007).

Touma, J. S., V. Isakov, A. Cimorelli, B. Anderson, and R. Brode. Using Prognostic Model Generated Meteorological Data in the AERMOD Dispersion Model: An Illustrative Application in Philadelphia. *J. A&WMA*. 57: 586-595 (2007).

Cook, R., J.S. Touma, A. Fernandez, D. Brzezinski, C. Bailey, C. Scarbro, J. Thurman, D. Ensley, M. Strum, and R. Baldauf. Impact of underestimating the effects of cold temperature on motor vehicle start emissions of air toxics in the United States. *Journal of Air & Waste Management Association* 57:1469-1479 (2007).

Cook, R., Strum M., Touma, J.S., Palma, T., Thurman, J., Ensley, D. and R. Smith. Inhalation exposure and risk from mobile source air toxics in future years. *J. Expos. Sci.& Environ. Epidemi.* 17: 95–105 (2007).

Touma, J.S., Cox, W., M., and J.A. Tikvart. Spatial and Temporal Variability of Ambient Air Toxics Data. *J. Air & Waste Manage. Assoc.*, 56:1716-1725 (2006).

Touma, J. S., V. Isakov, J. Ching, and C. Seigneur. Air quality modeling of hazardous pollutants: current status and future directions. *J. A&WMA*. 56: 547-558 (2006).

Cook, R., Touma, J. S., Beidler, A., and M. Strum. Preparing Highway Emissions for Urban Scale Modeling: A Case Study in Philadelphia. *Transportation Research Part D*, 11: 396-407 (2006).

NARRATIVE

My research over the past 25 years has focused on performing atmospheric modeling and data analysis for a variety of applications relating to air quality dispersion models. This work has included technique evaluations and applications of spatially resolved air quality models for air toxic pollutants in urban areas, and developing user's manuals and guidance documents. My emphasis during the past five years has been to provide USEPA and the modeling community with better modeling techniques for estimating local-scale impacts (especially mobile sources), and to link these air quality model estimates with human exposure models for use in human health impact studies.

**GARY L. WALTER, COMPUTER SCIENTIST**

Office of the Director
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

M.S. in Systems Engineering, 1992, George Mason University
B.S. in Electronic Engineering and Computer Engineering, 1985, George Mason University

PROFESSIONAL EXPERIENCE

Computer Scientist, USEPA/ORD/NERL/AMAD, Research Triangle Park, NC, 2008–present
Computer Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1992–2008
Electronic Engineer, Center for Night Vision and Electro-Optics, 1991–1992
Faculty Researcher, Center for Automation Research, Univ. of Maryland, College Park, MD, 1990–1991
Electronic Engineer, Night Vision Laboratory, 1985–1990

SELECTED AWARDS AND HONORS

USEPA Bronze Medal, 2005, Scientific Collaboration and Infrastructure Team
USEPA Bronze Medal, 2004, CMAQ Development Team

SELECTED PUBLICATIONS (4 out of 15 from 2004 to present)

FY 2008 National Information and Technology Research and Development Supplement to the President's Budget, EPA
FY 2007 National Information and Technology Research and Development Supplement to the President's Budget, EPA
SC2004 BOF: High-End Computing Revitalization Task Force (HECRTF), "Federal Plan for High-End Computing." EPA
High End Computing Revitalization Task Force Report: Federal Plan for High End Computing 2004, EPA

SELECTED PRESENTATIONS (9 out of 30 from 2004 to present)

NITRD Agencies, OPM AT NSF Date: 7/08 "EPA FY08 NITRD Priorities"
White House OSTP, NITRD Agencies, OPM AT NSF Date: 2/07, "EPA FY07 NITRD Program"
NITRD Agencies, OPM AT NSF Date: 9/06, "EPA HCI & IM IWG Review"
White House OSTP, NITRD Agencies, OPM AT NSF Date: 2/06, "EPA FY06 NITRD Program"
EPA Science Forum Date: 5/05, "EPA Compute and Data Grid"
EPA Science Forum Date: 5/05, "A Pilot Study for Near Real-time Aerosol Modeling and Air Quality Characterization"
Earth Science Information Partners conference Date: 6/05, "Remote Sensing Information Gateway," with Valerie Garcia EPA/ORD
White House Conference Center Date: 6/04, "High-End Computing Revitalization Task Force EPA participation" presentation to Dr. Marburger, Director White House OSTP, with Paul Gilman EPA/ORD AA
SC2004 Date: 11/04, "SC2004 BOF: High-End Computing Revitalization Task Force (HECRTF)", "Federal Plan for High-End Computing." EPA

NARRATIVE

I have served as primary focal point for planning and implementing the Division's scientific computing infrastructure, which is based on a high-end computing (HEC) architecture. As part of this effort, I have concentrated on the following two areas during FY08-09:

- Scientific Data Distribution—To overcome a deficiency in model data access, scientists are actively engaged in a grass-roots effort to develop a framework to share data and research findings over the Internet. Some current examples of technologies to distribute data include OPeNDAP, ADDE, and netCDF access via the HTTP protocol. Many agencies are actively pursuing strategies to improve model data access. I am investigating a distributed data services pilot for format-



independent access to environmental data, addressing the summit call for the exchange of observations in a full and open manner and also a Google-type data investigation service.

- Grid Services—Organizations around the world are utilizing grid services today. Built on pervasive Internet standards, grid services enable organizations to share computing and information resources across department and organizational boundaries in a secure, highly efficient manner.

**JEFFREY WEST, PHYSICAL SCIENTIST**

Office of the Director
Atmospheric Modeling and Analysis Division

**EDUCATION/TRAINING**

Graduate Studies in Environmental Engineering, 1977, Clemson University
B.S. in Environmental Science 1975, Stockton State College

PROFESSIONAL EXPERIENCE

Physical Scientist, USEPA/ORD/NERL/AMAD, 2008–present
Physical Scientist Administrator, NOAA Atmospheric Sciences Modeling Division
(in partnership with USEPA/NERL), Research Triangle Park, NC, 2000–2008
Senior Scientist, General Public Utilities/Metropolitan Edison, Reading, PA, 1990–1999
Senior Scientist, Pennsylvania Power and Light, Allentown, PA, 1982–1990
Project Scientist, Environmental Science and Engineering, Inc., Gainesville, FL, 1977–1982

SELECTED AWARDS AND HONORS

USEPA Bronze Medal for Commendable Service, 2006
USEPA Special Achievement Quality Assurance Award, 2006
USEPA Bronze Medal for Commendable Service, 2004

SELECTED PUBLICATIONS

Peterson, R.L. and West, J.L. 1993. Effect of a Nearby Hill on Good Engineering Practice Stack height, APCA 93-MP-2.04
West, J.L. and Ferullo, A.F. 1990. Doppler Acoustic Sounder Performance Audit: Tower vs. Sounder, APCA 90-86.2
West, J.L. and Ferullo, A.F. 1990. An On-Site Meteorological Monitoring Plan using Doppler Acoustic Sounders, APCA 90-86.3

NARRATIVE

For the past eight years I have been the appointed Associate Management Coordinator of A North American Consortium for Atmospheric Research in Support of Air-Quality Management (NARSTO). NARSTO is a multi-stakeholder entity organized in 1994 to sponsor cooperative, policy-relevant air quality research throughout North America. The major governmental (Canada, United States, Mexico) agencies involved with air quality research are all sponsoring members of the organization, as are numerous other public and private organizations. Together with the NARSTO Management Coordinator (William Pennell), I coordinate the functions of the organization, including production of major state-of-science assessments approximately every two years. In addition, I am responsible for the NARSTO Quality Systems Science Center located at Oak Ridge National Laboratory, which provides long-term data archiving services and quality assurance guidance to NARSTO members.

Prior to my federal employment I was involved with many aspects of air-quality-related science, ranging from managing a very large field study (NARSTO NE) involving over 100 supporting organizations to licensing and permitting of major sources. I was the lead project scientist involved with the installation of the first certified continuous emission monitor system (CEMS) in the United States. In the 1980s I was a nuclear quality assurance auditor for the radiation environmental monitoring programs required for all operating nuclear power plants.

DAVID WONG, COMPUTATIONAL SCIENTIST

Atmospheric Model Development Branch
 Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Computer Science, 1996, North Carolina State University
 M.S. in Applied Mathematics, 1990, Oklahoma State University
 B.S. in Computer Science and Mathematics (double majors), 1988, Oklahoma State University

PROFESSIONAL EXPERIENCE

Computational Scientist, USEPA/ORD/NERL/AMD/AMDB, Research Triangle Park, NC 2008–present.
 Computational Scientist, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 2006–2008
 Senior Consultant-Science Applications, Lockheed Martin, SAIC (USEPA contractor), Research Triangle Park, NC, 1998–2006

SELECTED AWARDS AND HONORS

Spot Award, Lockheed Martin, 2005
 Appreciation acknowledgment for Air Quality Forecasting System from NOAA and USEPA, 2003
 Lightning Awards, Lockheed Martin, 1999, 2002

SELECTED PUBLICATIONS

Pleim, J., Young, J., Wong, D. C., Gilliam, R., Otte, T., and Mathur, R., “Two-Way Meteorology and Air Quality Modeling”, Ch. 2.16, *Air Pollution Modeling and its Application XIX*, Springer, 2008
 Otte, T. L.; Wong, D. C.; et al, “Linking the Eta Model with the Community Multiscale Air Quality (CMAQ) Modeling System to Build a Real-Time National Air Quality Forecasting System”, *Weather and Forecasting*, Volume 20, Issue 3 (June 2005) pp. 367–384.
 Lee, P. C.; Wong, D. C.; et al, “Linking the ETA Model with the Community Multiscale Air Quality (CMAQ) Modeling System: Boundary Condition for Ozone Concentration”, 27th NATO/CCMS International Technical Meeting on Air Pollution Modelling and its Application, Banff, Canada, October 25-29 2004.
 Wong, D. C. and Karimi H. A., “Parallel Polygon-on-Polygon and Line-in-Polygon Intersection Algorithms”, International Conference on Parallel and Distributed Processing Techniques and Applications (PDPTA '00), Las Vegas, NV, June 26 - 29, 2000.
 Wong, D. C.; Davis, E. W.; and Young, J. O., “A Software Approach to Enhancing Performance by Avoiding Cache Collisions”, *IEEE Transaction on Parallel and Distributed Systems*, Vol. 9, No. 6, June 1998
 Wong, D. C.; Davis, E. W.; and Young, J. O, “Optimizing a Photochemical Air Quality Model Gas-Phase Chemistry Solver for Parallel Processing”, Proc. of the A&WMA's Computing in Environmental Resource Management Conference, Raleigh, NC, December 2 - 4, 1996.
 Wong, D. C; Davis, E. W; and Thomas. M, “Enhancing the Performance of Parallel Processors: Experiments with Loop Constructs and Tiling”, Proc. of the International Conference on Parallel and Distributed Processing Techniques and Applications, Athens, GA, Nov. 3 - 4, 1995

SELECTED PRESENTATIONS

Wong, D. C. “A Parallel Program Building Block”, IAMA Conference, UC Davis, December 5-7, 2007. (invited)
 Wong, D. C. “WRF-CMAQ Two-way Coupling System”, Chinese Research Academy of Environmental Sciences, Beijing, China, November 2007. (invited)
 Wong, D. C., “CMAQ and High Performance Computing”, International Workshop on Regional Air Quality Management in Rapidly Developing Economic Regions”, Zhuhai, China, March 12-13, 2007. (invited)
 Wong, D. C., “Executing CMAQ in Parallel: A Time Saving Approach”, Tsinghua University, Beijing, October, 2005. (invited)
 Wong, D. C., and Young, J. O., “Computational Aspects of the Air Quality Forecasting version of CMAQ (CMAQ-F)” 3rd Annual CMAS Models-3 conference, Chapel Hill, NC, October 18-20, 2004.



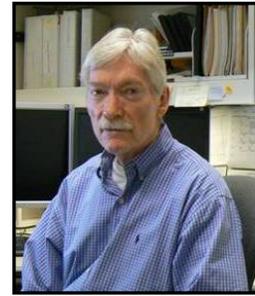
Wong, D.C., "Mathematical Offsetting Scheme to Improve Alignment and Enhance Performance on MPP Systems", Meeting on the Optimization of Codes for Cray MPP Systems, Pittsburgh Supercomputer Center, Pittsburgh, PA, January 24-26, 1996.

NARRATIVE

My area of expertise is in scientific computing and numerical algorithms. My work focuses on parallel algorithm design, general-purpose processor communication libraries, and code optimization for the Community Multiscale Air Quality (CMAQ) model and the Air Quality Forecasting (AQF) modeling system.

JEFFREY O. YOUNG, RESEARCH PHYSICAL SCIENTIST

Atmospheric Model Development Branch
Atmospheric Modeling and Analysis Division



EDUCATION/TRAINING

Ph.D. in Fluid Mechanics, 1970, Brown University
M.S. in Aerospace Engineering, 1965, Pennsylvania State University
B.S. in Aerospace Engineering, *cum laude*, 1961, Pennsylvania State University

PROFESSIONAL EXPERIENCE

Research Physical Scientist, USEPA/ORD/NERL/AMAD/AMDB, Research Triangle Park, NC, 2008–present
Mathematician, NOAA Atmospheric Sciences Modeling Division (in partnership with USEPA/NERL), Research Triangle Park, NC, 1991–2008
Technical Project Leader, Computer Sciences Corporation, Research Triangle Park, NC, 1986–1991
Scientific Applications Analyst, Computer Data Systems, Inc., Research Triangle Park, NC, 1983–1986
Assistant Professor of Mathematics (Visiting), University of North Carolina, Chapel Hill, NC, 1983–1984
Assistant Professor of Aerospace Engineering, Ohio State University, Columbus, OH, 1969–1973
National Science Foundation Trainee, Brown University, Providence, RI, 1966–1969
Research Assistant, Pennsylvania State University, University Park, PA, 1961–1966

SELECTED AWARDS AND HONORS

NOAA Silver Medal, 2005, for exceptional achievement in developing, testing, and implementing national air quality forecasting in less than two years
USEPA Bronze Medal, 2005, for contribution to the development and application of the Nation's premier numerical air quality simulation model
USEPA Silver Medal, 1999, for outstanding team research achievement in the development and evaluation of the Models-3 Computational Framework and the Community Multi-Scale Air Quality Modeling System

SELECTED PUBLICATIONS

Pleim, J., S. Roselle, P. Bhawe, R. Bullock, W. Hutzell, D. Luecken, C. Nolte, G. Sarwar, K. Schere, J. Young, J. Godowitch, and W. Appel, The 2006 CMAQ Release and Plans for 2007, Extended abstract for the 5th Annual CMAS Conference, Chapel Hill, October 16-18, 2006
Yu, S., R. Mathur, K. Schere, D. Kang, J. Pleim, J. Young, D. Tong, G. Pouliot, S. A. McKeen, and S. T. Rao (2008), Evaluation of real-time PM_{2.5} forecasts and process analysis for PM_{2.5} formation over the eastern United States using the Eta-CMAQ forecast model during the 2004 ICARTT study, *J. Geophys. Res.*, 113, D06204, doi:10.1029/2007JD009226
Otte, T. L., G. Pouliot, J. E. Pleim, J. O. Young, K. L. Schere, D. C. Wong, P. C. S. Lee, M. Tsidulko, J. T. McQueen, P. Davidson, R. Mathur, H.-Y. Chuang, G. DiMego and N. L. Seaman. 2005: Linking the Eta Model with the Community Multiscale Air Quality (CMAQ) Modeling System to Build a National Air Quality Forecasting System. *Weather and Forecasting*: Vol. 20, No. 3, pp. 367-384
Mathur, R., U. Shankar, A. Hanna, M. T. Odman, J. N. McHenry, C. J. Coats, Jr., K. Alapaty, A. Xiu, S. Arunachalam, D. T. Olerud, Jr., D. W. Byun, K. L. Schere, F. S. Binkowski, J. K.S. Ching, R. L. Dennis, T. E. Pierce, J. E. Pleim, S. J. Roselle, J. O. Young, 2005, The Multiscale Air Quality Simulation Platform (MAQSIP): Initial Applications and Performance for Tropospheric Ozone and Particulate Matter, *J. Geophys. Res.*, 110, D13308, doi:10.1029/2004JD004918, 2005
Pleim, J., S. Roselle, J. Young, G. Gipson, and R. Mathur, New Developments in the Community Multiscale Air Quality (CMAQ) Model, Extended abstract for the 3rd Annual CMAS Models-3 Users' Conference, Chapel Hill, October 18-20, 2004
Pleim, J., G. Gipson, S. Roselle, and J. Young, New Features of the 2003 Release of the CMAQ Model, Extended abstract for the 2nd Annual CMAS Models-3 Users' Conference, Research Triangle Park, October 27-29, 2003
Pleim, J., F. Binkowski, R. Dennis, J. Godowitch, T. Otte, T. Pierce, S. Roselle, K. Schere, and J. Young. Application of the Models-3 Community Multiscale Air Quality (CMAQ) model system to SOS/Nashville 1999. Preprints, 12th Joint Conference on the Applications of Air Pollution



Meteorology with A&WMA, May 20-24, 2002, Norfolk, Virginia. American Meteorological Society, Boston, May 20-24, 2002

Sections in "Science Algorithms of the EPA Models-3 Community Multiscale Air Quality (CMAQ) Modeling System", March 1999, EPA/600/R-99/030:

- Section 6: Byun, D. W., Young, J. O., Odman, M. T., Governing Equations and Computational Structure of the Community Multiscale Air Quality (CMAQ) Chemical Transport Model
- Section 7: Byun, D. W., Young, J. O., Pleim, J. E., Odman, M. T., Alapaty, K., Numerical Transport Algorithms for the Community Multiscale Air Quality (CMAQ) Chemical Transport Model
- Section 8: Gipson, G. L., Young, J. O., Gas-Phase Chemistry
- Section 15: Young, J. O., Program Control Processing in Models-3
- Section 18: Young, J. O., Integration of Science Codes into Models-3

Wong, D. C., Davis, E. W., Young, J. O., A Software Approach to Avoiding Spatial Cache Collisions in Parallel Processor Systems, IEEE Transactions on Parallel and Distributed Systems, Vol. 9, No. 6, June 1998

Mathur, R., Young, J. O., Schere, K. L., Gipson, G. L., A Comparison of Numerical Techniques for Solution of Atmospheric Kinetic Equations, Atmos. Env. Vol. 32, No. 9, pp. 1535-1553, 1998

Young, J. O., et al., The Regional Oxidant Model (ROM) User's Guide Part 3: The Core Model, EPA/600/8-90/083c, U.S. Environmental Protection Agency, 1991

Young, J. O., et al., Development of the Regional Oxidant Model Version 2.1, EPA-600/3-89/044, U.S. Environmental Protection Agency, 1989

Young, J. O. and Holl, J. W., Effects of Cavitation on Periodic Wakes Behind Symmetric Wedges, Trans. ASME, Ser. D, Vol. 88, 1966

Lehman, A. F. and Young, J. O., Experimental Investigations of Incipient and Desinent Cavitation, Trans. ASME, Ser. D, Vol. 86, 1964

Young, J. O., Preliminary Investigation of the Unsteady Cavity and Wake behind a Wedge at Zero Angle of Attack, Ordnance Research Laboratory Internal Memorandum, File No. 5.3410-07, The Pennsylvania State University, 1962

SELECTED PRESENTATIONS

Young, J. O., Layer Dependent Advection in CMAQ, Presented at the 4th Annual CMAS Models-3 Users' Conference, Chapel Hill, NC, Sep. 27, 2005

Young, J. O., Computational Aspects of the Air Quality Forecasting Version of CMAQ (CMAQ-F), Presented at the 3rd Annual CMAS Models-3 Users' Conference, Chapel Hill, NC, Oct. 19, 2004

Young, J. O., Recent Developments for Parallel CMAQ, Presented at the Models-3 Users' Workshop, Res. Tri. Pk., Oct. 27-29, 2003

Young, J. O., Wong, D. C., Bourgeois, A. J., Parallel CCTM User Guide, Presented at the Sixth SIAM Conference on Mathematical and Computational Issues in the Geosciences, Boulder, CO, June 11-14, 2001

Godowitch, J. M., Young, J. O., Photochemical Simulations of Point Source Emissions with the Models-3 CMAQ Plume-In-Grid Approach, Presented at the 93rd Annual Meeting of the AWMA Conference, Salt Lake City, UT, June 18-22, 2000, EPA/600/A-00/016

Roberts, A. and Young, J. O., The Regional Oxidant Model Multi-Processor (ROMMP), presented at the 83rd Air & Waste Management Association Annual Meeting, Pittsburg, PA, June 1990

Young, J. O. and Burggraf, O. R., Terminal Similarity Solutions of the Vortex Boundary Layer, presented at the University of Chicago, Feb. 1973 – also cited in: Odus R. Burggraf and Keith Stewartson, The Ladder Structure of the Generalised Vortex, Jour. App. Math. And Physics (ZAMP), Vol. 26, 1975

NARRATIVE

A key interest is applying mathematical and computational analysis to environmental model algorithms to improve the performance of environmental models. For over 10 years I have been involved in the architectural design of the Community Multiscale Air Quality (CMAQ) modeling system and have implemented many of the scientific components. I am also engaged in developing various state-of-the-science physical science processes simulated in CMAQ.