

**Dr. Joshua P. Schwarz**

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National Oceanic and Atmospheric Administration (NOAA)  
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**SPECIALIZED SCIENTIFIC COMPETENCE**

- In situ measurements of black carbon and total aerosol from the ground to the lower stratosphere using airborne instrumentation.
- Modeling of the optical properties of bare and coated black carbon particles in the context of experimental analysis.
- Engineering and testing of complex measurement systems in the laboratory and field.
- Written and oral communication of science results to the scientific community.

**EDUCATION**

Ph.D. Physics, 1998, University of Colorado, Boulder.  
M.S. Physics, 1996, University of Colorado, Boulder.  
B.S. Physics, 1993, University of Massachusetts, Amherst. Cum laude.

**EMPLOYMENT HISTORY**

- 2003 – Present    **Research Scientist II.** CIRES, University of Colorado/NOAA Earth System Research Laboratory, Chemical Sciences Division, Boulder, CO.
- Lead scientist developing and operating the NOAA Single Particle Soot Photometer (SP2).
- 2001 – 2003    **Research Scientist.** Swiss Federal Office of Metrology and Accreditation (METAS), Bern, Switzerland.
- Spearheaded investigations into sources of systematic uncertainty in the METAS Electronic Kilogram Experiment.
- 1999 – 2001    **National Research Council Postdoctoral Fellow.** National Institute of Standards and Technology (NIST), Electricity Division, Fundamental Electrical Measurements Group, Gaithersburg, MD.
- Research into systematic error sources in the NIST Electronic Kilogram Experiment.
- 1993 – 1998    **Graduate Research and Teaching Assistant.** JILA, University of Colorado/NIST, Boulder, CO.
- Developed and executed an innovative measurement of the Newtonian constant of gravity.

## **FIELD CAMPAIGNS**

- 2008 C3-STAR Pearl River Delta Campaign, Kaiping, China (PKU)
- 2008 Aerosol, Radiation, and Cloud Processes affecting Arctic Climate, Fairbanks, AK (NOAA)
- 2007 Tropical Composition, Cloud, and Climate Coupling, San Jose, Costa Rica (NASA)
- 2006 Texas Air Quality Study / Gulf of Mexico Atmospheric Composition and Climate Study, Houston, TX (NOAA)
- 2006 Costa Rican Aura Validation Experiment, San Jose, Costa Rica (NASA)
- 2004 Aura Validation Experiment, Houston, TX (NASA)

## **COLLABORATIVE ACTIVITIES**

- Provided instruction and support for the Single Particle Soot Photometer (SP2)
  - Andreas Petzold Group, German Aerospace Center, 2008
  - Antony Clarke Group, Department of Oceanography, University of Hawaii at Manoa, 2008
  - Hugh Coe Group, University of Manchester, 2006
  - Yutaka Kondo Group, University of Tokyo, 2006-2008
- Initiated, organized, and conducted SP2 inter-comparisons between NOAA, University of Hawaii, and University of Tokyo, 2008.
- Suggested black carbon test materials, provided samples, characterizations, and support
  - Sussane Paulson Group, Dept. of Atmospheric and Oceanic Sciences, UCLA 2006, 2007
  - Yinon Rudich Group, Weizmann Institute, Israel, 2007
- Led NOAA SP2 involvement in the Boston College Black Carbon Intercomparison with instruments from Desert Research Institute, Aerodyne Inc., Boston College, and Thermo Scientific Inc, Droplet Measurement Technologies. 2005 and 2008.
- Supported the modeling community with BC data and interpretation. Vertical profiles of BC mass mixing ratios and degree of internal mixing were provided with careful explanation of detection uncertainties and limitations.
  - Johannes Hendricks group, DLR, Germany
  - Ken Carslaw group, University of Leeds, United Kingdom
  - Dorothy Koch group, NASA GISS/Columbia University, New York
- Reviewer for journals and funding agencies: Atmospheric Chemistry and Physics, Geophysical Research Letters, Journal of Geophysical Research, Department of Energy, National Science Foundation
- Led NOAA involvement in the DMT SP2 Users Group Meeting 2008.
  - Lectured about error sources, system alignment, and the used of the NOAA SP2 split-detector
  - Advocated calibration and interpretation techniques to ensure quality measurements throughout the SP2 community.

## AWARDS

- NASA Ames Research Center Group Achievement Award: TC4 Campaign, 2008.
- NRC Research Fellowship to work on the NIST Watt experiment, 1999-2001.
- American Geophysical Union Chapman Conference Travel Grant, 1997.
- University Fellowship at the University of Colorado, based on performance on the Ph.D. comprehensive written exam, 1995.
- Phi Beta Kappa, 1993.
- Physics Club Book Award for Outstanding Junior Physics Major, the University of Massachusetts, 1992.

## PEER-REVIEWED PUBLICATIONS

**J. P. Schwarz**, H. Stark, J. R. Spackman, T. B. Ryerson, J. Peischl, W. H. Swartz, R. S. Gao, L. A. Watts, and D. W. Fahey (2009), Heating rates and surface dimming due to black carbon aerosol absorption associated with a major U.S. city, *Geophys. Res. Lett.*, 36, L15807, doi:10.1029/2009GL039213.

S. McKeen, G. Grell, S. Peckham, J. Wilczak, I. Djalalova1,, E.-Y. Hsie, G. Frost, J. Peischl, J. Schwarz, R. Spackman, J. Holloway, J. de Gouw, C. Warneke, W. Gong, V. Bouchet, S. Gaudreault, J. Racine6 J. McHenry, J. McQueen, P. Lee, Y. Tang, G. R. Carmichael, R. Mathur, An evaluation of real-time air quality forecasts and their urban emissions over Eastern Texas during the summer of 2006 TexAQS field study, *Accepted JGR* 2009.

G. Myhre, T.F. Berglen, M. Johnsrud, C. R. Hoyle, T.K. Berntsen, S.A. Christopher, D.W. Fahey, I.S.A. Isaksen, T.A. Jones, R.A. Kahn, N. Loeb, P. Quinn, L. Remer, **J.P. Schwarz**, K.E. Yttri1, Radiative forcing of the direct aerosol effect using a multi-observation approach, *Atmos. Chem. Phys.*, 9, 1365-1392, 2009.

C. Warneke, R. Bahreini, J. Brioude, C.A. Brock, J. A. de Gouw, D. W. Fahey, K. D. Froyd, J. S. Holloway, A. Middlebrook, L. Miller, S. Montzka, D. M. Murphy, J. Peischl, T. B. Ryerson, **J. P. Schwarz**, J. R. Spackman, P. Veres, Biomass burning in Siberia and Kazakhstan as an important source for haze over the Alaskan Arctic in April 2008, *Geophys. Res. Lett.*, doi: 10.1029/2008GL036194, 2008.

J. R. Spackman, **J. P. Schwarz**, R. S. Gao, L. A. Watts, D. S. Thomson, D. W. Fahey, J. S. Holloway, J. A. de Gouw, M. Trainer, T. B. Ryerson, Empirical correlations between black carbon aerosol and carbon monoxide in the lower and middle troposphere, *Geophys. Res. Lett.*, 35, L19816, 2008.

**J. P. Schwarz**, R. S. Gao, J. R. Spackman, L. A. Watts, D. S. Thomson, D. W. Fahey, T. Ryerson, J. Peischel, J. Holloway, M. Trainer, G. Frost, T. Baynard, J. A. deGouw, K. Croon, Laurie Del Negro, Measurement of the mixing state, mass, and optical size of individual black carbon particles in urban and biomass burning emissions, *Geophys. Res. Lett.*, doi:10.1029/2008GL033968, 2008.

R. S. Gao, S. R. Hall, W. H. Swartz, **J. P. Schwarz**, J. R. Spackman, L. A. Watts, D. W. Fahey, K. C. Aikin, R. E. Shetter, T. P. Bui, Calculations of solar shortwave heating rates due to black carbon and ozone absorption using in situ measurements, *J. Geophys. Res.*, doi:10.1029/2007JD009358, 2008

**J. P. Schwarz**, J. R. Spackman, D. W. Fahey, R. S. Gao, U. Lohmann, P. Stier, L. A. Watts, D. S. Thomson, D. A. Lack, L. Pfister, M. J. Mahoney, D. Baumgardner, J. C. Wilson, J. M. Reeves, Coatings and their enhancement of black-carbon light absorption in the tropical atmosphere, *J. Geophys. Res.*, doi:10.1029/2007JD009042, 2008.

J. G. Slowik, E. S. Cross, J. H. Han, P. Davidovits, T. B. Onasch, J. T. Jayne, L. R. Williams, M. R. Canagaratna, D. R. Worsnop, R. K. Chakrabarty, H. Moosmüller, W. P. Arnott, **J. P. Schwarz**, R. S. Gao, D. W. Fahey, G. L. Kok, A. Petzold, An intercomparison of instruments measuring black carbon content of soot particles, *Aero. Sci. Technol.*, 41:3, 295, 2007.

R. S. Gao, **J. P. Schwarz**, K. K. Kelly, D. W. Fahey, L. A. Watts, T. L. Thompson, J. R. Spackman, J. G. Slowik, E. S. Cross, J.-H. Han, P. Davidovits, T. B. Onasch, and D. R. Worsnop, A novel method for estimating light scattering properties of soot aerosols using a modified single particle soot photometer, *Aero. Sci. Technol.*, 41, 125, 2007.

**J. P. Schwarz**, R. S. Gao, D. W. Fahey, D. S. Thomson, L. A. Watts, J. C. Wilson, J. M. Reeves, M. Darbeheshti, D. G. Baumgardner, G. L. Kok, S. H. Chung, M. Schulz, J. Hendricks, A. Lauer, B. Kärcher, J. G. Slowik, K. H. Rosenlof, T. L. Thompson, A. O. Langford, M. Loewenstein, and K. C. Aikin, Single-Particle measurements of midlatitude black carbon and light-scattering aerosols from the boundary layer to the lower stratosphere, *J. Geophys. Res.*, 110, D16207, 2006.

W. Beer, A. L. Eichenberger, B. Jeanneret, B. Jeckelmann, A. R. Pourzand, P. Richard, and **J. P. Schwarz**, Status of the METAS watt balance experiment, *IEEE Trans. Instr. Meas.*, 52, 626–630, 2003.

**J. P. Schwarz**, R. Liu, E. B. Newell, R. L. Steiner, E. R. Williams, D. Smith, Hysteresis and related error mechanisms in the NIST watt balance experiment, *J. Res. Natl. Inst. Stand. Technol.*, 106, 627–640, 2001.

**J. P. Schwarz**, D. S. Robertson, T. M. Niebauer, and J. E. Faller, A new determination of the Newtonian constant of gravity using the free fall method, *Meas. Sci. Technol.*, 10, 478–486, 1999.

**J. P. Schwarz**, D. S. Robertson, T. M. Niebauer, and J. E. Faller, A free fall determination of the Newtonian constant of gravity, *Science*, 282, 2230–2234, 1998.

## PRESENTATIONS

University of Tokyo, **Invited seminar**: Overview of black carbon measurements at NOAA, Tokyo, Japan, October 2008.

3C-STAR field campaign, **Invited seminar**: Use and Utility of the Single Particle Soot Photometer, Kaiping, China, October 2008.

Droplet Measurement Technologies SP2 User Group Meeting, **Invited seminar**: Theoretical and experimental basis for measurement of black carbon aerosol optical size, Boulder, CO, September 2008.

2007 AGU Fall meeting, **Oral presentation**: Heating of the urban boundary layer by black carbon absorption of solar radiation, San Francisco, CA, December 2007.

2007 Gordon Research Conference - Atmospheric Sciences, **Poster presentation:** In situ measurements of the mixing state, light-scattering, and physical properties of black carbon, Big Sky, MT, August 2007.

NOAA Chemical Sciences Division Seminar Series, **Invited seminar:** Unraveling the black carbon puzzle, Boulder, CO, January 2007.

2006 AGU Fall Meeting, **Poster presentation:** In situ measurements of the mixing state and light-scattering properties of black carbon in the troposphere and lower stratosphere, San Francisco, CA, December 2006.

Aerodyne Research, Inc., **Invited seminar:** Hot science: quantifying black carbon with a single particle soot photometer, Billerica, MA, October 2006.

Costa-Rican Aura Validation Experiment science meeting, **Oral presentation:** Black carbon mixing states measured during CR-AVE with the NOAA single particle soot photometer, Greenbelt, MD, November 2006

2005 AGU Fall meeting, **Poster presentation:** Single-particle black carbon aerosol vertical profiles from the boundary layer to the lower stratosphere. San Francisco, CA, December 2005.

2004 AGU Fall meeting, **Oral presentation:** Characterization of a single particle soot photometer, San Francisco, CA, December 2004

First International Watt Balance Workshop, **Oral presentation:** Alignment issues in the METAS watt-balance experiment, Ottawa, ON, June 2002.

Physics and Astronomy Departmental Colloquium at the University of Kentucky, **Invited seminar:** The delicate balance of power: improving the SI with the NIST Watt Balance experiment, Lexington, KY, September 2000.

IOP Conference on the gravitational constant, theory and experiment 200 years after Cavendish, **Invited oral presentation:** The free-fall measurement of G, London, November 1998.

1997 AGU Chapman Conference on Microgal Gravimetry, **Invited oral presentation:** A new G determination, St. Augustine, FL, March 1997.