

## Curriculum Vitae

### **Darin W. Toohey**

Atmospheric and Oceanic Sciences  
and Program in Environmental Studies  
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## Education

### **Harvard University, Cambridge, Massachusetts**

Ph.D., Applied Physics, July 1988, Kinetic and Mechanistic Studies of Reactions Important in the Earth's Atmosphere  
M.S., Applied Physics, June 1984

### **California State University, Fullerton, California**

B.A., Physics, High Honors, with minor in Mathematics; May 1982  
B.S., Chemistry, High Honors, with minor in Mathematics; May 1982

## Professional

### **University of Colorado, Boulder**

Director, Global Studies Residential Academic Program, 2013-present  
Interim Director, Sustainability and Social Innovation Residential Academic Program, January-May 2013  
Professor of Atmospheric and Oceanic Sciences; 2004-present  
Professor of Environmental Studies; 2004-present  
Director, Baker Residential Academic Program; 2005-2009  
Associate Professor of Atmospheric and Oceanic Sciences and Environmental Studies; 1999-2004  
Associate Professor of Environmental Studies; 1999-2004

### **University of California, Irvine**

Associate Professor of Earth System Science and Chemistry; 1996-1999  
Assistant Professor of Chemistry; 1992-1996  
Assistant Professor of Earth System Science; 1991-1996

### **Harvard University**

Postdoctoral Fellow, Applied Physics; 1988-1991  
Research Assistant, Applied Physics; 1982-1988  
Teaching Assistant, Earth and Planetary Physics; 1983-1987

### **California State University, Fullerton**

Undergraduate Research Assistant, Chemistry; 1980-1982  
Teaching Assistant, Physics and Chemistry; 1980-1982

## Teaching (Bold denotes courses developed or extensively modified)

### **Semester at Sea**

**Introduction to Global Ecology** (Summer '06)  
**Introduction to Biogeosciences** (Summer '06)

### **University of Colorado at Boulder**

**Climate Change, Energy, and Foreign Policy**, ATOC 7500 (F'12)  
**Instrumentation Lab**, ATOC 7500 (S'07, 5 weeks)

CU 101 - The Student Citizen, ARSC 1001 (F'07)  
**Air Chemistry and Pollution**, ATOC 3500 (F'01, F'02, F'03, F'06, S'10, S'11)  
**Remote Sensing of the Atmosphere**, ATOC 5235 (S'04)  
**Thermodynamics of Atmospheres and Oceans**, ASEN/ATOC 5225 (F'02)  
**Introduction to Atmospheric Physics**, ATOC 4710/5710 (F'99, S'03)  
Introduction to Atmospheric Dynamics, ATOC 4720/5720 (S'01)  
**Our Changing Environment**: ATOC 1060 (S'99, F'00, S'02, S'06, F'07, S'09, F'09, F'10, S'13)

#### ***University of California, Irvine***

**Principles of Atmospheric Chemistry**, Chemistry 252 (1993)  
**Classical Dynamics with some Electricity and Magnetism**, Chemistry 230 (1993)  
**Experimental Methods in Earth System Science**, Earth System Science 231 A (1994)  
**The Global Environment: Atmospheric Pollution**, Physical Sciences 20E (1994)  
Atmospheric Pollution in the 1990s, Engineering Extension 434.32 (1994)  
**The Global Environment: Climate, Oceans, and Land**, Physical Sciences 20F (1995)  
**Remote Sensing of the Environment**, Earth System Science 233A (1996)  
General Chemistry, Chemistry 1C (1996)  
**Honors Chemistry - Chemistry of the Environment**, Chemistry, H90 (1997)  
**Honors ESS - Chemistry of the Environment**, Earth System Science, H90 (1998)  
Principles of Atmospheric Chemistry, Earth System Science 202 (1998)

#### ***Harvard University (5 undergraduate)***

**The Atmosphere, Science A-30** (1983, 1984, 1985, 1986, 1987)

#### ***California State University, Fullerton (2 undergraduate)***

Fundamental Physics Laboratory, Physics 101 C (1980)  
Fundamental Physics Laboratory, Physics 101 A (1981)

## **Honors and Awards**

- ◆ Bank of America Achievement Award, 1978
- ◆ Graduated with High Honors, CSU Fullerton, 1982
- ◆ Outstanding Student, Department of Physics, CSU Fullerton, 1982
- ◆ American Chemical Society Outstanding Student, CSU Fullerton, 1982
- ◆ Lyle Wallace Service Award, Department of Chemistry, CSU Fullerton, 1982
- ◆ Certificate of Distinction in Teaching, Danforth Center for Teaching and Learning, Harvard University, 1985, 1986, and 1987
- ◆ Procter and Gamble Award, American Chemical Society, Division of Physical Chemistry; 1987
- ◆ NASA Group Achievement Award, AASE Campaign, 1989
- ◆ National Science Foundation, Young Investigator Award, 1992
- ◆ NASA Group Achievement Award, SPADE Campaign, 1993
- ◆ NOAA Outstanding Paper Award, 1994
- ◆ UC Irvine Nominee, NSF Presidential Faculty Fellow, 1996
- ◆ University of Colorado at Boulder, CIRES Visiting Faculty Fellow, 1997
- ◆ Outstanding Contributions to Undergraduate Education, Physical Sciences, UCI, 1998
- ◆ Antarctica Service Medal of the United States of America, 1999
- ◆ Distinguished Alumnus, Department of Chemistry, CSU Fullerton, 1999
- ◆ NASA Group Achievement Award, SOLVE Campaign, 2001
- ◆ NASA Group Achievement Award, UARS Science Team, 2007
- ◆ Certificate of Achievement, U.S. Department of State, 2012
- ◆ Recognition by the Ozone Secretariat, United Nations Environment Programme, 2012

*(Details for Darin Toohey)*

## **Service**

### **Professional**

- ◆ Co-writer, UNDP proposal for O<sub>3</sub> measurements from "Southern Cone", Buenos Aires, April, 1992
- ◆ Session Organizer and Chair, Fall AGU Meeting, San Francisco, CA, December 1992
- ◆ Session Chair, Fall AGU Meeting, San Francisco, CA, December 1992
- ◆ Session Organizer and Chair, Spring AGU Meeting, Baltimore, MD May 1993
- ◆ Session Organizer and Chair, Atmospheric Chemistry, ACS Meeting, Pasadena, CA, October 1993
- ◆ Session Chair, Methyl Bromide State of the Science Workshop, Washington DC, October 1993
- ◆ American Meteorological Society Committee on Middle Atmospheres, 1993-1996
- ◆ Session Chair, Satellite Data and Meteorology, AMS Meeting, Monterey, CA, October 1993
- ◆ Session Chair, Workshop on Chemical Physics in the Atmosphere, Telluride, CO, August 1994
- ◆ Co-organizer and Session Chair, Methyl Bromide Workshop, Monterey, CA, June 1995
- ◆ Organizer and Session Chair, Fall AGU Meeting, San Francisco, CA, December 1995
- ◆ Co-organizer, Stratospheric Ozone Depletion by Halogens: Recent Achievements and Continuing Challenges, AAAS Meeting, Washington DC, February 1996
- ◆ Panel Reviewer, NASA Assessment of the Effects of High-Speed Aircraft in the Stratosphere, 1998
- ◆ Chair, Communications Committee, AGU Atmospheric Sciences Section, 1998-2001
- ◆ Executive Committee, AGU Atmospheric Sciences Section, 1998-2002
- ◆ Observing Facilities Advisory Panel, NCAR, 1999-2002
- ◆ NSF SBIR Panel Reviewer, 1999
- ◆ Session Organizer, 2000 Conference on the Atmospheric Effects of Aviation, Snowmass, June 2000
- ◆ SPARC Water Vapor Assessment Review Panel, 2000
- ◆ NASA New Investigator Program, Panel Reviewer, 2000
- ◆ Chair, 2000 Conference on the Atmospheric Effects of Aviation, Snowmass, CO, June 2000
- ◆ Session Chair, IAMAS Meeting, Innsbruck, July, 2001
- ◆ Session Chair, Fall AGU Meeting, San Francisco, December 2001
- ◆ Session Chair, Spring AGU Meeting, Boston, MA, May 2001
- ◆ Session Chair, Spring AGU Meeting, Washington DC, May 2002
- ◆ Co-convener, Organizer, and Session Chair, Polar Ozone Workshop, Potsdam, Germany, March 2002
- ◆ Expert Reviewer, Arctic Climate Impact Assessment, 2003
- ◆ Editor, JGR Atmospheres, 2000-2005
- ◆ Co-organizer, Boulder Café Scientifique, 2005-present
- ◆ Reviewer, Chapter 4, UNEP/WMO Scientific Assessment of Ozone Depletion, 2006
- ◆ Editorial Board, The Earth System Atlas, 2007-present
- ◆ Editor, Atmospheric Measurement Techniques, 2008-present
- ◆ Review Panel, NASA, 2009, 2012
- ◆ Lead Author, Chapter 5, WMO Scientific Assessment of Ozone Depletion, 2010
- ◆ Review Panel, USAID, 2012, 2013
- ◆ Lead organizer of "APEC Workshop on Climate Change Adaptation in the Asia-Pacific: Observations and Modeling Tools for Better Planning," Singapore, August 23-24, 2012.
- ◆ Review Panel, Jefferson Science Fellows program, 2013

### **University**

- ◆ Chemistry Department Group Housing Faculty Advisor, 1993
- ◆ Physical Sciences Machine Shop Committee, 1993-1994
- ◆ UCI Chemistry Graduate Admissions Committee, 1993-1995
- ◆ UCI PhD and Candidacy Exam Committees (ten from 1993-1998)
- ◆ UCI Earth System Science Department Graduate Researchers Award Committee, 1994-1995
- ◆ Chair, UCI Computer Policy Committee, 1995-1996
- ◆ UCI Computer Policy Committee, 1994-1996

- ◆ UCI Campus-Wide Information Systems Steering Committee, 1995-1996
- ◆ UCI Senate Executive Committee, 1995-1996
- ◆ ESS Faculty Search Committee, 1995, 1996, 1998
- ◆ Physical Sciences Instructional Computing Committee, UCI, 1996
- ◆ Faculty Panelist, Planning Your Research Career Workshop, UCI, May 15, 1996
- ◆ Graduate Admissions Committee, PAOS, 1999, 2001-2002, 2002-2003
- ◆ Director Search Committee, PAOS, 1999
- ◆ Chair, Tenure Committee, PAOS, 1999
- ◆ Executive Committee, CU Program in Atmospheric and Oceanic Sciences, 1999-2003
- ◆ Chair, Promotion and Tenure Committee, ATOC, 1999, 2005, 2006, 2009
- ◆ Promotion and Tenure Committee, ATOC, 1999, 2009
- ◆ Co-organizer, PAOS/CDC Distinguished Lecture Series, 2000-2001, 2002-2003
- ◆ Invited Panelist, Graduate School, Faculty Research Opportunities Program, 2000
- ◆ Curriculum Committee, Environmental Studies Program, 2000-2006
- ◆ Tenure Committee, PAOS, 2000
- ◆ PAOS Self-Study Strategic Plan Committee, 2000
- ◆ Executive Committee, CU Environmental Studies Program, 2000-2003
- ◆ Chair, ENVS Self-Study Strategic Plan Committee, 2000-2001
- ◆ Biogeochemistry Faculty Search Committee, ENVS, 2002
- ◆ Graduate Student Advisor, PAOS, 2002-2005
- ◆ PAOS Comprehensive Exam Committee, 2003-2005
- ◆ PAOS/ATOC Course Fees Committee, 2003-2005, 2009-2010
- ◆ Faculty Representative, PAOS Graduate Students Concerns, 2003-2005
- ◆ Graduate Student Advisor, PAOS, 2003-2005
- ◆ Chair, Post-Tenure Review Committee, PAOS/ATOC, 2003, 2006, 2008, 2013
- ◆ Chair, ATOC Graduate Admissions Committee, 2005-2008
- ◆ Residential Academic Program Council, 2005-2009
- ◆ Faculty Reappointment Committee, ATOC, 2006, 2010
- ◆ Chair, Faculty Search Committee, ENVS, 2006-2007
- ◆ Chair, ATOC Course Fees Committee, 2006-2009, 2010
- ◆ Teaching Lab Development Committee, ATOC, 2006-2007
- ◆ Computer Committee, ATOC, 2006-2009
- ◆ Fullbright Scholarship Review Committee, CU Boulder, 2006, 2009
- ◆ Provost's Task Force for CU 101, Sub-group 3, 2006-2008
- ◆ Invited panelist, Committee on Learning and Academic Support, 2006
- ◆ Provost's Task Force on Orientation, 2007
- ◆ Member, Flagship 2030 Undergraduate Education Committee, 2008
- ◆ Chair, ATOC Undergraduate Curriculum Committee, Spring 2008
- ◆ Chair, ENVS Sustainability Residential Academic Program Committee, 2008-2009
- ◆ Chair, ATOC Comps I Exam Committee, 2008-2010
- ◆ Invited Panelist, Academic Support Assistance Program, Supporting Your Student's Academics, 2008
- ◆ Sewall RAP Director Search Committee, 2008.
- ◆ Member of Review Committee, Council on Research and Creative Work, Fall 2009.
- ◆ Arts and Sciences, RAP Representative for ASSETT Steering Committee, 2009.
- ◆ Labs and Facilities Committee, ATOC, 2009-2010
- ◆ Member, ATOC Awards Committee, 2010-2011, 2012-present
- ◆ Member, ATOC Comps I Exam Committee, 2012-present
- ◆ Member, CU Vice Chancellor's Research Review Board (2012-present)
- ◆ Member, Informal CU Global Development Visioning Group (2013-present)

## Students and Postdoctorates Supervised

### ***Undergraduate Students***

- ◆ Anefiok Atuk (1986)
- ◆ Jean Andino (1987)
- ◆ Karena McKinney (1990-1991)
- ◆ Jason Low – UCI Chemistry (1994-1996)
- ◆ Dennis Ralutin – UCI Chemistry (1994)
- ◆ Jessica Neu – UCI Chemistry REU (1996)
- ◆ Dahlia Sokolov – UCI Engineering (1996)
- ◆ Steve Cordero – UCI Chemistry (1997)
- ◆ Sheila Manalang – UCI Chemistry (1997)
- ◆ Kiyono McRill – UCI Chemistry (1996)
- ◆ Jenny Yom – UCI Chemistry (1996)
- ◆ Tara Fortin – UCI Earth System Science (1995-1996)
- ◆ Nathan Johns - CU ATOC (2003)
- ◆ Diane Strassberg – CU ATOC (2005)
- ◆ Ian Moritz – CU Honors Program (2006)
- ◆ Arellis Rivera Giboyeaux – CU SMART Program (Summer 2009)
- ◆ Isatis Cintron – CU SMART Program (Summer 2013)

### ***Graduate students***

- ◆ James Pierson – UCI Chemistry (1992-1997)
- ◆ Karena McKinney – UCI Chemistry (1994-1998)
- ◆ Allison Conley – UCI Chemistry (1993)
- ◆ William Barney – UCI Chemistry (1993)
- ◆ Nancy Ciszkowski – UCI Chemistry (1996)
- ◆ Thomas Woyke – KFA Julich (1994)
- ◆ Amy Hankinson – CU PAOS (1999-2001)
- ◆ Alice Delia – CU PAOS (1999-2004)
- ◆ Brett Thornton – CU Chemistry (1999-2004)
- ◆ David Krank – CU PAOS (1999-2001)
- ◆ Kristi Hines – CU PAOS (2000)
- ◆ Jason Farmer – CU APS (1999-2001)
- ◆ Lars Kalnajs – CU PAOS (Summer 2003)
- ◆ Sherri Heck – CU PAOS (2005-2006,2013)
- ◆ Nick Facciola – CU Mech E (2005-2006) – supervised field work project
- ◆ Marsha Fisher – CU PAOS (2005-2007)

### ***Postdoctorates***

- ◆ Dr. Roy Dixon (1994)
- ◆ Dr. Troy Mazely (1995-1996)
- ◆ Dr. Hiroyuki Kosai (1996-2000)
- ◆ Dr. Holger Voemel (1999-2000)

## Experience

### ***Principal Investigator***

- ◆ Balloon measurements of ClO, Palestine, TX (1990)
- ◆ Balloon measurements of ClO, Ft. Sumner, NM (1991)
- ◆ Development of fast-response CO<sub>2</sub> instrument for the ER-2 (1989-1992)
- ◆ Measurements of ClO and BrO, AASE II (1991-1992)

- ◆ Development of balloon-borne instrument for measurements of ClO and BrO (1993-1994)
- ◆ Measurements of ClO and BrO for SESAME, Kiruna, Sweden (1995)
- ◆ Development of balloon-borne CO<sub>2</sub> instrument for STRAT (1995)
- ◆ Development of a ClO instrument for measurements on the STRATO-2C aircraft (1996-1997)
- ◆ Development of a lightweight balloon-borne instrument for measurements of ClO and BrO (1995-1996)
- ◆ Balloon Measurements of ClO and BrO from Antarctica (1996)
- ◆ Balloon Measurements of ClO and BrO for ILAS-II Validations, Kiruna, Sweden (1997)
- ◆ Development of an ultra-fast instrument for measurements of ClO and Cl for the WB-57 (1997-1998)
- ◆ WB-57 Measurements of ClO for WAM, Houston (1998)
- ◆ WB-57 Measurements of ClO for RISO, Houston TX, Lancaster, CA (1998)
- ◆ WB-57 Measurements of ClO for ACCENT II, Houston, TX (1999)
- ◆ Development of CO<sub>2</sub> instrument for WB-57 (1999)
- ◆ Balloon measurements of ClO and BrO, Laramie, WY (1999)
- ◆ DC-8 Measurements of ClO for SOLVE (1999-2000)
- ◆ Balloon measurements of ClO and BrO for HALOZ-2000, Kiruna, Sweden (2000)
- ◆ WB-57 measurements of ClO and Cl for ACCENT III, Houston, TX, and Cape Canaveral, FL (2000)
- ◆ Balloon measurements of ClO and BrO from Te Anau, New Zealand (2001)
- ◆ Ground-based measurements of particle composition, PROPHET 2001, Pellston, MI (2001)
- ◆ Development of a Integrated System for Analyses of Aerosol Composition and Chemistry (1999-2004)
- ◆ Balloon Measurements of ClO and BrO, Kiruna, Sweden (2002)
- ◆ Measurements of particle composition, Palmer Elementary School (2002)
- ◆ Measurements of particle composition, O<sub>3</sub>, NO<sub>x</sub>, and CO<sub>2</sub>, CELTIC (2003)
- ◆ WB-57 measurements of CO<sub>2</sub> for PUMA-A, Houston, TX and Cape Canaveral, FL (2004)
- ◆ WB-57 measurements of CO<sub>2</sub> and temp for PUMA-B, Houston, TX and Cape Canaveral, FL (2005)
- ◆ USFS Twin Otter measurements of fine particles, CO<sub>2</sub>, and H<sub>2</sub>O during MILAGRO, Veracruz, MX (2006)
- ◆ WB-57 measurements of CO<sub>2</sub> and temp for PUMA-C, Houston, TX and Cape Canaveral, FL (2006)
- ◆ Measurements of sub-micron particles at the USFS Fire Lab, Missoula, MT (2007)
- ◆ Measurements of sub-micron particles, CO<sub>2</sub>, and H<sub>2</sub>O, at Mauna Loa, HI, during WAWAIIKI (2008)
- ◆ Measurements of sub-micron particle size and composition, Beltsville Air Quality Study, Maryland (2009)
- ◆ Measurements of sub-micron particles, CO<sub>2</sub>, and H<sub>2</sub>O, Hawaii (2010)
- ◆ C-130 measurements of sub-micron particles and isotopes of water for ICE-T, St. Croix (2011)
- ◆ Gulfstream V measurements of cloud water content, IDEAS-IV-GV, Broomfield CO (2013)

#### **Co-Investigator**

- ◆ ER-2 measurements of ClO and BrO over the Arctic (1988)
- ◆ ER-2 measurements of ClO and BrO for AASE, (1988-1989)
- ◆ ER-2 measurements of CO<sub>2</sub> for SPADE, (1992)
- ◆ Ground-based measurements of ClO and BrO for ARCTOC '96, Ny Alesund, Spitsbergen, (1996)
- ◆ WB-57 measurements of CO<sub>2</sub> for ACCENT II, Houston (1999)
- ◆ Development of CO<sub>2</sub> instrument for DC-8 (1999)
- ◆ DC-8 measurements of CO<sub>2</sub> for SOLVE, (1999-2000)
- ◆ Ground-based measurements of ClO and BrO for PSE-2000, Alert, Canada, (2000)
- ◆ Ground-based measurements of particle composition, TexAQS, Houston, TX, (2000)
- ◆ WB-57 measurements of CO<sub>2</sub> for ACCENT III, Houston, TX, and Cape Canaveral, FL (2000)
- ◆ DC-8 measurements of NO and NO<sub>2</sub> during TRACE-P (2001)
- ◆ C-130 measurements of CO<sub>2</sub> for IDEAS, Broomfield, CO (2002)
- ◆ Measurements of CO<sub>2</sub>, particle size composition, ASHRAE indoor AQS, Colorado (2005-2007)
- ◆ INTEX Ozonesonde Network Study, IONS (2006)
- ◆ C-130 measurements of fine particles during VOCALS, Chile (2008)
- ◆ C-130 measurements of fine particles during PLOWS (2009-2010)
- ◆ Gulfstream V measurements of fine particles during PREDICT, St. Croix, US Virgin Is. (2010)
- ◆ C-130 counterflow virtual impactor measurements of particles and water during ICE-T, St. Croix (2011)
- ◆ C-130 measurements of submicron aerosols, IDEAS-IV, Broomfield (2012)

- ◆ Gulfstream V measurements of cloud total water content, DC3, Kansas (2012)
- ◆ Gulfstream V CVI measurements of particles and water, IDEAS-IV GV, Broomfield CO (2013)

### **Mission Planning**

- ◆ Mission Scientist, HALOZ-2000 Campaign, Kiruna, Sweden (1999-2000)
- ◆ Mission Scientist, HALOZ-2001 Campaign, Lauder, New Zealand (2001)
- ◆ Mission Scientist, HALOZ-2002 Campaign, Kiruna, Sweden (2002)
- ◆ Project Scientist, PUMA-A, Houston, TX (2004)
- ◆ Project Scientist and Mission Manager, PUMA-B, Houston, TX/Cocoa Beach, FL (2005)
- ◆ Project Scientist and Mission Manager, PUMA-C, Houston, TX/Cocoa Beach, FL (2006)

## **Peer-Reviewed Publications**

B.J. Finlayson-Pitts, T.E. Kleindienst, M.J. Ezell, and D.W. Toohey (1981), The Production of O(<sup>3</sup>P) and Ground State OH in the Reaction of Hydrogen Atoms with Ozone, **J. Chem. Phys.**, **74**, 4533-4543.

B.J. Finlayson-Pitts, D.W. Toohey, M.J. Ezell (1983), Relative Rate Constants for Removal of Vibrationally Excited OH(X<sup>2</sup>Π<sub>i</sub>)<sub>v=9</sub> by Some Small Molecules at Room Temperature, **Int. J. Chem. Kinet.**, **15**, 151-165.

B.J. Finlayson-Pitts, D.W. Toohey, M.J. Ezell (1984), Kinetics of Interaction of Vibrationally Excited OH(X<sup>2</sup>Π<sub>i</sub>)<sub>v=9</sub> with Simple Hydrocarbons at Room Temperature, **Int. J. Chem. Kinet.**, **17**, 613-628.

J.J. Schwab, D.W. Toohey, W.H. Brune, and J.G. Anderson (1984), Reaction Kinetics of O + ClO → Cl + O<sub>2</sub> Between 252-347 K, **J. Geophys. Res.**, **89**, 9581-9587.

D.W. Toohey, W.H. Brune, and J.G. Anderson (1986), Mechanism and Kinetics of Br + HO<sub>2</sub> → HBr + O<sub>2</sub> and Br + H<sub>2</sub>O<sub>2</sub> → Products over the Temperature Range 260-390 K, **J. Phys. Chem.**, **91**, 1215-1222.

D.W. Toohey, W.H. Brune, and J.G. Anderson (1988), Rate Constant for the Reaction Br + O<sub>3</sub> → BrO + O<sub>2</sub> from 248 to 418 K: Kinetics and Mechanism, **Int. J. Chem. Kinet.**, **20**, 131-144.

D.W. Toohey and J.G. Anderson (1988), Formation of BrCl(<sup>3</sup>Π<sub>0+</sub>) in the Reaction of BrO with ClO, **J. Phys. Chem.**, **92**, 1705-1708.

W.H. Brune, D.W. Toohey, J.G. Anderson, W.L. Starr, J.F. Vedder, and E.F. Danielsen (1988), In Situ Northern Mid-Latitude Observations of ClO, O<sub>3</sub>, and BrO in the Wintertime Lower Stratosphere, **Science**, **242**, 558-562.

J.P.D. Abbatt, D.W. Toohey, F.F. Fenter, P.S. Stevens, W.H. Brune, and J.G. Anderson (1989), Kinetics and Mechanism of X + ClNO → XCl + NO (X = Cl, F, Br, OH, O, N) from 220 K to 450 K: Correlation of Reactivity and Activation Energy with Electron Affinity of X, **J. Phys. Chem.**, **93**, 1022-1029.

D.W. Toohey and J.G. Anderson (1989), Theoretical Investigations of Reactions of Some Radicals with HO<sub>2</sub>. 1. Hydrogen Abstractions by Direct Mechanisms, **J. Phys. Chem.**, **93**, 1049-1058.

J.G. Anderson, W.H. Brune, S.A. Lloyd, D.W. Toohey, S.P. Sander, W.L. Starr, M. Loewenstein, and J.R. Podolske (1989), Kinetics of O<sub>3</sub> Destruction by ClO and BrO within the Antarctic Vortex: An Analysis Based on in Situ ER-2 Data, **J. Geophys. Res.**, **94**, 11480-11520.

- W.H. Brune, D.W. Toohey, J.G. Anderson, and K.R. Chan (1990), In Situ Observations of ClO in the Arctic Stratosphere: ER-2 Aircraft Results from 59°N to 80°N Latitude, **Geophys. Res. Lett.**, **17**, 505-508.
- W.H. Brune, D.W. Toohey, S.A. Lloyd, and J.G. Anderson (1990), The Sunrise and Sunset Variation of ClO in the Lower Stratosphere, **Geophys. Res. Lett.**, **17**, 509-512.
- D.W. Toohey, J.G. Anderson, W.H. Brune, and K.R. Chan (1990), In Situ Measurements of BrO in the Arctic Stratosphere, **Geophys. Res. Lett.**, **17**, 513-516.
- R.L. Jones, S. Solomon, D.S. McKenna, L.R. Poole, W.H. Brune, D.W. Toohey, J.G. Anderson, and D.W. Fahey (1990), The Polar Stratospheric Cloud Event of January 24: Part 2, Photochemistry, **Geophys. Res. Lett.**, **17**, 541-544.
- S.R. Kawa, D.W. Fahey, S. Solomon, W.H. Brune, M.H. Proffitt, D.W. Toohey, D.E. Anderson, Jr., L.C. Anderson, and K.R. Chan (1990), Interpretation of Aircraft Measurements of NO, ClO, and O<sub>3</sub> in the Lower Stratosphere, **J. Geophys. Res.**, **95**, 18,597-18609.
- J.G. Anderson, D.W. Toohey, and W.H. Brune (1991), Free Radicals within the Antarctic Vortex: The Role of CFCs in Antarctic Ozone Loss, **Science**, **251**, 39-46.
- D.W. Toohey, W.H. Brune, J.G. Anderson, and K.R. Chan (1991), In Situ Measurements of Midlatitude ClO in Winter, **Geophys. Res. Lett.**, **18**, 21-24.
- J.F. Stanton, C.M.L. Rittby, R.J. Bartlett, and D.W. Toohey (1991), Low-Lying Isomers of the Chlorine Oxide Dimer: A Theoretical Study, **J. Phys. Chem.**, **95**, 2107-2110.
- W.H. Brune, J.G. Anderson, D.W. Toohey, D.W. Fahey, S.R. Kawa, R.L. Jones, D.S. McKenna, and L.R. Poole (1991), The Potential for Ozone Depletion in the Arctic Polar Stratosphere, **Science**, **252**, 1260-1266.
- J.C. King, W.H. Brune, D.W. Toohey, J.M. Rodriguez, W.L. Starr, and J.F. Vedder (1991), Measurements of ClO and O<sub>3</sub> from 21°N to 61°N in the Lower Stratosphere during February 1988: Implications for Heterogeneous Chemistry, **Geophys. Res. Lett.**, **18**, 2273-2276.
- D.W. Fahey, S.R. Kawa, E.L. Woodbridge, P. Tin, J.C. Wilson, H.H. Jonsson, J.E. Dye, D. Baumgardner, S. Borrmann, D.W. Toohey, L.M. Avallone, M.H. Proffitt, J. Margitan, M. Loewenstein, J.R. Podolske, R.J. Salawitch, S.C. Wofsy, M.K.W. Ko, D.E. Anderson, M.R. Schoeberl, and K.R. Chan (1993), In situ Measurements Constraining the Role of Sulphate Aerosols in Mid-latitude Ozone Depletion, **Nature**, **363**, 509-514.
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## Invited Talks

*Comet Halley*, DAS Brown Bag Seminar, Harvard Observatory, 1986

*Atmospheric Observations*, Harvard Observatory, 1987.

*Laboratory Studies of Reactions of Halogen Oxides*, MIT Department of Chemistry Seminar, January, 1988

*Four-Center Elimination from Halogen-substituted Peroxides*, American Chemical Society Meeting, Los Angeles, July, 1988

*Measurements of BrO during AASE*, Seminar in Department of Meteorology, The Pennsylvania State University, June, 1989

*Halogen Photochemistry and Thermochemistry in the Polar Stratosphere*, ACS Meeting, Washington DC, May 18, 1990

*Observations of ClO at Night during AASE*, AASE Science Team Meeting, Charlottesville, June 1990

*With ClO<sub>x</sub> Ticking is Time Running out for the Ozone Layer?*, Seminar in Physical Chemistry, Wright Patterson Air Force Base, 1990.

*The Photochemistry of ClO in the Polar Stratosphere*, Seminar in Department of Chemistry, University of California, Irvine, March, 1990

*The Measurement of Atmospheric Constituents: The Role of Aircraft and Balloons in the Satellite Age*, Seminar for Instrumentation and Space Research Division, Southwest Research Institute, San Antonio, November 5, 1990

*CO<sub>2</sub> Measurements from the NASA ER-2 Aircraft*, HSRP Meeting, NASA Ames Research Center Sept. 1990

*Atmospheric Chemical Measurements: The Role of Airplanes and Balloons in the Satellite Age*, Seminar in Department of Chemistry, Tufts University, April 23, 1991

*Studies of Polar Ozone Chemistry using Perseus*, UAV Workshop, U.C. San Diego, 1991

*AASE II ClO Overview - Highlights Relating to HSRP Goals*, 1992 HSRP Annual Meeting, Virginia Beach, VA, April, 1992

*Current Status of Knowledge of Stratospheric Abundances of Free-Bromine Species: BrO (both direct and indirect)*, Methyl Bromide Workshop, Arlington, VA, June 2, 1992

*Stratospheric Ozone*, The 23<sup>rd</sup> Whole Earth Festival, U.C. Davis, May 3-5, 1992

*The Disappearing Ozone Layer: Facts and Fiction*, UCI University Club Forum, June 24, 1992

*The Disappearing Ozone Layer, Facts and Fiction*, Key Note Address, The Loral Aeronautic Chapter of the National Management Association, Newport Beach, CA, October 13, 1992

*Measurements of ClO and BrO during AASE II*, Atmospheric Chemistry Seminar, Jet Propulsion Laboratory, 1992

*Present Understanding of the Chemistry of Ozone in the Stratosphere*, Seminar in Mechanical and Aerospace Engineering/Civil Engineering, University of California, Irvine, January 12, 1993

*Photochemical and Kinetic Parameters of Cl<sub>2</sub>O<sub>2</sub> Determined from In Situ Measurements of ClO*, 10<sup>th</sup> Informal Symposium on Kinetics and Photochemical Processes in the Atmosphere, Riverside, CA, January 19, 1993

*PSCs, Volcanoes, and HSCTs: An Overview of in situ Measurements of ClO in the Lowery Stratosphere*, NOAA Aeronomy Laboratory Seminar, Boulder, CO, March 25, 1993

*What do In Situ Measurements of ClO Tell Us about Heterogeneous Reactions in the Earth's Stratosphere*, Department of Chemistry Seminar, California Institute of Technology, April 6, 1993

*In Situ Observations of ClO*, SESAME Planning Meeting, British Antarctic Survey, Cambridge, England, April 26, 1993

*In Situ Studies of Ozone Depletion*, Keynote Address, Pacific Rim Consortium in Energy, Combustion, and Air Pollution Workshop, Irvine, CA, April 28, 1993

*Looking into the Crystal Ball of Stratospheric Ozone Research*, AGU Spring meeting, Baltimore, MD, May, 1993

*Evidence for Atmospheric Processing by Heterogeneous Chemistry*, 1993 Gordon Conference, Newport, RI, June 22, 1993

*ClO Observations from Aircraft and Balloons*, EPFL, Lausanne, Switzerland, August 9, 1993

*Balloon and ER-2 Aircraft Observations of ClO*, KFA, Juelich, Germany, November 8, 1993

*Ozone Depletion: From Orange County Labs to International Crisis*, Presentation and Panel Discussion, Association of Environmental Professionals Statewide Conference, Newport Beach, CA, April 22, 1994

*The Partitioning of Stratospheric Inorganic Chlorine*, Workshop on Trace Gas Measurements for the Year 2000 and Beyond, NASA Meeting, Tyson's Corner, VA, July 6, 1994

*Overview of 1993-94 SESAME Ballooning Activities*, NASA Balloon Measurements Workshop, San Juan Capistrano, CA, July 12, 1994

*What do Atmospheric Measurements Tell Us about Heterogeneous Chemistry?*, 1994 Workshop on Chemical Physics and the Atmosphere, Telluride, CO, August 1, 1994

*The Politics and Science of Stratospheric Ozone Depletion*, Keynote Address, Air and Waste Management Association Orange County Chapter Dinner Meeting, Irvine, CA, September 28, 1994

*Lighter, Faster, Cheaper: Stratospheric Photochemistry After the Ozone Hole*, Seminar in Department of Chemistry, University of California, Irvine, October 11, 1994

*Studies of Lower Stratospheric Photochemistry and Transport Using Combined UARS and In Situ Data Sets*, UARS Science Team Meeting, Longmont, CO, November 3, 1994

*The Chemistry of Bromine in the Stratosphere*, Workshop on Methyl Bromide and Stratospheric Ozone Depletion, Orlando, FL, November 16, 1994

*Designing Instrumentation for In Situ Measurements of Reactive Species: Can Vacuum-Ultraviolet Techniques be used in the Troposphere?* Seminar in Environmental Engineering Science, California Institute of Technology, April 5, 1995

*How well do we Really Understand the Partitioning of Inorganic Chlorine in the Lower Stratosphere?* Geophysics Seminar, University of Chicago, May 12, 1995



*Inorganic Halogen Partitioning in the Lower Stratosphere as Deduced from Measurements*, International Conference on Ozone in the Lower Stratosphere, Halkidiki, Greece, May 15-20, 1995

*Free Radical Measurements in the World's Largest Laboratory*, Chemistry Department Seminar, California State University, Fullerton, Sept. 14, 1995

*ClO<sub>y</sub> Measurements*, Third European Symposium on Polar Stratospheric Ozone Research, Schliersee, Germany, Sept. 19, 1995

*Studies to Monitor the Recovery of Stratospheric Ozone*, Environmental Chemistry 1995: Problems and Prospects, The 1995 International Chemical Congress of Pacific Basin Societies, Honolulu, HI, Dec. 17-22, 1995

*In Situ Measurements of Halogen Oxides: Will there be an Arctic Ozone Hole?* Scripps Institution of Oceanography Seminar, May 3, 1996

*Crary Science Lecture, Featuring the Ozone Hole Guys*, Science Lecture, McMurdo Station, Antarctica, Sept. 29, 1996

*Measurements of Halogen Oxides in the Lower Stratosphere: An Anthology*, CIRES Seminar, University of Colorado, Boulder, Nov. 25, 1996

*The Role of In Situ Measurements in the Satellite Era*, 1st SPARC General Assembly, Melbourne, Australia, Dec. 6, 1996

*Balloon Measurements in New Mexico or Sweden?*, Earth System Science Holiday Seminar Series, December 16, 1996

*Making Sense of Atmospheric Measurements of BrO and ClO*, Atmospheric Sciences Seminar, University of Wyoming, April 28, 1997

*In Situ Measurements of Halogen Oxides in the Troposphere*, NOAA Aeronomy Laboratory Seminar, May 28, 1997

*Scientific Uncertainty and Global Change*, Global Change and Environmental Education Workshop, University of Wyoming, Laramie, WY, June 11, 1997

*Do Cirrus Clouds Activate Inorganic Chlorine in the Lower Stratosphere?* Goddard Space Flight Center, October 3, 1997

*In situ measurements of Halogen Oxides in the Troposphere*, Federation of Analytical Chemistry and Spectroscopy Society, Providence, RI, October 30, 1997

*Ozone in the Lower Stratosphere: Where Chemistry Meets Dynamics*, University of Colorado, Program in Atmospheric and Oceanic Science Seminar, November 7, 1997

*Do Cirrus Clouds Activate Inorganic Chlorine in the Lower Stratosphere?* ETH, Zurich, November 18, 1997

*Do Cirrus Clouds Activate Inorganic Chlorine in the Lower Stratosphere?* Earth System Science Seminar, University of California, Irvine, January 1998

Overview of Halogen Chemistry in the Arctic Polar Vortex, SOLVE Science Team Meeting, Lancaster, CA, January 1999

*Measurements of ClO in Rocket Plumes*, California State University, Fullerton, Department of Chemistry Seminar, September 18, 1999

*Overview: Contrails, Cirrus, and Particles*, 2000 Conference on the Atmospheric Effects of Aviation, Snowmass, Colorado, June 4-9, 2000

*In Situ Measurements of ClO, BrO, CFC-11, Ozone and Particles in the Arctic Vortex: An Overview of the HALOZ 2000 Balloon Campaign*, SOLVE/THESEO Science Team Meeting, Palermo, Italy, September 25-29, 2000

*Technology for Measurements of Atmospheric Free Radicals by Resonance Fluorescence*, LASP Technology Colloquium, University of Colorado at Boulder, June 13, 2000

*Attributing Stratospheric Ozone Losses to Halogen Chemistry – Three Regimes*, Ames Earth Science Seminar, NASA Ames Research Center, August 11, 2000

*The Space Shuttle: The Original “Ozone Hole”*, Program in Atmospheric and Oceanic Sciences Seminar, March 14, 2001

*Critical Stratospheric Photochemical Parameters Deduced from In Situ Measurements of Halogen Oxides*, Seminar in Environmental Engineering, Colorado School of Mines, April 17, 2001

*In Situ Measurements to Assess Photochemistry in Rocket Plumes – Challenges and Successes*, Graduate Seminar in Mechanical Engineering, University of Colorado at Boulder, March, 2001

*Deducing Photochemical Parameters from In Situ Measurements of ClO*, Seminar in Department of Chemistry, University of Cambridge, May 25, 2001

*Toward a Better Understanding of the Lower Stratosphere based on In Situ Measurements from Balloons and Aircraft*, Seminar in Environmental Sciences, University of Virginia, April 25, 2002

*What are Measurements of ClO in the Lowermost Stratosphere Trying to Tell Us?*, AGU Spring Meeting, Washington, DC, May 2002

*A Chemical Explanation for Mid-winter Ozone Loss in the Arctic Stratosphere*, Spring 2003 EGS/EUG/AGU meeting, Nice, France, April 6-11, 2003.

*The Role of Halogen Oxides in the Atmosphere: How Fast is “Fast?”*, University of Virginia, School of Engineering Seminar, August 21, 2003.

*The Role of Halogen Oxides in the Atmosphere: How Fast is “Fast?”*, The National Institute of Aeronautics, Hampton, VA, August 22, 2003.

*Halogens in the UTLs, UTLs Workshop*, National Center for Atmospheric Research, Boulder, CO, October 27-28, 2003

*Science in the Wake of the Space Shuttle: or Can. J. Chem. 52, 1610-1615, 1974 Revisited*, Earth System Science, UC Irvine, February 10, 2005

*Measurements in Plumes of Rockets - Early Results from the PUMA Campaigns*, NOAA Chemical Sciences Division, October 5, 2005.

*An Overview of the PUMA Campaign*, Program in Atmospheric and Oceanic Sciences, CU Boulder, October 26, 2005

*Probing the Atmosphere with Exhaust from Space Launch Vehicles*, Mechanical Engineering, CU Boulder, December 1, 2005

*Keeping an Eye on the Space Shuttle: What a Little Foam Can Do*, Café Scientifique, Boulder, CO, June 6, 2006.

*Using Rocket Plumes to Study Chemistry and Transport Issues in the Lower Stratosphere*, Department of Meteorology, Penn State University, Feb. 8, 2007.

*Aircraft Measurements in Rocket Plumes*, Antarctic Programs, National Science Foundation, September 24, 2007.

*Overview of SSWP I on UT/LS Chemistry and Transport*, ACCRI Review Meeting, Virginia Beach, VA, Feb. 26, 2008.

*Global Warming, Have We Reached the Tipping Point?* Cal State University Fullerton Math and Science Colleagues Colloquium, May 1, 2008.

*Probing the Atmosphere with Emission Plumes*, Department of Chemistry Seminar, Cal State University Fullerton, May 1, 2008.

*The Consistency of Observations of ClO from the ER-2, WB57F, and Balloons - Constraints on Reactive Chlorine Photochemistry*, SPARC Initiative on ClO Dimer Chemistry, Cambridge, UK, June 27, 2008.

*Using the Atmosphere to Probe Instruments*, ATOC Department Seminar, Sept. 5, 2008.

*The Impact of Rockets on Stratospheric Ozone: Implications for Space Launch Activities*, Invited Talk, Department of Chemistry, U. New Orleans, Feb. 6, 2009.

*Climate Change in a Bottle*, CU Science Wizards, University of Colorado, Feb. 14, 2009.

*Using Rockets to Engineer Climate without Harming the Ozone Layer*, The Academy for Lifelong Learning, Denver, CO, Mar. 3, 2010.

*Climate Change in a Bottle*, CU Science Wizards, University of Colorado, Dec. 4, 2010.

*The Canary in the Coalmine: Why the Stratosphere is Still Relevant*, Invited Seminar, University of Maryland, April 6, 2012.

*Energy, Green Growth, and APEC*, Invited lecture, Osgood Center for International Studies, April 2012.

*The Canary in the Coalmine: Why the Stratosphere is Still Relevant*, Invited Lecture, U.S. Department of State, April 24, 2012 (video and transcript available at <http://www.state.gov/e/stas/series/193969.htm>)

*Saving the Earth's Ozone Layer: The (W)hole Story*, Invited talk, The Royal Geographic Society of Hong Kong, August 3, 2012, Hong Kong.

*In Situ Measurements of Aerosols and Trace Gases*, Invited Talk, The Civic Exchange, Hong Kong, August 3, 2012

*Energy, Air Pollution, Policy, and the Asia-Pacific Economic Cooperation*, Invited talk for private sector representatives, U.S. Consulate General, Hong Kong, August 3, 2012

*Serving as a Science Fellow in the U.S. Department of State*, invited panelist, 2012-2013 Jefferson Science Fellow Orientation, National Academy of Sciences, Washington DC, August 20, 2012.

*Context and Goals for the Workshop*, Invited talk, APEC Workshop on Climate Change Adaptation in the Asia-Pacific: Observations and Modeling Tools for Better Planning, APEC/U.S. Department of State/ USAID, Singapore, August 23, 2012

*Global Warming, Climate Change, and the Golden Age of Facts*, Invited Lecture, U.S. Department of State, September 12, 2012.

*Climate Change, Energy, and Economic Cooperation in the Asia-Pacific*, Invited Seminar, Dept. of Meteorology, Penn State University, October 24, 2012.

*Short-lived Climate Forcers: How They Get into the Atmosphere, Where They End Up, & What the Government is Doing to Get Rid of Them*, Lecture for the "CU Science at the Cutting Edge" series, The Academy for Lifelong Learning, Denver, November 6, 2012.

*Understanding Climate Change and the Redistribution of Heat, Winds, Water, and Worries*, Invited Talk, U.S. Center, UN Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP18) in Doha, Qatar, November 28, 2012. Webcast with 4000 participants (video available at <http://www.ustream.tv/recorded/27347154>)

*The Montreal Protocol: The Gift that Keeps on Giving*, Invited Talk, American Geophysical Union Fall Meeting, San Francisco CA, December 5, 2012 (presented on behalf of Daniel Reifsnyder, U.S. Department of State)

*Climate Change, Energy, and Open Governance: My Year as an Economic Policy Analyst at the State Department*, Café Scientifique, Boulder, CO, July 9, 2013

## Meeting Presentations

D.W. Toohey, M.J. Ezell, and B.J. Finlayson-Pitts, *Laboratory Studies of Vibrationally Excited Hydroxyl*, ACS Meeting, Anaheim, CA, October, 1981

J.J. Schwab, R.R. Friedl, W.H. Brune, D.W. Toohey, and J.G. Anderson, *Recent Rate Constant Measurements for Reactions Involving Sulfur-, Oxygen-, Hydrogen-, and Nitrogen-Containing Free Radicals*, ACS Annual Meeting, Philadelphia, PA, August 26-31, 1984

W.H. Brune, R.M. Stimpfle, E. Weinstock, J.J. Schwab, L. Loewenstein, R. Friedl, D. Toohey, J. Larabee, and J.G. Anderson, *Free Radical Kinetics and Atmospheric Chemistry: Two Friends*, 14<sup>th</sup> Informal Conference on Photochemistry, Cambridge, MA, August 20-24, 1984

D.W. Toohey, W.H. Brune, and J.G. Anderson, *Reaction Kinetics of  $Br+HO_2 \rightarrow HBr + O_2$* , International Conference on Chemical Kinetics, Gaithersburg, MD, June 17-19, 1985

D.W. Toohey, J.J. Schwab, P. Haaland, W.H. Brune, and J.G. Anderson, *Experimental and Theoretical Investigations of Reactions of HO, HO<sub>2</sub>, ClO, and BrO with Atoms and Radicals: Interpretation of Reaction Trends and Implications for Stratospheric Chemistry*, 18<sup>th</sup> International Symposium on Free Radicals, Oxford, September, 1987

W.H. Brune, D.W. Toohey, J.G. Anderson, E.F. Danielsen, and W. Starr, *In Situ Observations of ClO in the Wintertime Northern Hemisphere: ER-2 Aircraft Results from 21°N to 61°N Latitude*, Polar Ozone Workshop, Snowmass, CO, May 9-13, 1988.

W.H. Brune, D.W. Toohey and J.G. Anderson, *Chlorine Monoxide in the Wintertime Arctic Stratosphere: In Situ Measurements During AASE Mission*, Fall AGU Meeting, San Francisco, CA, December 4-8, 1989

S.R. Kawa, D.W. Fahey, S. Solomon, M.H. Proffitt, W.H. Brune, D.W. Toohey, J.G. Anderson, L.C. Anderson, and K.R. Chan, *Interpretation of Aircraft Measurements of NO, ClO, and O<sub>3</sub> in the Lower Stratosphere*, AGU Fall Meeting, San Francisco, CA, December 4-8, 1989

D.W. Toohey, J.G. Anderson, and W.H. Brune, *In Situ Observations of BrO in the Arctic Stratosphere in January and February, 1989*, AGU Fall Meeting, San Francisco, CA, December 4-8, 1989

W.H. Brune, D.W. Toohey, and J.G. Anderson, *The Gas-Phase Photochemistry of the Polar Stratosphere in Springtime: Photochemical Mechanisms and Effects on Ozone*, AGU Fall Meeting, San Francisco, CA, December 4-8, 1989

W.H. Brune, D.W. Toohey and J.G. Anderson, *Chlorine Monoxide in the Winter-time Arctic Stratosphere: In Situ Measurements During the AASE Mission*, AGU Fall Meeting, San Francisco, CA, December 4-8, 1989

S.R. Kawa, D.W. Fahey, S. Solomon, M.H. Proffitt, L.H. Heidt, W.H. Brune, D.W. Toohey, J.G. Anderson, D.E. Anderson, M. Loewenstein, and K.R. Chan, *Photochemical Partitioning of the Reactive Nitrogen and Chlorine Reservoirs in the High-latitude Stratosphere*, AGU Fall Meeting, San Francisco, CA, December 1990

L.M. Avallone, D.W. Toohey, and J.G. Anderson, *High-Pressure Discharge Flow Measurement of the Equilibrium Constant for Cl+O<sub>2</sub> <-> ClOO from 150-210 K*, AGU Spring Meeting, Baltimore, MD, May 28-31, 1991

D.W. Toohey, W.H. Brune, J. G. Anderson, and K.R. Chan, *In situ Measurements of ClO in the Nighttime Arctic Stratosphere in January and February, 1989*, AGU Spring Meeting, Baltimore, MD, May 28-31, 1991

W.H. Brune, J.C. King, D.W. Toohey, J.G. Anderson, W.L. Starr, and J.F. Vedder, *Measurements of ClO and O<sub>3</sub> from 21°N to 61°N in the Lower Stratosphere during February 1988: Implications for Heterogeneous Chemistry*, AGU Spring Meeting, Baltimore, MD, May 28-31, 1991

D.W. Toohey, J. Stanton, and K. Demerjian, *The Hydroperoxyl (HO<sub>2</sub>)-water adduct: Is H<sub>3</sub>O<sub>3</sub> an Important Species in the Earth's Atmosphere?*, ACS Meeting, San Francisco, CA, April 1992

L.M. Avallone and D.W. Toohey, *Stratospheric Bromine Photochemistry*, ACS Meeting, Pasadena CA, October, 1992

E.L. Woodbridge, D.W. Fahey, P. Tin, S.R. Kawa, M.H. Proffitt, J. Margitan, D.W. Toohey, M. Loewenstein, J. Podolske, K.R. Chan, D.E. Anderson, *Progress in the Measurement of Reactive Nitrogen Species in the Stratosphere*, NASA High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft Annual Meeting, Virginia Beach, VA, May 17-21, 1992

S.R. Kawa, D.W. Fahey, P. Tin, E.L. Woodbridge, M.H. Proffitt, S. Solomon, D.W. Toohey, J.C. Wilson, J.E. Dye, D. Baumgardner, D.E. Anderson, R.J. Salawitch, S.C. Wofsy, K.R. Chan, M.K.W. Ko, and J.M. Rodriguez, *Simulation of Stratospheric NO<sub>x</sub>/NO<sub>y</sub> Based on ER-2 Measurements*, NASA High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft Annual Meeting, Virginia Beach, VA, May 17-21, 1992

J.C. Wilson, H. Jonsson, C. Brock, D. Toohey, L. Avallone, R. Salawitch, J. Dye, D. Baumgardner, G. Ferry, and M. Loewenstein, *Aerosol Size Distributions Measured from the ER-2 in AASE II: Characterization of the Pinatubo Aerosol and a Preliminary Relationship between ClO and Aerosol Surface in August and September, 1991 at Mid-latitudes*, NASA High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft Annual Meeting, Virginia Beach, VA, May 17-21, 1992

L.M. Avallone, J.G. Anderson, and D.W. Toohey, *A Midlatitude Balloon-borne ClO Profile: Implications for Lower Stratospheric Chemistry*, NASA High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft Annual Meeting, Virginia Beach, VA, May 17-21, 1992

D.W. Toohey, L.M. Avallone, J.G. Anderson, and W.H. Brune, *In Situ Measurements of ClO at Midlatitudes from the ER-2 Aircraft*, NASA High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft Annual Meeting, Virginia Beach, VA, May 17-21, 1992

S.C. Wofsy, R.J. Salawitch, E.W. Gottleib, J.G. Anderson, D. Baumgardner, K.R. Chan, J. Dye, J.W. Elkins, D.W. Fahey, K. Kelly, M. Loewenstein, P. Newman, J. Podolske, M. Proffitt, M. Schoeberl, D. Toohey, C. Webster, and J.C. Wilson, *Dependence of Ozone Recombination Rates on NO<sub>y</sub>: Lessons from AASE II*, NASA High Speed Research Program/Atmospheric Effects of Stratospheric Aircraft Annual Meeting, Virginia Beach, VA, May 17-21, 1992

L.M. Avallone, J.G. Anderson, W.H. Brune, M. Loewenstein, J. Podolske, M.H. Proffitt, and D.W. Toohey, *In Situ Measurements of ClO at Midlatitudes: Is there an Effect from Mt. Pinatubo*, AGU Fall Meeting, San Francisco, CA, December 1992

C.R. Webster, R.D. May, D. Toohey, L. Avallone, J.G. Anderson, P. Newman, L. Lait, M. Schoeberl, K.R. Chan, J. Elkins, and D. Fahey, *Hydrochloric Acid Loss and Chlorine Chemistry on Polar Stratospheric Clouds in the Arctic Winter*, AGU Fall Meeting, San Francisco, CA, December 1992

J.C. Wilson, H. Jonsson, C.A. Brock, D. Toohey, L. Avallone, M. Loewenstein, and G. Ferry, *Relationship between Aerosol Surface Concentration and ClO Observed in AASE II from the NASA ER-2*, AGU Fall Meeting, San Francisco, CA, December 1992

R.J. Salawitch, S.C. Wofsy, E.W. Gottlieb, J.G. Anderson, L. Avallone, D. Baumgardner, J.E. Dye, K.R. Chan, M. Loewenstein, J.R. Podolske, A. Weaver, J.W. Elkins, D.W. Fahey, K.K. Kelly, M.H. Proffitt, L.R. Lait, P.A. Newman, M.R. Schoeberl, R.D. May, C.R. Webster, S.E. Strahan, D.W. Toohey, and J.C. Wilson, *Loss of O<sub>3</sub> in the Arctic Polar Vortex for the Winter of 1991-1992*, AGU Fall Meeting, San Francisco, CA, December 1992

E.L. Woodbridge, D.W. Fahey, M.H. Proffitt, S.R. Kawa, P. Tin, D.W. Toohey, L. Avallone, M. Loewenstein, J.C. Wilson, J.E. Dye, D. Baumgardner, and K.R. Chan, *Progress in the Measurement of Reactive Nitrogen Species in the Stratosphere*, AGU Fall Meeting, San Francisco, CA, December 1992

D.W. Toohey, L.M. Avallone, J.G. Anderson, W.H. Brune, K.R. Chan, M. Loewenstein, and J. Podolske, *In Situ Measurements of ClO from AASE and AASE II: The Temporal and Spatial Evolution of Reactive Chlorine in the Arctic Polar Vortex*, AGU Fall Meeting, San Francisco, CA, December 1992

M.H. Proffitt, K. Aikin, D.W. Fahey, J.W. Elkins, J.J. Margitan, C.R. Webster, R.D. May, K.R. Chan, M. Loewenstein, J. Podolske, A. Weaver, S.E. Strahan, D.W. Toohey, L.M. Avallone, *Northern Hemisphere Vortex as a Flowing Processor of Ozone during AASE II*, AGU Fall Meeting, San Francisco, CA, December 1992

R.S. Stolarski, A.R. Douglass, M.R. Schoeberl, P.A. Newman, D. Toohey, L. Avallone, C.R. Webster, R. May, D. Fahey, L.R. Lait, *Chemical Calculations along Parcel Trajectories during AASE II*, AGU Fall Meeting, San Francisco, CA, December 1992

M.R. Schoeberl, P.A. Newman, L.R. Lait, D. Toohey, C.R. Webster, R. May, M. Loewenstein, and J. Podolske, *Trajectory Analysis of Aircraft Constituent Observations*, AGU Fall Meeting, San Francisco, CA, December, 1992

D.W. Toohey, B.L. Gary, and J.S. Langford, *An Investigation of Polar Stratospheric Clouds using Remote Sensors, In Situ Instruments, and the Perseus Remotely Piloted Aircraft*, IEEE/LEOS Annual Meeting, Albuquerque, NM, March 1993

D.W. Waugh, R.A. Plumb, M. Loewenstein, and D.W. Toohey, *Investigation of Fine-Scale Structure in Stratospheric Tracer Transport using Contour Advection with Surgery*, Fourth International Symposium on Southern Hemisphere Meteorology, Melbourne, Australia, March, 1993

D.W. Toohey, W.H. Brune, and L.M. Avallone, *Photochemical and Kinetic Parameters of Cl<sub>2</sub>O<sub>2</sub> Determined from in situ Measurements of ClO*, 10th Informal Symposium on Kinetics and Photochemical Processes in the Atmosphere, Riverside, CA, January 19, 1993

L.M. Avallone, J.G. Anderson, W.H. Brune, and D.W. Toohey, *An Assessment of Uncertainties for In Situ Measurements of ClO*, AGU Spring Meeting, Baltimore, MD, May 24-28, 1993

R.S. Stolarski, A.R. Douglass, M.R. Schoeberl, D. Toohey, and L. Avallone, *Evolution of ClO Concentration in the Arctic Vortex*, AGU Spring Meeting, Baltimore, MD, May 24-28, 1993

L.M. Avallone and D.W. Toohey, *Stratospheric Bromine Photochemistry*, ACS Meeting, Pasadena, CA, Oct. 20, 1993

D.W. Toohey, L.M. Avallone, D.W. Fahey, and E.L. Woodbridge, *The Partitioning of Inorganic Chlorine at 20 km Deduced from Simultaneous Measurements of ClO and NO during AASE II*, NASA AEAP Annual Meeting, Virginia Beach, VA, May, 1994

D.W. Toohey, L.M. Avallone, S.M. Schauffler, W.H. Pollock, E.L. Atlas, and K.R. Chan, *Measurements of BrO in the Lower Stratosphere During the 1991-1992 AASE II Campaign*, Fall AGU Meeting, San Francisco, CA, December 5-9, 1994

J.L. Neu, L.M. Avallone, and D.W. Toohey, *An Investigation of Inorganic Chlorine Partitioning in the Lower Stratosphere Based on In Situ Measurements in the Northern Hemisphere*, AGU Spring Meeting, Baltimore, MD, May 30 - June 2, 1994

D.W. Toohey, L.M. Avallone, and M.J. Prather, *Preliminary Investigations of Ozone Loss Rates using Combined UARS and In Situ Data Sets*, UARS Science Team Meeting, Pasadena CA, 28-30 March, 1995

J.M. Pierson, K.A. McKinney, T.L. Mazely, and D.W. Toohey, *An In Situ Measurement of ClO in the Arctic Vortex: An Opportunity to Intercompare with MLS*, UARS Science Team Meeting, Pasadena, CA, March 28-30, 1995

T.L. Mazely, J.M. Pierson, K.A. McKinney, J.C. Low, R. Dixon, and D.W. Toohey, *Overview of a New Lightweight Instrument for In Situ Detection of Halogen Oxides*, 5th Annual Meeting on the Atmospheric Effects of Aviation, NASA, Virginia Beach, VA, April 23-28, 1995

K.A. McKinney, J.M. Pierson, and D.W. Toohey, *In Situ Measurement of BrO between 18 and 27 km in the Arctic Vortex*, 5th Annual Meeting on the Atmospheric Effects of Aviation, NASA, Virginia Beach, VA, April 23-28, 1995

J.M. Pierson, K.A. McKinney, T.L. Mazely, and D.W. Toohey, *In Situ Balloon Measurement of ClO in the Arctic Vortex during SESAME 1995*, 5th Annual Meeting on the Atmospheric Effects of Aviation, NASA, Virginia Beach, VA, April 23-28, 1995

L.M. Avallone, J.L. Neu, D.W. Toohey, and D.W. Fahey, *Halogen Oxides in the Lower Stratosphere: Measurement Uncertainties and tests of Photochemistry*, International Conference on Ozone in the Lower Stratosphere, Halkidiki, Greece, May 15-20, 1995

D. Toohey, J. Pierson, K. McKinney, T. Mazely, F. Stroh, and T. Woyke, *In Situ Measurement of BrO and ClO in the Arctic Stratosphere: Test of a New Lightweight Balloon Borne Instrument*, International Conference on Ozone in the Lower Stratosphere, Halkidiki, Greece, May 15-20, 1995

L.M. Avallone and D.W. Toohey, *Reanalysis of In Situ Measurements of BrO in the Lower Stratosphere*, 1995 Methyl Bromide State of the Science Workshop, Monterey, CA, June 5-7, 1995

D.W. Toohey and K.A. McKinney, *A Balloon-borne Measurement of BrO in the Arctic Vortex*, 1995 Methyl Bromide State of the Science Workshop, Monterey, CA, June 5-7, 1995

K.A. McKinney, J.M. Pierson, and D.W. Toohey, *A Balloon Profile of BrO in the Arctic Polar Vortex*, IGAC Workshop, Quebec, September 4-15, 1995

D.W. Toohey, J.M. Pierson, and K.A. McKinney, *Investigations of Chlorine and Bromine Photochemistry: In Situ Observations of ClO and BrO*, Third European Symposium on Polar Stratospheric Ozone Research, Schliersee, Germany, September 18-22, 1995

T. Woyke, F. Stroh, A. Engel, J. Pierson, K. McKinney, T. Mazely, and D. Toohey, *In Situ Measurement of Halogen Radicals in the Arctic Stratosphere*, Third European Symposium on Polar Stratospheric Ozone Research, Schliersee, Germany, September 18-22, 1995

J.M. Pierson, K.A. McKinney, and D.W. Toohey, *In Situ Balloon Measurement of ClO and Modeling Studies of Chlorine Partitioning in the Arctic Vortex*, AGU Fall Meeting, San Francisco, CA, December 11-15, 1995

K.A. McKinney, J.M. Pierson, and D.W. Toohey, *BrO Photochemistry in the Arctic Stratosphere*, AGU Fall Meeting, San Francisco, CA, December 11-15, 1995

T.L. Mazely and D.W. Toohey, *Deducing Ozone Loss Rates from Combined In Situ and Satellite Observations*, AGU Fall Meeting, San Francisco, CA, December 11-15, 1995

D.W. Toohey, *The Contemporary Budget of Stratospheric Chlorine*, AGU Fall Meeting, San Francisco, CA, December 11-15, 1995

T. Mazely and D. Toohey, *Deducing Ozone Loss Rates from Combined In Situ and Satellite Observations*, UARS Science Team Meeting, Hampton, VA, March 1996

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## Funding

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*Young Investigator Award*, National Science Foundation, 1992-1998

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