

Philip Stanford Stevens

School of Public and Environmental Affairs
Indiana University
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Education

Ph.D., Chemistry, Harvard University, Cambridge Massachusetts, June 1990
Kinetic and Mechanistic Investigations of Atom Abstraction Reactions (Prof. J. G. Anderson)

B.A. with honors, Chemistry, Oberlin College, Oberlin, Ohio, May 1984
Synthesis and Vibrational Spectroscopy of the Cyclopropenyl Cation (Prof. N. C. Craig)

Academic Appointments

Professor, School of Public and Environmental Affairs, Indiana University, 2008-
Chair, Environmental Science Faculty, School of Public and Environmental Affairs, 2008-
Director, Ph.D. Program in Environmental Science, Indiana University, 2007-2009
Associate Professor, School of Public and Environmental Affairs, Indiana University, 2002-2008
Assistant Professor, School of Public and Environmental Affairs, Indiana University, 1995-2002
Adjunct Professor, Department of Chemistry, Indiana University, 2003-
Adjunct Professor, Department of Geography, Indiana University, 1996-

Other Appointments

Research Associate, The Pennsylvania State University, 1990-1995
Research and Teaching Assistant, Harvard University, 1984-1990

Awards and Honors

National Science Foundation CAREER Award, 2000-2005
Trustees Teaching Award, Indiana University, 2006
Graduate Teaching Award, School of Public and Environmental Affairs, 1997, 2000, 2003
Teaching Excellence Recognition Award, Indiana University, 1997, 1998, 2000

Professional Affiliations

Sigma Xi, American Chemical Society, American Geophysical Union, American Association for the Advancement of Science

Publications (refereed)

M. Baasandorj, J. Raff, R. A. Hites, and P. S. Stevens, Measurements of the kinetics of the reactions of OH with 3-buten-2-ol and 3-methyl-3-butene-1-ol over the temperature range 253-423 K. *International Journal of Chemical Kinetics*, in preparation

D. Vimal and P. S. Stevens, Experimental and theoretical studies of the OH + methylethyl ketone reaction at low pressure, *International Journal of Chemical Kinetics*, in preparation.

M. A. Navarro, S. Dusanter, R. A. Hites, and P. S. Stevens, Temperature dependence of the yields of methacrolein and methyl vinyl ketone from the OH-initiated oxidation of isoprene, *Journal of Physical Chemistry Letters*, in preparation

R. F. Hansen, S. Dusanter, S. M. Griffith, P. S. Stevens, M. H. Erickson, W. Wallace, B. T. Jobson, M. Carroll, P. B. Shepson, and S. B. Bertman, Total hydroxyl radical reactivity during PROPHET 2008 and CABINEX 2009, *Atmospheric Chemistry and Physics Discussions*, in preparation

S. M. Griffith, R. F. Hansen, S. Dusanter, P. S. Stevens, M. E. Thurlow, A. O'Brien, M. M. Galloway, J. Hottle, A. Kammrath, F. N. Keutsch, L. H. Mielke, M. Alaghmand, P. B. Shepson, N. Zhang, J. Hou, X. Zhou, S. B. Bertman, M. Carroll, M. H. Erickson, H. W. Wallace, B. T. Jobson, N. Grossberg, and B. L. Lefer, Above Canopy OH and HO₂ during PROPHET 2008 and CABINEX 2009: Measurement and Theory, *Atmospheric Chemistry and Physics Discussions*, in preparation

S. Dusanter, L.T. Molina, and P. S. Stevens, Photochemical production of O_x (O₃ + NO₂) in downtown Mexico City during MCMA-2006, *Atmospheric Chemistry and Physics Discussions*, in preparation

D. Kim, P. S. Stevens, and R. A. Hites, Kinetic isotope effects and rate constants for the gas-phase reactions of deuterated toluenes with OH from 298-413 K, *Journal of Physical Chemistry A*, submitted, 2011

R. A. Washenfelder, C. J. Young, S. S. Brown, W. Angevine, E. L. Atlas, D. R. Blake, D. M. Bon, M. J. Cubison, J. A. de Gouw, S. Dusanter, J. Flynn, J. B. Gilman, M. Graus, S. Griffith, N. Grossberg, P. L. Hayes, J. L. Jimenez, W. C. Kuster, B. L. Lefer, I. Pollack, T. B. Ryerson, H. Stark, P. S. Stevens, M. K. Trainer, and E. J. Williams, The glyoxal budget and its contribution to organic aerosol for Los Angeles, California during CalNex 2010, *Journal of Geophysical Research, Atmospheres*, submitted, 2011

S. M. Dietrick, A. B. Pacheco, P. S. Stevens, and S. S. Iyengar, The influence of water on anharmonicity, stability and vibrational energy distribution of hydrogen-bonded adducts in atmospheric reactions: Case study of the OH + Isoprene reaction intermediate using ab-initio molecular dynamics, *Journal of Physical Chemistry A*, submitted, 2011

X. Zhou, N. Zhang, M. TerAvest, J. Hou, D. Tang, S. Bertman, M. Alaghmand, P. B. Shepson, M. A. Carroll, S. Griffith, S. Dusanter, and P. S. Stevens, Photochemical Cycling of Reactive Nitrogen at the Top of the Forest Canopy Surface, *Nature Geosciences*, *4*, 440-443, 2011

M. A. Navarro, S. Dusanter, R. A. Hites, and P. S. Stevens, Radical dependence of the yields of methacrolein and methyl vinyl ketone from the OH-initiated oxidation of isoprene under NO_x-free conditions. *Environmental Science and Technology*, *45*, 923–929, 2011

D. Kim, P. S. Stevens, and R. A. Hites, Rate constants for the gas-phase reactions of cis-ocimene, β-myrcene, and (E)-β-farnesene with OH and O₃ as a function of temperature. *Journal of Physical Chemistry A*, *115*, 500–506, 2011

L.T. Molina, S. Madronich, J. S. Gaffney, E. Apel, B. de Foy, J. Fast, R. Ferrare, S. Herndon, C. Hostetler, J. L. Jimenez, B. Lamb, A. R. Osornio-Vargas, P. Russell, J. J. Schauer, P. S. Stevens, M. Zavala, An Overview of the MILAGRO 2006 Campaign: Mexico City Emissions and its Transport and Transformation, *Atmospheric Chemistry and Physics*, *10*, 8697-8760, 2010

G. Li, W. Lei, M. Zavala, R. Volkamer, S. Dusanter, P. Stevens, and L. T. Molina. Impacts of HONO sources on the photochemistry in Mexico City during the MCMA-2006/MILAGRO Campaign. *Atmospheric Chemistry and Physics Discussions*, *10*, 4143–4188, 2010

M. Baasandorj, S. Griffith, S. Dusanter and P. S. Stevens. Experimental and theoretical studies of the kinetics of the OH + hydroxyacetone reaction as a function of temperature. *Journal of Physical Chemistry A*, *113*, 10495-10502, 2009

S. Dusanter, D. Vimal, P. S. Stevens, R. Volkamer, L.T. Molina, A. Baker, S. Meinardi, D. Blake, P. Sheehy, A. Merten, E. Fortner, J. Zheng, R. Zhang, W. Junkermann, M. Dubey, T. Rahn, B. Eichinger, P. Lewandowski, J. Prueger, and H. Holder. Measurements of OH and HO₂ Concentrations during the MCMA-2006 Field Campaign: Part 2 – Model Comparison and Radical Budget, *Atmospheric Chemistry and Physics*, *9*, 6655-6675, 2009

S. Dusanter, D. Vimal, P. S. Stevens, R. Volkamer and L. T. Molina. Measurements of OH and HO₂ Concentrations during the MCMA-2006 Field Campaign: Part 1 - Deployment of the Indiana University Laser-Induced Fluorescence Instrument. *Atmospheric Chemistry and Physics*, *9*, 1665–1685, 2009

J. Zheng, R. Zhang, E. C. Fortner, L. Molina, A. C. Aiken, J. L. Jimenez, K. Gaggeler, J. Dommen, S. Dusanter, P. S. Stevens, and X. Tie. Measurements of HNO₃ and N₂O₅ using Ion drift – Chemical Ionization Mass Spectrometry during the MCMA – 2006 Campaign. *Atmospheric Chemistry and Physics*, *8*, 6823-6838, 2008

D. Vimal, A. B. Pacheco, S. S. Iyengar, and P. S. Stevens. Experimental and ab initio dynamical investigations of the kinetics and intra-molecular energy transfer mechanisms for the OH + 1,3-butadiene reaction between 263 and 423 K at low pressure. *Journal of Physical Chemistry A*, *112*, 7227-7237, 2008

S. Dusanter, D. Vimal, and P. S. Stevens. Measuring tropospheric OH and HO₂ by laser-induced fluorescence at low pressure: A comparison of calibration techniques. *Atmospheric Chemistry and Physics*, 8, 321–340, 2008

M. Baasandorj and P. S. Stevens. Experimental and theoretical studies of the kinetics of the reactions of OH and OD with 2-methyl-3-buten-2-ol between 300 and 415 K at low pressure. *Journal of Physical Chemistry A*, 111, 640-649, 2007

D. Vimal and P. S. Stevens. Experimental and theoretical study of the kinetics of the reactions of OH radicals with acetic acid, acetic acid-*d*₃ and acetic acid-*d*₄ at low pressure. *Journal of Physical Chemistry A*, 110, 11509-11516, 2006

M. E. Davis, W. Drake, D. Vimal, and P. S. Stevens. Experimental and theoretical studies of the kinetics of the reactions of OH and OD with acetone and acetone-*d*₆ at low pressure. *The Journal of Photochemistry and Photobiology, A: Chemistry*, 176, 162-171, 2005. Professor R. P. Wayne Special Issue.

J. D. Raff, P. S. Stevens, and R. A. Hites. Relative Rate and Product Studies of the OH-Acetone Reaction. *Journal of Physical Chemistry A*, 109, 4728-4735, 2005

M. E. Davis, C. Tapscott, and P. S. Stevens. Measurements of the kinetics of the OH-initiated oxidation of β-pinene: Radical propagation in the OH + β-pinene + O₂ + NO reaction system. *International Journal of Chemical Kinetics*, 37, 522-531, 2005

W. Lee, M. Baasandorj, P. S. Stevens, and R. A. Hites. Monitoring the OH-Initiated Oxidation Kinetics of Isoprene and its Products using On-line Mass Spectrometry. *Environmental Science and Technology*, 39, 1030-1036, 2005

M. E. Davis and P. S. Stevens. Measurements of the kinetics of the OH-initiated oxidation of α-pinene: Radical propagation in the OH + α-pinene + O₂ + NO reaction system. *Atmospheric Environment*, 39, 1765-1774, 2005

B. Chuong and P. S. Stevens. Measurements of the kinetics of the OH-initiated oxidation of methyl vinyl ketone and methacrolein. *International Journal of Chemical Kinetics*, 36, 12-25, 2004

W. Lee, P. S. Stevens, and R. A. Hites. Rate constants for the gas-phase reactions of methylphenanthrenes with OH as a function of temperature. *Journal of Physical Chemistry A*, 107, 6603-6608, 2003

B. Chuong and P. S. Stevens. Kinetics of the OH + methyl vinyl ketone and OH + methacrolein reactions at low pressure. *Journal of Physical Chemistry A*, 107, 2185-2191, 2003

- B. Chuong and P. S. Stevens. Measurements of the kinetics of the OH-initiated oxidation of isoprene. *Journal of Geophysical Research*, *107*, D13, 4162, doi:10.1029/2001JD000865, 2002
- B. Chuong, M. Davis, M. Edwards, and P. S. Stevens. Measurements of the kinetics of the OH + α -pinene and OH + β -pinene reactions at low pressure. *International Journal of Chemical Kinetics*, *34*, 300-308, 2002
- P. S. Stevens, E. Seymour, and Z. Li. Theoretical and experimental studies of the reaction of OH with isoprene. *Journal of Physical Chemistry A*, *104*, 5989-5997, 2000
- B. Chuong and P. S. Stevens. Kinetic study of the OH + isoprene and OH + ethylene reactions between 2 - 6 Torr and over the temperature range 300 - 423 K. *Journal of Physical Chemistry A*, *104*, 5230-5237, 2000
- P. Stevens, D. L'Esperance, B. Chuong, and G. Martin. Measurements of the kinetics of the OH-initiated oxidation of isoprene: Radical propagation in the OH + Isoprene + O₂ + NO Reaction System. *International Journal of Chemical Kinetics*, *31*, 637-643, 1999
- P. S. Stevens, J. H. Mather, W. H. Brune, F. L. Eisele, D. J. Tanner, C. A. Cantrell, and R. E. Shetter, S. Sewall, A. Fried, B. Henry, E. Williams, K. Baumann, P. Goldan, and W. Kuster. The HO₂/OH and RO₂/HO₂ ratios during the Tropospheric OH Photochemistry Experiment: Measurement and theory. *Journal of Geophysical Research*, *102*, 6379-6391, 1997
- C. A. Cantrell, R. E. Shetter, J. G. Calvert, F. L. Eisele, E. Williams, K. Baumann, W. H. Brune, P. S. Stevens, and J. H. Mather. Peroxy radicals from photostationary state deviations and steady state calculations during the Tropospheric OH Photochemistry Experiment at Idaho Hill, Colorado, 1993. *Journal of Geophysical Research*, *102*, 6369-6378, 1997
- J. H. Mather, P. S. Stevens, and W. H. Brune. OH and HO₂ measurements by laser-induced fluorescence. *Journal of Geophysical Research*, *102*, 6427-6436, 1997
- W. H. Brune, P. S. Stevens, and J. H. Mather. Measuring OH and HO₂ in the troposphere by laser-induced fluorescence at low pressure. *Journal of the Atmospheric Sciences*, *52*, 3328-3336, 1995
- P. S. Stevens, J. H. Mather and W. H. Brune. Measurements of tropospheric OH and HO₂ by laser-induced fluorescence at low pressure. *Journal of Geophysical Research*, *99*, 3543-3557, 1994
- P. S. Stevens and J. G. Anderson. Kinetic and Mechanistic Study of X + ClOCl → Products (X = Cl, F, Br, OH, O, N) over the temperature range 230-400 K. *Journal of Physical Chemistry*, *96*, 1708-1718, 1992
- P. S. Stevens and J. G. Anderson. Kinetic measurements of the ClO + O₃ → ClOO + O₂ reaction. *Geophysical Research Letters*, *17*, 1287-1290, 1990

P. S. Stevens, W. H. Brune, and J. G. Anderson. Kinetic and mechanistic investigations of F + H₂O/D₂O and F + H₂/D₂ over the temperature range 240-373 K. *Journal of Physical Chemistry*, *93*, 4068-4079, 1989

J. P. D. Abbatt, D. W. Toohey, F. F. Fenter, P. S. Stevens, W. H. Brune, and J. G. Anderson. Kinetics and mechanism of X + ClNO → XCl + NO (X=Cl, Br, F, OH, O, N) from 220 to 450 K. Correlation of reactivity and activation energy with electron affinity of X. *Journal of Physical Chemistry*, *93*, 1022-1029, 1989

N. C. Craig, J. Pranata, J. R. Sprague, and P. S. Stevens. Vibrational spectra of 3- fluorocyclopropene -d₀ and -d₃. *Spectrochimica Acta*, *43A(6)*, 753-761, 1987

N. C. Craig, J. Pranata, S. J. Reinganum, J. R. Sprague, and P. S. Stevens. Vibrational spectra and a potential function for 3-chlorocyclopropene and its various deuterated modifications. *Spectrochimica Acta*, *43A(4)*, 569-582, 1987

N. C. Craig, J. Pranata, S. J. Reinganum, J. R. Sprague and P. S. Stevens. Vibrational spectra of C₃H₃⁺, C₃D₃⁺, C₃H₂D⁺, C₃D₂H⁺ and force constants for this ion system. *Journal of the American Chemical Society*, *108*, 4378-4386, 1986

N. C. Craig, J. Pranata, J. R. Sprague, and P. S. Stevens. Force constants for the cyclopropenyl cation. *Journal of the American Chemical Society*, *106*, 7637-7638, 1984

N. C. Craig, K. L. Sloan, J. R. Sprague, and P. S. Stevens. 3-Fluorocyclopropene. *Journal of Organic Chemistry*, *49*, 3847-3848, 1984

Research Grants and Fellowships

National Science Foundation, AGS-1104880, 9/1/11-8/31/13, \$446,119, “Measurements of HO_x radical chemistry in a changing forest environment.”

Indiana University, Center for Research in Environmental Science, 5/1/11-4/30/12, \$26,000, “Temporal dynamics of volatile organic carbon (C) emissions from forest soils: In-situ measurements of the C we do not see.” Co-PI R. Phillips

National Science Foundation, AGS-1012161, 9/1/10-8/31/13, \$434,503, “Development of a Laser Photofragmentation/ Laser-Induced Fluorescence Instrument for Tropospheric Measurements of Nitrous Acid.” Co-PI S. Dusanter.

National Science Foundation, ATM-0904167, 6/1/09-8/31/11, \$1,633,776, “Collaborative Research: PROPHET 2009 – Community Atmosphere-Biosphere INteractions EXperiment (CABINEX).” M. A. Carroll (U. Michigan), P. B. Shepson (Purdue), P. S. Stevens (IU), S.

Bertman (W. Michigan), D. Helmig (U. Colorado), F. Keutsch (U. Wisconsin), S. Lee (Kent State), B. Lefer (U. Houston), T. VanReken (Washington State University), IU portion \$145,915.

National Science Foundation AGS-0612738, 7/1/06-1/31/12, \$619,505, "Measurements of Tropospheric OH and HO₂ in Forest Environments" including supplement for participation in the CalNex measurement campaign.

National Science Foundation AGS-0622815, 9/1/06-2/28/12, \$541,139, "Kinetic Studies of the Hydroxyl Radical (OH) and Ozone Initiated Oxidation of Biogenic Terpenes." (Co-PI: R. A. Hites).

National Science Foundation ATM-9984152, 7/1/00-12/31/06, \$584,143, "CAREER: Laboratory and Field Measurements of Tropospheric OH and HO₂ by Laser-Induced Fluorescence" including supplement for participation in the MILAGRO (Megacity Initiative: Local and Global Research Observations) measurement campaign.

The Camille and Henry Dreyfus Foundation Postdoctoral Program in Environmental Chemistry, 9/1/04-8/31/06, \$120,000, "Influence of Biogenic Emissions on Atmospheric Chemistry."

Indiana University Faculty Research Support Program 5/05-5/06, \$75,078, "Theoretical and Experimental Studies of the OH + Isoprene Reaction." Co-PI's: S. Iyengar and C. Jarrold.

National Science Foundation ATM-0106705, 9/1/01-8/31/06, \$484,831, "Laboratory Measurements of the OH-initiated Oxidation of α - and β -pinene." Co-PI: Ronald A. Hites.

National Science Foundation ATM-9622712, 9/1/96-8/31/01, \$286,512, "Laboratory Kinetics Studies of Peroxy Radical Reactions."

The Petroleum Research Fund (administered by the American Chemical Society), 33643-G6, 9/1/98-8/31/00, \$20,000, "Kinetic and Mechanistic Studies of the OH-initiated oxidation of alkenes."

Teaching

Indiana University, School of Public and Environmental Affairs, Bloomington, Indiana:

E100/E162: Environment and People (Fall 1995-97, 2002, Spring 1998-2001, 2004-10)

E262: Environmental Problems and Solutions (Spring 2001)

E451: Air Pollution and Control (Spring 1996-98, Fall 1998-2002, 2004-06, 08, 10)

E515: Fundamentals of Air Pollution (Spring 1996, Fall 1996-2002, 2004-07, 09)

E400/E555: Advanced Topics in Atmospheric Chemistry (Spring 1998-00, 02)

C409: Undergraduate Chemical Research (1997-99)

C500: Graduate Chemical Research (2006-2008)

Student Advising, School of Public and Environmental Affairs and Indiana University:

MSES General Program Advisor (1998-present)
MSES Environmental Chemistry Toxicology and Risk Assessment Concentration Advisor (1996-present)
BSPA Environmental Management Major Advisor (1998-present)
University Division Advisor (1996-2002)
Lilly Program Project Faculty Advisor (1998-99)

School and University Service

Committee Service, School of Public and Environment Affairs:

Personnel Committee (2009-2011)
Policy Committee (2005-2007)
Budgetary Affairs Committee (2005-2007)
Masters Admission and Financial Aid Committee (1996, 1998-2003)
Ph.D. in Environmental Sciences Committee (1997-present)
Awards Committee (1998-2002, 2003-2005)

Committee Service, Indiana University, Bloomington:

Bloomington Faculty Council, Program Merger/Reorganization/Elimination Committee 2009-2010
Advisory Committee, Center for Research in Energy and the Environment 2009-present
Executive Committee, Center for Research in Environmental Science 2008-present
Office of the Vice Provost for Research Faculty Advisory Committee 2008-2010
Multidisciplinary Science Building Phase II Steering Committee, 2007-present
SPEA Dean Search Committee, 2007-2008

Miscellaneous Service, School and University

Environmental Management Association Faculty Advisor (1997-present)

Faculty Development Presentations: "Using the Web in the Classroom." SPEA Fall Faculty Retreat, 1997

Indiana University Mini University Lecture: "Ozone in the Atmosphere: Good or Bad or Both?" June 21, 1999

SPEA Statehouse Colloquium Series: "Clean Air in Indiana: Current Control Measures for Reducing Ground-level Ozone." Session organizer and Chair, February 27, 2001

Public Service

Member, Indiana State Air Pollution Control Board, 2000- present

Member, Technical Advisory Group, Southwest Indianapolis Air Toxics Study, Indiana Department of Environmental Management, 2006-present

Chair, Mercury emissions study group, Indiana Department of Environmental Management, 2006-2007

Professional Service

Board Member, Telluride Summer Research Center, 2000-2003

Co-Convener, Biosphere-Atmosphere Exchange of Reactive Trace Gases and Their Role in the Chemistry of Ozone and Aerosols, American Geophysical Union Fall Meeting, December 13-17, 2010, San Francisco, California

Co-Chair, Workshop in Atmospheric Chemistry - New Insights Into Gas-Phase Atmospheric Chemistry, August 9-13, 2010, Telluride, Colorado

Peer Review for Professional Grants:

National Science Foundation, Atmospheric Chemistry Program
National Science Foundation, Chemistry Program
National Science Foundation, Office of Polar Programs
Environmental Protection Agency, SBIR Program
Environmental Protection Agency, STARS Program
Department of Energy, National Institute for Global Environmental Change
The Petroleum Research Fund (American Chemical Society)
Natural Environment Research Council, United Kingdom

Peer Review for Professional Journals:

Journal of Physical Chemistry A
Journal of Geophysical Research - Atmospheres
Environmental Science and Technology
Atmospheric Chemistry and Physics
Atmospheric Measurement Techniques
International Journal of Chemical Kinetics
Applied Physics B
Chemical Physics Letters
Journal of Photochemistry and Photobiology A: Chemistry
Geophysical Research Letters