

Peter Zoogman

Harvard-Smithsonian Center for Astrophysics

Atomic and Molecular Physics Division
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EDUCATION

<i>Ph.D.</i> , Earth and Planetary Sciences Harvard University, Cambridge, MA Dissertation: <i>Geostationary Satellite Observations of Ozone Air Quality</i>	August 2013
<i>M.A.</i> , Physics Harvard University, Cambridge, MA	June 2006
<i>B.A.</i> , Chemistry and Physics Harvard University, Cambridge, MA Magna cum laude with highest honors	June 2006

TEACHING EXPERIENCE

University Level

<i>Atmospheric Chemistry and Physics</i> (Graduate Level) Teaching Fellow Harvard University, Cambridge, MA • <i>Certificate of Distinction in Teaching</i>	Fall 2012
<i>Atmospheric Chemistry</i> Teaching Fellow Harvard University, Cambridge, MA	Spring 2011
<i>Inorganic Chemistry</i> <i>Introductory Mechanics and Relativity</i> Tutor for the Harvard Bureau of Study Counsel Harvard University, Cambridge, MA	Fall 2004
<i>Introduction to Calculus</i> Teaching Assistant Harvard University, Cambridge, MA	Fall 2003

K-12

<i>Nature Camp Instructor</i> Cape Cod Museum of Natural History, Brewster, MA	Summers of 2000-2002
<i>Tennis Instructor</i> Mid-Cape Athletic Club, South Yarmouth, MA	Summers of 1999-2002

RESEARCH EXPERIENCE

Satellite Observations of Atmospheric Trace Gases Research October 2013 – Present
 Postdoctoral Fellow

Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.

Working with Kelly Chance

- As a member of science team for TEMPO (Tropospheric Emissions: Monitoring of Pollution), a NASA satellite mission focused on remote sensing of atmospheric gases that cause air pollution and climate change, I have worked on optimizing the numerical methods necessary for the satellite observations. I have also precisely quantified the visible reflectance of the surface scenes to enable the planned TEMPO measurements.
- I am currently investigating the emissions, physics, and chemistry of forest fires using current satellite observations and statistical methods

Data Assimilation and Numerical Techniques Research June 2010 – August 2010

Graduate Research Assistant

Jet Propulsion Laboratory, Pasadena, CA.

Worked with Kevin Bowman

- Worked on developing new techniques for atmospheric data assimilation and analysis based on information theory concepts such as entropy.

Atmospheric Chemistry Research June 2005 – August 2013

Undergraduate Research Assistant (June 2005 – June 2006)

Graduate Research Assistant (September 2006–August 2013)

Harvard University, Department of Earth and Planetary Sciences, Cambridge, MA.

Worked with Daniel J. Jacob

- Undergraduate research on computational modeling of organic acids in the Earth's atmosphere.
- Developed data assimilation framework for combining satellite observations of ozone with a numerical chemical transport model (GEOS-Chem).
- Applied this framework to determine the measurement requirements for a proposed NASA satellite mission.
- Developed a framework for the joint assimilation of ozone and carbon monoxide
- Analyzed the ability of the planned TEMPO satellite to enable monitoring and attribution of ozone pollution events in the Western United States.

Materials Science Research June 2004 – August 2004

Undergraduate Research Assistant

Columbia University, New York, NY.

Worked with Louis Brus

- Fabricated heavy metal (Hafnium and Zirconium) oxide nanocrystals.
- Analyzed the crystalline structure and crystal phase transformation of these nanocrystals.

Solid State Physics Research January 2004 – May 2004

Undergraduate Research Assistant

Harvard University, Cambridge, MA.

Worked with Robert Westervelt

- Assisted in the development and testing of a new technique for fabrication of quantum dots.

MENTORING EXPERIENCE

Shannon Duffy (Undergraduate at MIT starting Fall 2016) Summer 2016

Error constraints on air mass factors for satellite observations of atmospheric trace gases

Co-Mentor – Harvard-Smithsonian Center for Astrophysics

Alicia Hoffman (PhD candidate at UC Irvine starting Fall 2016) Spring 2016

Effects of Landcover Type on Trace Gas Emissions from Biomass Burning

Mentor – Harvard-Smithsonian Center for Astrophysics

Rebecca Xu (Lexington High School)

Summer 2015

Atmospheric Deposition of Nitrogen: the Implication on Primary Production Along Coastlines

Co-Mentor – Harvard-Smithsonian Center for Astrophysics

YouthAstroNet Mentor

Spring 2016 – Present

Participating in a nationwide online network of middle-school age youth and educators pursuing astronomy-related projects via the MicroObservatory robotic telescope system

HONORS

NASA Earth and Space Science Fellowship

2010–2013

Harvard University Certificate of Distinction in Teaching

Fall 2012

Samuel H. Abramson Memorial Research Fellowship

2005

John Harvard Scholar (Given to top 5% of class by GPA)

2003 and 2004

Detur Book Prize

2003

PUBLICATIONS

Zoogman, P., and 52 co-authors, *Tropospheric emissions: Monitoring of pollution (TEMPO)*. Journal of Quantitative Spectroscopy and Radiative Transfer, in press.

Nowlan, C.R., X. Liu, J. Leitch, K. Chance, G. Gonzalez Abad, C Liu, **P. Zoogman**, J. Cole, T. Delker, W. Good, F. Murcray, L. Ruppert, D. Soo, M.B. Follette–Cook, S. Janz, M. Kowalewski, C. Loughner, K. Pickering, J. Herman, M. Beaver, R. Long, J. Szykman, L. Judd, X. Ren, J. Al–Saadi, *Nitrogen dioxide observations from the Geostationary Trace gas and Aerosol Sensor Optimization airborne instrument: Retrieval algorithm and measurements during DISCOVER–AQ Texas*. Atmospheric Measurement Techniques, 9, 2647–2668, 2016.

Zoogman, P., X. Liu, K. Chance, Q. Sun, C. Schaaf, T. Mahr, T. Wagner, *A climatology of visible surface reflectance spectra*. Journal of Quantitative Spectroscopy and Radiative Transfer, 180, 39–46, 2016.

Zoogman, P., D.J. Jacob, K. Chance, X. Liu, A. Fiore, M. Lin, K. Travis, *Monitoring high–ozone events in the US Intermountain West using TEMPO geostationary satellite observations*. Atmospheric Chemistry and Physics, 14, 6261–6271, 2014.

Zoogman, P., D.J. Jacob, K. Chance, H.M. Worden, D.P. Edwards, L. Zhang, *Improved monitoring of surface ozone air quality by joint assimilation of geostationary satellite observations of ozone and CO*. Atmospheric Environment, 84, 254–261, 2014.

Zoogman, P., D.J. Jacob, K. Chance, L. Zhang, P. Le Sager, A.M. Fiore, A. Eldering, X. Liu, V. Natraj, S.S. Kulawik, *Ozone Air Quality Measurement Requirements for a Geostationary Satellite Mission*. Atmospheric Environment, 45, 7,143–7,150, 2011.

Tang, J., F. Zhang, **P. Zoogman**, J. Fabbri, S.W. Chan, Y. Zhu, L.E. Brus, M.L. Steigerwald, *Martensitic phase transformation of isolated HfO₂, ZrO₂, and Hf_xZr_{1–x}O₂ nanocrystals*. Advanced Functional Materials, 2005.

PROFESSIONAL ACTIVITIES

Reviewer: Journal of Geophysical Research

Atmospheric Measurement Techniques

Atmospheric Environment
 National Aeronautics and Space Administration (grant review panel)
 National Oceanic and Atmospheric Administration (grant review)

Seminar Organizer:

Atomic and Molecular Physics Division (Harvard-Smithsonian Center for Astrophysics)
 Stars and Planets (Harvard-Smithsonian Center for Astrophysics)

Member: American Geophysical Union

INVITED SEMINARS

- “Remote sensing of atmospheric trace gases at the Panama Isthmus.” March 17, 2015
 Co-presented with G. Gonzalez Abad.
 Smithsonian Tropical Research Institute, Panama City, Panama.
- “TEMPO: The future of space-based air pollution observations.” September 15, 2014
 Massachusetts Institute of Technology, Cambridge, MA.
- “Geostationary Satellite Observations of Ozone Air Quality.” May 20, 2014
 NASA Langley Research Center, Hampton, VA.

SELECTED PRESENTATIONS

- “Satellite observations of NO_x and VOC emissions from fires.” (poster) December 15, 2015
 AGU Fall Meeting. San Francisco, CA.
- “Updates to surface reflectance for trace gas retrievals.” (oral) May 27, 2015
 TEMPO Science Team Meeting. Huntsville, AL.
- “Surface Reflectance in the Visible for Improved Satellite Measurements of Near-Surface Ozone.” (poster) December 19, 2014
 AGU Fall Meeting. San Francisco, CA.
- “Monitoring high-ozone events in the US Intermountain West using future TEMPO satellite observations.” (oral) June 18, 2014
 NASA Air Quality Applied Sciences Team (AQAST) Meeting. Cambridge, MA.
- “Surface reflectance in the visible: representation by EOFs.” (oral) May 22, 2014
 TEMPO Science Team Meeting. Hampton, VA.
- “Simulation Experiments for TEMPO Air Quality Objectives.” (oral) July 24, 2013
 TEMPO Science Team Meeting. Cambridge, MA.
- “Improved assimilation of surface ozone air quality from a geostationary satellite using ozone-CO error correlations.” (oral) December 4, 2012
 AGU Fall Meeting. San Francisco, CA.
- “Simulation Experiments for Geostationary Ozone Air Quality.” (oral) October 22, 2012
 Atmospheric Composition Observation System Simulation Experiments Workshop. Reading, England.
- “Joint Assimilation of Ozone and CO Geostationary Observations to Improve Constraints on Ozone Air Quality.” (oral) May 12, 2011
 GEO-CAPE Science Team Meeting. Boulder, CO.
- “Simulation Experiments for Geostationary Observations of Regional Air Quality.” (oral)

AGU Fall Meeting. San Francisco, CA.

December 18, 2009

“Simulation Experiments for GEO–CAPE Regional Air Quality.” (oral)
GEO–CAPE Science Working Group Meeting. Columbia, MD.

September 22, 2009

“Improving Air Quality Forecasting Using Geostationary Observations: OSSE Framework and Initial Tests.”
(poster)
GEO–CAPE Science Definition Planning Workshop. Chapel Hill, NC.

August, 18, 2008