

STANLEY P. SANDER

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RELEVANT EXPERIENCE

Dr. Sander is a Senior Research Scientist at JPL with more than 40 years of experience in lab kinetics, photochemistry and spectroscopy, instrument development and flight missions with applications to Earth and planetary atmospheres. He is PI and Co-I of NASA technology tasks related to geostationary FTS components and instruments, and has developed and deployed many atmospheric FTS and dispersive instruments for atmospheric composition studies. Dr. Sander operates observatories at Table Mountain Facility and Mt. Wilson, California for remote sensing of atmospheric trace species, aerosols, pollutants and greenhouse gases. As a Co-Investigator on the UVSI, Aura/TES, OCO and OMI science teams, he delivered instrument designs, calibration/validation plans and algorithms. Dr. Sander has over 140 peer-reviewed publications in chemical kinetics, photochemistry, spectroscopy, instrument design and remote sensing.

EDUCATION

Ph. D., Environmental Engineering Science, California Institute of Technology (1980)
minor in Chemistry

M. S., Environmental Engineering Science, California Institute of Technology (1975)

B. A., Physics, Pomona College, *cum laude* (1974)

AREAS OF EXPERTISE

Laboratory Kinetics and Photochemistry, Chemistry and Composition of Earth and Planetary Atmospheres, Remote Sensing of Atmospheric Composition, Emissions of Trace Gases and Aerosols in Megacities, Satellite and Ground-Based Instrument Technologies (esp. Fourier Transform and Dispersive Spectrometers)

PROFESSIONAL EXPERIENCE

Jet Propulsion Laboratory

Senior Research Scientist	1996-present
Manager, Oceanic and Atmospheric Sciences Section	1992-1994
Lead Scientist, Atmospheric Chemistry Research Element	1994-1996
Supervisor, Laboratory Studies and Modeling Group	1998-2016
Research Scientist	1980-1995
Graduate Research Assistant and Part-Time Academic Employee	1971-1980

California Institute of Technology

Visiting Associate in Planetary Science	1998-present
Lecturer in Planetary Science and Env. Engineering Science	2002-2004, 2017
Visiting Associate in Chemical Engineering	1980-1981

University of California, Los Angeles

Visiting Professor, Department of Atmospheric Sciences	1996
Project Scientist, Joint Institute for Regional Earth System Science and Engineering (JIFRESSE)	2008-present

CURRENT RESEARCH PROGRAMS

External

Laboratory Studies of Tropospheric Chemical Reactions, NASA SMD/ESD (P.I.)
Laboratory Studies of Reactions Important for Stratospheric Ozone, NASA SMD/ESD (P.I.)
Mechanistic Studies of Benzene Formation in Titan's Atmosphere, NASA SMD/PSD (P.I.)
Validation of SAGE III/ISS Nighttime Measurements of NO₃ and NO₂, NASA SMD/ESD (P.I.)
Quantifying Trends in Methane Emissions in the Los Angeles Basin Using Remote Sensing Spectroscopy at CLARS, California Air Resources Board (P.I.)
Biogenic CO₂ Fluxes in the Los Angeles Basin, NASA/SMD/ESD (Co-I)
Radical Spectroscopy for Interpreting Observations of Triton, Pluto and other Kuiper Belt Objects, NASA/SMD/PSD (Co-I)
Solar Forcing Impacts on Middle Atmospheric Ozone-Controlling HO_x and NO_x Chemistry and the Climate, NASA/SMD/LWS (Co-I)
Radical Spectroscopy for Interpreting Observations of Kuiper Belt Objects, NASA/PSD (Co-I)

Internal

Panchromatic Fourier Transform Spectrometer System Development – SR&TD (P.I.)
Laboratory Studies of the Reactive Uptake of Organics on Mars –Topic Area R&TD (P.I.)

PAST RESEARCH PROGRAMS (LAST 10 YEARS)

Panchromatic Fourier Transform Spectrometer for the GEO-CAPE Mission, NASA IIP (P.I.)
In-Pixel Digitization ROIC for the GEO-CAPE Mission, NASA ACT (Co-I)
Advanced Onboard Fault-Tolerant Interferogram Processing, NASA AIST (Co-I)
Ground-based Remote Sensing of Atmospheric Trace Species Using FTUVS, NASA ESD (P.I.)
Mechanistic Studies of Benzene and PAH Formation on Titan, NASA PSD (P.I.)
Planetary Major Equipment, NASA PSD (P.I.)
PanFTS Engineering Model for the GEO-CAPE Mission, NASA ESTO IIP (P.I.)
Kinetics Studies of Tropospheric Peroxy Radical Reactions, NASA ESD (P.I.)
Laboratory Kinetics Studies of Atmospheric HO_x and NO_x Radicals, NASA ESD (P.I.)
Megacity Carbon Project, NIST Greenhouse Gas Program, (Co-I)
Spatial Distributions of O₃ Precursors and Greenhouse Gases in the LA Basin, CARB, (Co-PI)
Validation of SAGE III/Meteosat Measurements of NO₃, NASA ESD (P.I.)

HONORS AND AWARDS

NASA Exceptional Achievement Medal 2011, 2015
NASA Exceptional Service Medal 2007
AGU Editor's Citation for Excellence in Refereeing, IEEE Aerospace Conference Best Paper Award (2012), JPL Director's Research Achievement Award, Group Achievement Awards (8), Tech Brief Awards (3).

PROFESSIONAL ACTIVITIES

Chair, NASA Panel for Evaluation of Laboratory Data for Atmospheric Modeling
JPL Technical Equipment, Facilities and Infrastructure Management (TEFIM) Executive Committee
NASA/WMO Ozone Assessment Report Panel
NASA Fluorocarbon Lifetime Assessment Panel
Co-Chair, 23rd Informal Photochemistry Conference, Pasadena, California

Chair, 2001 Gordon Conference on Atmospheric Chemistry, Newport, R.I.
Associate Editor, Journal of Geophysical Research – Atmospheres, 1998
Editorial Board, Internal Journal of Chemical Kinetics, 2000-2002
Proposal Panel Reviewer, NASA/NSF/EPA

PUBLICATIONS

149. Zeng, Z-C, Natraj, V., Xu, F., Pongetti, R. J., Shia, R-L, Kort, E. A., Toon, G. C., Sander, S. P. and Yung, Y. L.; Constraining aerosol vertical profile in the boundary layer using hyperspectral measurements of oxygen absorption; *Geophys. Res. Lett.*; **2018**, <https://doi.org/10.1029/2018GL079286>
148. Hui, A. O., Okumura, M. and Sander, S. P.; Temperature dependence study of the kinetics and product yields of the HO₂ + CH₃C(O)O₂ reaction by direct detection of OH and HO₂ radicals using 2f-IR wavelength modulation spectroscopy, in preparation.
147. Winiberg, F., Percival, C., Shannon, R., Khan, M., Anwar H., Liu, Y., Shallcross, D. and Sander, S.; Reaction kinetics of OH + HNO₃ under conditions relevant to the Upper Troposphere/Lower Stratosphere, *Phys. Chem. Chem. Phys.*; **2018**, *20*, 24652-24664. <https://doi.org/10.1039/c8cp04193h>
146. Webster, C. R., Mahaffy, P. R., Atreya, S. K., Moores, J. E. and 37 other authors; Background levels of methane in Mars' atmosphere show strong seasonal variations; *Science*, **2018**, *360*, 1093-1096. <http://dx.doi.org/10.1126/science.aag0131>
145. Zhang, X and Sander, S. P.; Infrared absorption spectrum of phenanthrene in an argon matrix; *Chem. Phys. Lett.*; **2017**, *688*, 47-50. <http://dx.doi.org/10.1016/j.cplett.2017.09.023>
144. Zhang, Q.; Li, K-F; Wang, S.; Sander, S. P.; Yung, Y. L.; Resolving model-observation discrepancy in the mesospheric and stratospheric HO_x chemistry; *Earth and Space Science*, **2017**, *4*, 607-624. <https://doi.org/10.1002/2017EA000283>
143. Zeng, Z.-C., Zhang, Q., Margolis, J. S., Shia, R.-L., Newman, S., Fu, D., Pongetti, T. J., Wong, K. W., Sander, S. P., Wennberg, P. O., and Yung, Y. L.; Investigating wavelength-dependent aerosol optical properties using water vapor slant column retrievals from CLARS over the Los Angeles basin, *Atmos. Chem. Phys.*; **2017**, *17*, 2495-2508. <http://dx.doi.org/10.5194/acp-17-2495-2017>
142. Orphal, J. and 48 other authors; Absorption cross-sections of ozone in the ultraviolet and visible spectral regions: Status report 2015; *J. Mol. Spec.*; **2016** *327*, 105-121. <http://dx.doi.org/10.1016/j.jms.2016.07.007>
141. Bloom, A. A.; Lauvaux, T.; Yadav, V.; Duren, R.; Sander, S.; Worden, J.; Schimel, D.; Resolving biogeochemical controls on greenhouse fluxes from space: a case study on Amazon wetland emissions; *Atmos. Chem. Phys.*; <http://doi:10.5194/acp-16-15199-2016>.

140. Zhang, X.; Sander, S. P.; Cheng, L.; Venkatesan, T. S.; Stanton, J. F.; Matrix-isolated spectrum of CH₂BrOO radical; *Chem. Phys. Lett.*; **2016** 657, 131-134.
<http://dx.doi.org/10.1016/j.cplett.2016.05.060>
138. Feng, S.; Lauvaux, T.; Newman, S.; Rao, P.; Ahmadov, R.; Deng, A.; Diaz-Isaac, L. I.; Duren, R. M.; Fischer, M. L.; Gerbig, G.; Gurney, K. R.; Huang, J.; Jeong, S.; Li, Z.; Miller, C. E.; O'Keefe, D. O.; Patarasuk, R.; Sander, S. P.; Song, Y.; Wong, K. W.; Yung, Y. L.; L.A. Megacity: A high resolution land-atmosphere modeling system for urban CO₂ emissions; *Atmos. Chem. Phys.*; **2016**, 16, 13121-13130,
<http://dx.doi.org/10.5194/acp-16-9019-2016>
137. Wong, K. W.; Pongetti, T. J.; Oda, T.; Gurney, K. R.; Newman, S.; Duren, R.; Miller, C. E.; Yung, Y. L.; Sander, S. P.; Monthly trends of top-down methane emissions in the South Coast Air Basin from 2011-2015; *Atmos. Chem. Phys.*; **2016**, 16, 9019-9045,
<http://dx.doi.org/10.5194/acp-16-13121-2016>
136. Hosoda, T.; Fradet, M.; Frez, C.; Shterengas, L.; Sander, S.; Forouhar, S.; Belenky, G.; Laterally coupled distributed feedback cascade diode lasers emitting near 2.9 μm; *Electr. Lett.*; **2016**, 52, 857-859, <http://dx.doi.org/10.1049/el.2016.0115>
135. Zhang, Q.; Shia, R.-L.; Sander, S. P.; Yung, Y. L.; XCO₂ retrieval over deserts near critical surface albedo, *Earth and Space Science.*; **2016**, 3, dx.doi.org/10.1002/2015EA000143.
134. Zhang, X.; Sander, S. P.; Cheng, L.; Venkatesan, T. S.; Stanton, J. F.; Matrix-isolated spectrum of CH₂IIOO radical, *J. Phys. Chem. A*; **2016**, 120, 260-285,
dx.doi.org/10.1021/acs.jpca.5b12143.
133. Burkholder, J. B., Sander, S. P. *et al. Chemical Kinetics and Photochemical Data for Use in Atmospheric Studies, Evaluation Number 18*, JPL Publication 15-10, Jet Propulsion Laboratory, Pasadena (2015).
132. Colosimo, S. F; Natraj, V.; Sander, S. P.; Stutz, J.; A sensitivity study on the retrieval of aerosol vertical profiles using the oxygen A-band, *Atmos. Meas. Tech.*; **2015**, 8, 11853-11924, <http://dx.doi.org/10.5194/amt-9-1889-2016>.
131. Wang, S.; Zhang, Q.; Millan, L.; Li, K.-F.; Yung, Y. L.; Sander, S. P.; Livesey, N. J.; Santee, M. L.; First evidence of middle atmospheric HO₂ response to 27-day solar cycles from satellite observations, *Geophys. Res. Lett.*, **2015**, 42, 10,004-10,009,
dx.doi.org/10.1002/2015GL065237.
130. Zhang, Q.; Natraj, V.; Li, K.-F.; Shia, R.-L.; Fu, D.; Pongetti, T. J.; Sander, S. P.; Roehl, C. M.; Yung, Y. L.; Accounting for aerosol scattering in the CLARS retrieval of column averaged CO₂ mixing ratios, *J. Geophys. Res. Atmos.*; **2015**, 120, 7205-7218,
dx.doi.org/10.1002/2015JD023499.

129. Xi, X.; Natraj, V.; Shia, R. L.; Luo, M.; Zhang, Q.; Newman, S.; Sander, S. P.; Yung, Y. L.; Simulated retrievals for the remote sensing of CO₂, CH₄, CO, and H₂O from geostationary orbit, *Atmos. Meas. Tech.*; **2015**, *8*, 4817-4830, [dx.doi.org/10.5194/amt-8-4817-2015](https://doi.org/10.5194/amt-8-4817-2015).
128. Liu, Y.; Sander, S. P.; Rate constants for the OH + CO reaction over the temperature range 193-296 K, *J. Phys. Chem. A*; **2015**, 10060-10066, [dx.doi.org/10.1021/acs.jpca.5b07220](https://doi.org/10.1021/acs.jpca.5b07220)
127. Dodson, L. G.; Shen, L.; Savee, J. D.; Eddingsaas, N. C.; Welz, O.; Taatjes, C. A.; Osborn, D. L.; Sander, S. P.; Okumura, M.; VUV photoionization cross sections of HO₂, H₂O₂, and H₂CO, *J. Phys. Chem. A*; **2015**, 119, 1279-1291, [dx.doi.org/10.1021/jp508942a](https://doi.org/10.1021/jp508942a)
126. Hume, K. L.; Bayes, K. D.; Sander S. P.; The equilibrium constant for the reaction ClO + ClO = ClOOC1 between 250 and 206 K., *J. Phys. Chem. A*; **2015**, *119*, 4473-4481.
125. Wong, K. W.; Fu, D.; Pongetti, T. J.; Newman, S.; Kort, E. A.; Duren, R.; Hsu, Y-K.; Miller, C. E.; Yung, Y. L.; Sander, S. P.; Mapping CH₄:CO₂ ratios in Los Angeles, with simulated satellite remote sensing from Mount Wilson, California, *Atmos. Chem. Phys.*, **2015**, *15*, 241-252, <http://doi.org/10.5194/acp-15-241-2015>
124. Fu, D.; Pongetti, T. J.; Blavier, J-F L.; Crawford, T. J.; Manatt, K. S.; Toon, G. C.; Wong, K. W.; Sander, S. P.; Near-infrared remote sensing of Los Angeles trace gas distributions from a mountaintop site, *Atmos. Meas. Tech.*, **2014**, *7*, 713-729, <http://doi.org/10.5194/amt-7-713-2014>
123. Liu, Y.; Bayes, K. D.; Sander, S. P.; Measuring rate constants for reactions of the simplest Criegee intermediate (CH₂OO) by monitoring the OH radical, *J. Phys. Chem. A* **2014**, *118*, 741-747.
122. Sprague, M. K.; Mertens, L. A.; Widgren, H. N.; Okumura, M.; Sander, S. P.; McCoy, A. B.; Cavity ringdown spectroscopy of the hydroxy-methyl-peroxy radical. *J. Phys. Chem. A.*, **2013**, *117*, 10006-10017.
121. Wang, S.; Li, K.-F.; Pongetti, T. J.; Sander, S. P.; Yung, Y. L.; Liang, M.-C.; Livesey, N. J.; Santee, M. L.; Harder, J. W.; Snow, M.; Mills, F. P.; Atmospheric OH response to the 11-year solar cycle, *Proc. Natl. Acad. Sci.*, **2013**, *110*, 2023-2028.
120. Key, R.; Sander, S.; Eldering, A.; Blavier, J-F; Bekker, D.; Manatt, K.; Rider, D.; Wu, Y-H; The Geostationary Fourier Transform Spectrometers, *SPIE Proceedings*, **2012**, *8515*, 851506. <https://doi.org/10.1117/12.930257>
119. Zhang, X.; Sander, S. P. and Stanton, J. F.; Detection of the far-IR ν_{12} bending level in propargyl: a complete set of fundamentals for an important radical, *J. Phys. Chem. A*. **2012**, *116*, 10338-10343.
118. Andersen, M. P. S; Nielsen, O. J.; Karpichev, B.; Wallington, T. J. and Sander, S. P.; Atmospheric chemistry of isoflurane, desflurane and sevoflurane: kinetics and mechanism of reactions with chlorine atoms and OH radicals, and global warming potentials, *J. Phys. Chem. A.*, **2012**, *116*, 5806-5820.
117. Sprague, M. K.; Garland, E. R.; Mollner, A. K.; Bloss, C.; Bean, B. D.; Weichman, M.

- L.; Mertens, L. A.; Okumura, M. and Sander, S. P.; Kinetics of n-butoxy and 2-pentoxy isomerization and detection of primary products by infrared cavity ringdown spectroscopy, *J. Phys. Chem. A* **2012**, *116*, 6327-6340.
116. Andersen, M. P. S.; Nielsen, O. J.; Wallington, T. J., Karpichev, B.; and Sander, S. P.; Assessing the impact on global climate from general anesthetic gases, *Anesth. Analg.* **2012**, *114*, 1081-1085.
115. Andersen, M. P. S.; Waterland, R. L.; Sander, S. P. et al. Atmospheric chemistry of $C_xF_{2x+1}CH=CH_2$ ($x=1, 2, 4, 6$ and 8): Radiative efficiencies and global warming potentials, *J. of Photochem. Photobiol. A-Chem.* **2012**, *233*, 50-52.
114. Saiz-Lopez, A.; Lamarque, J.-F.; Kinnison, D.E.; Tilmez, S.; Ordonez, C.; Orlando, J. J.; Conley, A.J.; Plane, J.M.C.; Mahajan, A.S.; Sousa Santos, G.; Atlas, E.L.; Blake, D.R.; Sander, S.P.; Schauffler, S.; Thompson, A.M. and Brasseur, G.; Estimating the climate significance of halogen-driven ozone loss in the tropical marine atmosphere, *Atmos. Chem. Phys.*, **2012**, *12*, 3939-3949.
113. Grieman, F. J.; Noell, A. C.; Davis-Van Atta, C.; Okumura, M. and Sander, S. P.; Determination of equilibrium constants for the reaction between acetone and HO_2 using infrared kinetics spectroscopy, *J. Phys. Chem. A* **2011**, *115*, 10527-10538.
112. Zhang, X. and Sander, S. P.; Infrared absorption spectra of CO_2/H_2O complex in a cryogenic nitrogen matrix – detection of a new bending frequency, *J. Phys. Chem. A*, **2011**, *115*, 9854-9860.
111. Chen, C. M.; Cageao, R. P.; Lawrence, L.; Stutz, J.; Salawitch, R. J.; Jourdain, L.; Li, Q.; and Sander, S. P.; “Diurnal variation of midlatitudinal NO_3 column abundance over Table Mountain Facility, California”, *Atmos. Chem. Phys.*, **2011**, *11*, 963-978.
110. Sander, S.P. et al., *Chemical Kinetics and Photochemical Data for Use in Atmospheric Studies, Evaluation Number 17*, JPL Publication 10-6, Jet Propulsion Laboratory, Pasadena (2010).
109. Andersen, M. P. S.; Andersen V. F.; Nielsen O. J.; Sander S. P. and Wallington, T. J.; Atmospheric chemistry of $HCF_2O(CF_2CF_2O)_xCF_2H$ ($x=2-4$): Kinetics and mechanisms of the chlorine atom initiated oxidation”, *Chem. Phys. Chem.*, **2010**, *11*, 4035-4041.
108. Zhang, X.; Sander, S. P.; Chaimowitz, A.; Ellison; G. B.; and Stanton, J. F.; “Detection of vibrational bending mode ν_8 and overtone bands of the propargyl radical, $HCCCH_2$, \tilde{X}^2B_1 ”, *J. Phys. Chem.*, **2010**, *114*, 12021-12027.
107. Andersen, M. P. S.; Sander, S. P.; Nielsen, O. J.; Wagner, D. S.; Sanford, T. J.; and Wallington, T. J. ; “Inhalation anesthetics and climate change”, *British J. Anaesthesia*, **2010**, *105*, 760-766.
106. Mollner, A. K.; Valluvadasan, S.; Feng, L.; Sprague, M. K.; Okumura, M.; Milligan, D. B.; Bloss, W. J.; Sander, S. P.; Martien, P. T.; Harley, R. A.; McCoy, A. C. and Carter, W. P. L.; Rate of gas phase association of hydroxyl radical and nitrogen dioxide, *Science*, **2010**, *330*, 646-649.

105. Wang, S.; Pongetti, T. J.; Sander, S. P. et al.; Direct sun measurements of NO₂ column abundances from Table Mountain, California: Intercomparison of low and high resolution spectrometers, *J. Geophys. Res.*, **2010**, doi:10.1029/2009JD013503.
104. Noell, A.C.; Alconcel, L. S.; Robichaud, D. J.; Okumura, M. and Sander, S. P.; Near-IR kinetic spectroscopy (IR-KS) of the HO₂ and C₂H₅O₂ self and cross reactions, *J. Phys. Chem. A*, **2010**, *114*, 6983-6995.
103. Santee, M. L.; Sander, S. P.; Livesey, N. J. and Froidevaux, L. Constraining the chlorine monoxide/chlorine peroxide equilibrium constant from Aura Microwave Limb Sounder measurements of nighttime ClO, *Proc. Natl. Acad. Sci.*, **2010**, *107* 6588-6593.
102. Sander, S.P. et al., *Chemical Kinetics and Photochemical Data for Use in Atmospheric Studies, Evaluation Number 16*, JPL Publication 09-31, Jet Propulsion Laboratory, Pasadena (2009)
101. Cheung, R.; Li, K.; Wang, S.; Pongetti, T.; Cageao, R.; Sander, S. and Yung, Y.; An improved retrieval method for atmospheric hydroxyl (OH) abundances from ground-based ultraviolet solar spectra, *Appl. Optics*, **2008**, *47*, 6277-6284.
100. Wang, S.; Pickett, H.; Pongetti, T.; Cheung, R.; Yung, Y.; Shim, C.; Li, Q.; Canty, T.; Salawitch, R.; Jucks, K.; Drouin, B. and Sander, S.; Validation of Aura MLS OH measurements with FTUVS total OH column measurements at Table Mountain, California, *J. Geophys. Res.*, **2008**, *113*, doi:10.1029/2008JD009883
99. Hanson, J. C.; Friedl, R. R.; Sander, S.P. Kinetics of the OH+ClOOCl and OH+Cl₂O reactions: experiment and theory, *J. Phys. Chem. A* **2008**, *112*, 9229-9237.
98. Pickett, H.; Drouin, B.; Canty, T.; Salawitch, R.; Fuller, R.; Perun, V.; Livesey, N.; Waters, J.; Stachnik, R.; Sander, S.; Traub, W.; Jucks, K.; Minschwaner, K.; Validation of Aura Microwave Limb Sounder OH and HO₂ measurements, *J. Geophys. Res.* **2008**, *113*, doi:10.1029/2007JD008775.
97. Celarier, E.; Brinksma, E.; Gleason, J.; Veeffkind, J.; Cede, A.; Herman, J.; Ionov, D.; Goutail, F.; Pommereau, J.-F.; Lambert, J.-C.; van Roozendaal, M.; Pinardi, G.; Wittrock, F.; Schoenhardt, A.; Richter, A.; Imbrahim, O.; Wagner, T.; Bojkov, B.; Mount, G.; Spinei, E.; Chen, C.; Pongetti, T.; Sander, S.; Bucsela, E.; Wenig, M.; Swart, D.; Volten, H.; Kroon, M.; Levelt, P.; Validation of Ozone Monitoring Instrument nitrogen dioxide columns, *J. Geophys. Res.* **2008**, *113*, doi:10.1029/2007JD008908.
96. Beer, R.; Shephard, M.; Kulawik, S.; Clough, S.; Eldering, A.; Bowman, K.; Sander, S.; Fisher, B.; Payne, V.; Luo, M.; Osterman, G.; Worden, J.; First satellite observations of lower tropospheric ammonia and methanol, *Geophys. Res. Lett.* **2008**, *35*, doi:10.1029/2008GL033642.
95. Worden, J.; Noone, D.; Bowman, K.; Beer, R.; Eldering, A.; Fisher, B.; Gunson, M.; Goldman, A.; Herman, R.; Kulawik, S.; Lampel, M.; Osterman, G.; Rinsland, C.; Rodgers, C.; Sander, S.; Shephard, M.; Webster, C.; Worden, H. Importance of rain evaporation and continental convection in the tropical water cycle, *Nature*, **2007**, *445*, 528-532.
94. Saiz-Lopez, A.; Chance, K.; Liu, X.; Kurosu, T. P.; Sander, S. P.; First observations of iodine oxide from space, *Geophys. Res. Lett.* **2007**, *34*, doi:10.1029/2007GL030111.

93. Hickson, K. M.; Keyser, L. F.; Sander, S. P. Temperature dependence of the HO₂+ClO reaction. 2. Reaction kinetics using the discharge-flow resonance-fluorescence technique, *J. Phys. Chem. A* **2007**, *111*, 8126.
92. Miller, C. E.; Crisp, D.; DeCola, P. L.; Olsen, S. C.; Randerson, J. T.; Michalak, A. M.; Alkhaled, A.; Rayner, P.; Jacob, D. J.; Suntharalingam, P.; Jones, D. B. A.; Denning, A. S.; Nicholls, M. E.; Doney, S. C.; Pawson, S.; Boesch, H.; Connor, B. J.; Fung, I. Y.; O'Brien, D.; Salawitch, R. J.; Sander, S. P.; Sen, B.; Tans, P. P.; Toon, G. C.; Wennberg, P. O.; Wofsy, S. C.; Yung, Y. L.; Law, R. M. Precision requirements for space-based XCO₂ data, *J. Geophys. Res.* **2007**, *112*, doi:10.1029/2006JD007659.
91. Pope, F. D.; Hansen, J. C.; Bayes, K. D.; Friedl, R. R.; Sander, S. P. Ultraviolet absorption spectrum of chlorine peroxide, ClOOC1, *J. Phys. Chem. A* **2007**, *111*, 4322.
90. Guo, X.; Natraj, V.; Feldman, D. R.; Spurr, R. J. D.; Shia, R.-L.; Sander, S. P.; Yung, Y. L. Retrieval of ozone profile from ground-based measurements with polarization: A synthetic study, *J. Quant. Spectrosc. Rad. Transfer* **2007**, *103*, 175.
89. Sander, S.P. *et al.*, *Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 15*, JPL Publication 06-2, Jet Propulsion Laboratory, Pasadena (2006).
88. Worden, J.; Bowman, K.; Noone, D.; Beer, R.; Clough, S.; Eldering, A.; Fisher, B.; Goldman, A.; Gunson, M.; Herman, R.; Kulawik, S.; Lampel, M.; Luo, M.; Osterman, G.; Rinsland, C.; Rodgers, C.; Sander, S.; Shepard, M.; Worden, H., Tropospheric emission spectrometer observations of the tropospheric HDO/H₂O ratio: estimation approach and characterization, *J. Geophys. Res.* **2006**, *111*, doi:10.1029/2005JD006606.
87. Christensen, L. E.; Okumura, M.; Hansen, J. C.; Sander, S. P.; Francisco, J. S. Experimental and ab initio study of the HO₂*CH₃OH complex: Thermodynamics and kinetics of formation, *J. Phys. Chem. A* **2006**, *110*, 6948.
86. Ingham, T.; Sander, S. P.; Friedl, R. R. Kinetics and product studies of the reaction of Br, Cl, and NO with ClOOC1 using discharge-flow mass spectrometry, *Faraday Discuss.* **2005**, *130*, 1.
85. Li, K.-F.; Cageao, R. P.; Karpilovsky, E. M.; Mills, F. P.; Yung, Y. L.; Margolis, J. S.; Sander, S. P. OH column abundance over Table Mountain Facility, California: AM-PM diurnal asymmetry, *Geophys. Res. Lett.* **2005**, *32*, doi:10.1029/2005GL022521.
84. Bayes, K. D.; Friedl, R. R.; Sander, S. P. Kinetics of the reactions of the CHBr₂ and CHBr₂O₂ radicals with O₂ and NO, *J. Phys. Chem. A* **2005**, *109*, 3045.
83. Yang, Z.; Wennberg, P. O.; Cageao, R. P.; Pongetti, T. J.; Toon, G. C.; Sander, S. P. Ground-Based Photon Path Measurements from Solar Absorption Spectra of the O₂ A-Band, *J. Quant. Spect. Rad. Trans.* **2005**, *90*, 309.
82. Crisp, D.; Atlas, R. M.; Breon, F.-M.; Brown, L. R.; Burrows, J. P.; Ciais, P.; Connor, B. J.; Doney, S. C.; Fung, I. Y.; Jacob, D. J.; Miller, C. E.; O'Brien, D.; Pawson, S.; Randerson, J. T.; Rayner, P.; Salawitch, R. J.; Sander, S. P.; Sen, B.; Stephens, G. L.; Tans, P. P.; Toon, G. C.; Wennberg, P. O.; Wofsy, S. C.; Yung, Y. L.; Kuang, Z.; Chudasama, B.; Sprague, G.; Weiss, B.; Pollock, R.; Kenyon, D.; Schroll, S.; The Orbiting Carbon Observatory (OCO) mission, *Adv. Space Res.* **2004**, *34*, 700.

81. Nizkorodov, S. A.; Sander, S. P.; Brown, L. R. Temperature and pressure dependence of high-resolution air-broadened absorption cross sections of NO₂ (415-525 nm), *J. Phys. Chem. A* **2004**, *108*, 4864.
80. Christensen, L. E.; Okumura, M.; Sander, S. P.; Friedl, R. R.; Miller, C. E.; Sloan, J. J. Measurements of the Rate Constant of HO₂ + NO₂ + N₂ → HO₂NO₂ + N₂ Using Near-Infrared Wavelength-Modulation Spectroscopy and UV-Visible Absorption Spectroscopy, *J. Phys. Chem. A* **2004**, *108*, 80.
79. Jiang, Y.; Yung, Y. L.; Sander, S. P.; Travis, L. D. Modeling of Atmospheric Radiative Transfer with Polarization and its Application to the Remote Sensing of Tropospheric Ozone, *J. Quant. Spect. Rad. Trans.* **2004**, *84*, 169.
78. Sander, S.P. *et al.*, *Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 14*, JPL Publication 02-25, Jet Propulsion Laboratory, Pasadena (2003).
77. Mills, F. P.; Cageao, R. P.; Sander, S. P.; Allen, M.; Yung, Y. L.; Remsberg, E. E.; Russell, J. M.; Richter, U. OH column abundance over Table Mountain Facility, California: Intra-annual variations and comparisons to model predictions for 1997-2001, *J. Geophys. Res.* **2003**, *108*, art. no.
76. Bean, B. D.; Mollner, A. K.; Nizkorodov, S. A.; Nair, G.; Okumura, M.; Sander, S. P.; Peterson, K. A.; Francisco, J. S. Cavity ringdown spectroscopy of cis-cis HOONO and the HOONO/HONO₂ branching ratio in the reaction OH+NO₂+M, *Journal of Physical Chemistry A* **2003**, *107*, 6974.
75. Bayes, K. D.; Toohey, D. W.; Friedl, R. R.; Sander, S. P. Measurements of Quantum Yields of Bromine Atoms in the Photolysis of Bromoform from 266 to 324 nm, *J. Geophys. Res.* **2003**, *108*, 4095.
74. Mills, F. P.; Cageao, R. P.; Nemtchinov, V.; Jiang, Y.; Sander, S. P. OH column abundance over Table Mountain Facility, California: annual average 1997-2000, *Geophys. Res. Lett.* **2002**, *29*, art. no. 1742.
73. Christensen, L. E.; Okumura, M.; Sander, S. P.; Salawitch, R. J.; Toon, G. C.; Sen, B.; Blavier, J.-F.; Jucks, K. W. Kinetics of HO₂ + HO₂ → H₂O₂ + O₂: Implications for Stratospheric H₂O₂, *Geophys. Res. Lett.* **2002**, *29*, 1029/2001GL014525.
72. Bloss, W. J.; Nickolaisen, S. L.; Salawitch, R. J.; Friedl, R. R.; Sander, S. P. Kinetics of the ClO self-reaction and 210 nm absorption cross section of the ClO dimer, *J. Phys. Chem. A* **2001**, *105*, 11226.
71. Cageao, R. P.; Blavier, J.-F.; McGuire, J. P.; Jiang, Y.; Nemtchinov, V.; Mills, F. P.; Sander, S. P. High-Resolution Fourier-Transform Ultraviolet-Visible Spectrometer for the Measurement of Atmospheric Trace Species: Application to OH, *Appl. Opt.* **2001**, *40*, 2024.
70. Roehl, C. M.; Mazely, T. L.; Friedl, R. R.; Li, Y. M.; Francisco, J. S.; Sander, S. P. NO₂ Quantum Yield from the 248 nm Photodissociation of Peroxynitric Acid (HO₂NO₂), *J. Phys. Chem. A* **2001**, *105*, 1592.

69. Sander, S. P. et al., Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 13, JPL Publication 00-3, Jet Propulsion Laboratory, Pasadena (2000).
68. Zhang, H.; Roehl, C. M.; Sander, S. P.; Wennberg, P. O. Intensity of the second and third OH overtones of H₂O₂, HNO₃, and HO₂NO₂, *J. Geophys. Res.* **2000**, *105*, 14593.
67. Nickolaisen, S. L.; Roehl, C. M.; Blakeley, L. K.; Friedl, R. R.; Francisco, J. S.; Liu, R. F.; Sander, S. P. Temperature Dependence of the HO₂+ClO Reaction. 1. Reaction Kinetics by Pulsed Photolysis-Ultraviolet Absorption and ab initio Studies of the Potential Surface, *J. Phys. Chem. A* **2000**, *104*, 308.
66. Ko, M. K. W.; Sze, N. D.; Scott, C.; Rodriguez, J. M.; Weisenstein, D. K.; Sander, S. P. Ozone depletion potential of CH₃Br, *J. Geophys. Res.* **1998**, *103*, 28187.
65. DeMore, W. B., Sander, S. P. et al. Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 12, JPL Publication 97-4, Jet Propulsion Laboratory, Pasadena (1997).
64. Mazely, T. L.; Friedl, R. R.; Sander, S. P. Quantum Yield of NO₃ from Peroxyacetyl Nitrate Photolysis, *J. Phys. Chem.* **1997**, *101*, 7090.
63. Miller, C. E.; Sander, S. P.; The ν_1 and ν_2 bands of FNO₂, *J. Mol. Spectrosc.* **1997**, *184*, 442.
62. Li, Z. J.; Friedl, R. R.; Sander, S. P. Kinetics of the HO₂+BrO reaction over the temperature range 233-348 K, *J. Chem. Soc. - Faraday Trans.* **1997**, *93*, 2683.
61. Miller, C. E.; Nickolaisen, S. L.; Francisco, J. S.; Sander, S. P. The OBrO C(²A₂) ← X(²B₁) absorption spectrum, *J. Chem. Phys.* **1997**, *107*, 2300.
60. Jiang, Y.; Yung, Y. L.; Sander, S. P.; Detection of tropospheric ozone by remote sensing from the ground, *J. Quant. Spect. Rad. Trans.* **1997**, *57*, 811.
59. Cageao, R. P.; Ha, Y. L.; Jiang, Y.; Morgan, M. F.; Yung, Y. L.; Sander, S. P. Calculated Hydroxyl A²Σ → X²Π Band Emission Rate Factors Applicable to Atmospheric Spectroscopy, *J. Quant. Spectrosc Rad. Trans.* **1997**, *57*, 703.
58. Miller, C. E.; Sander, S. P. The ν_4 band of FNO₂, *J. Mol. Spectrosc.* **1997**, *181*, 18.
57. Li, Z.; Friedl, R. R.; Moore, S. B.; Sander, S. P. Interaction of Peroxynitric Acid with Solid H₂O-Ice, *J. Geophys. Res.* **1996**, *101*, 6795.
56. Nickolaisen, S. L.; Sander, S. P.; Friedl, R. R. Pressure-Dependent Yields and Product Branching Ratios in the Broadband Photolysis of Chlorine Nitrate, *J. Phys. Chem.* **1996**, *100*, 10165.
55. Francisco, J. S.; Sander, S. P. Structures, relative stabilities, and vibrational spectra of isomers of HClO₃, *J. Phys. Chem.* **1996**, *100*, 573.
54. Nickolaisen, S. L.; Miller, C. E.; Sander, S. P.; Hand, M. R.; Williams, I. H.; Francisco, J. S. Pressure Dependence and Metastable State Formation in the Photolysis of Dichlorine Monoxide (Cl₂O), *J. Chem. Phys.* **1996**, *104*, 2857.

53. Francisco, J. S.; Sander, S. P. Ab-Initio Prediction of the Barrier Height for Abstraction of Hydrogen from H₂O₂ by ClO Radical, *Mol. Phys.* **1995**, *85*, 1069.
52. Francisco, J. S.; Sander, S. P. Existence of a Chlorine Oxide and Water (ClO-Dot-H₂O) Radical Complex, *J. Am. Chem. Soc.* **1995**, *117*, 9917.
51. Francisco, J. S.; Sander, S. P. A Computational Study of Dissociation Pathways in the FOCl-FCIO System, *Chem. Phys. Lett.* **1995**, *241*, 33.
50. Li, Z.; Friedl, R. R.; Sander, S. P. Kinetics of FO₂ with NO, NO₂, O₃, CH₄ and C₂H₆, *J. Phys. Chem.* **1995**, *99*, 13445.
49. Francisco, J. S.; Sander, S. P. Protonated Hydrochlorous Acid (HOClH⁺) - Molecular-Structure, Vibrational Frequencies, and Proton Affinity, *J. Chem. Phys.* **1995**, *102*, 9615.
48. Mazely, T. L.; Friedl, R. R.; Sander, S. P. The Production of NO₂ from the Photolysis of Peroxyacetyl Nitrate, *J. Phys. Chem.* **1995**, *99*, 8162.
47. DeMore, W.B., Sander, S. P. et al., Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 11, JPL Publication 94-26, Jet Propulsion Laboratory, Pasadena (1994)
46. Webster, C. R.; May, R. D.; Jaegle, L.; Hu, H.; Sander, S. P.; Gunson, M. R.; Toon, G. C.; Russell, J. M.; Stimpfle, R. M.; Koplow, J. P.; Salawitch, R. J.; Michelsen, H. A. Hydrochloric Acid and the Chlorine Budget of the Lower Stratosphere, *Geophys. Res. Lett.* **1994**, *21*, 2575.
45. Francisco, J. S.; Sander, S. P.; Lee, T. J.; Rendell, A. P. Structures, Relative Stabilities, and Spectra of Isomers of HClO₂, *J. Phys. Chem.* **1994**, *98*, 5644.
44. Francisco, J. S.; Sander, S. P. A Computational Evaluation of the Structure and Heat of Formation for FOCl and Cl₂O, *Chem. Phys. Lett.* **1994**, *223*, 439.
43. Nickolaisen, S. L.; Friedl, R. R.; Sander, S. P. Kinetics and Mechanism of the ClO + ClO Reaction: Pressure and Temperature Dependences of the Bimolecular and Termolecular Channels and Thermal Decomposition of Chlorine Peroxide, ClOOCl, *J. Phys. Chem.* **1994**, *98*, 155.
42. Mazely, T. L.; Friedl, R. R.; Sander, S. P. Measurement of the V-T Energy-Transfer Rates of Highly Excited ²A₁ NO₂ Generated from HNO₃ Photolysis, *J. Chem. Phys.* **1994**, *100*, 8040.
41. Francisco, J. S.; Sander, S. P. Structure and Thermochemistry of Hydrochlorous Acid, HOCl, *J. Chem. Phys.* **1993**, *99*, 6219.
40. Sander, S. P. Halogen Monoxide Disproportionation and Recombination Reactions. In *The Tropospheric Chemistry of Ozone in the Polar Regions*; Niki, H., Ed.; Springer-Verlag: Berlin, 1993; Vol. 7.
39. Francisco, J. S.; Sander, S. P. Structure and Thermochemistry of ClO₂ Radicals, *J. Chem. Phys.* **1993**, *99*, 2897.
38. Sander, S. P.; Cageao, R. P.; Friedl, R. R. A Compact, High Resolution Michelson Interferometer for Atmospheric Spectroscopy in the Near Ultraviolet, *S.P.I.E. Proceedings Series* **1993**, *175*, 15.

37. DeMore, W.B., Sander, S. P. et al., Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 10, JPL Publication 92-20, Jet Propulsion Laboratory, Pasadena (1992).
36. Friedl, R. R.; Sander, S. P.; Yung, Y. L. Chloryl Nitrate - a Novel Product of the $\text{OCIO} + \text{NO}_3 + \text{M}$ Recombination, *J. Phys. Chem.* **1992**, *96*, 7490.
35. Colussi, A. J.; Sander, S. P.; Friedl, R. R. Temperature Dependence and Mechanism of the Reaction Between $\text{O}(^3\text{P})$ and Chlorine Dioxide, *J. Phys. Chem.* **1992**, *96*, 4442.
34. Leu, M.-T.; Blamont, J. E.; Anbar, A. D.; Keyser, L. F.; Sander, S. P. Adsorption of CO on Oxide and Water Ice Surfaces - Implications for the Martian Atmosphere, *Journal of Geophysical Research-Planets* **1992**, *97*, 2621.
33. Colussi, A. J.; Sander, S. P. Induced ClO Vacuum Ultraviolet Fluorescence, *Chem. Phys. Lett.* **1991**, *187*, 85.
32. Colussi, A. J.; Sander, S. P.; Friedl, R. R. Thermodynamics of Acetylene Vanderwaals Dimerization, *Chem. Phys. Lett.* **1991**, *178*, 497.
31. DeMore, W. B., Molina, M. J., Sander, S. P., Golden, D. M., Hampson, R. F., Kurylo, M. J., Howard, C. J. and Ravishankara, A. R., Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 9, JPL Publication 90-1, Jet Propulsion Laboratory, Pasadena (1990).
30. Yung, Y. L.; Allen, M.; Crisp, D.; Zurek, R. W.; Sander, S. P. Spatial Variation of Ozone Depletion Rates in the Springtime Antarctic Polar Vortex, *Science* **1990**, *248*, 721.
29. Webster, C. R.; Sander, S. P.; Beer, R.; May, R. D.; Knollenberg, R. G.; Hunten, D. M.; Ballard, J. Tunable Diode-Laser Ir Spectrometer for Insitu Measurements of the Gas-Phase Composition and Particle-Size Distribution of Titans Atmosphere, *Applied Optics* **1990**, *29*, 907.
28. Birk, M.; Friedl, R. R.; Cohen, E. A.; Pickett, H. M.; Sander, S. P. The Rotational Spectrum and Structure of Chlorine Peroxide, *J. Chem. Phys.* **1989**, *91*, 6588.
27. Sander, S. P.; Friedl, R. P.; Yung, Y. L. Role of the ClO Dimer in Polar Stratospheric Chemistry; Rate of Formation and Implications for Ozone Loss, *Science* **1989**, *245*, 1095.
26. Anderson, J. G.; Brune, W. H.; Lloyd, S. A.; Toohey, D. W.; Sander, S. P.; Starr, W. L.; Loewenstein, M.; Podolske, J. R. Kinetics of O_3 Destruction by ClO and BrO within the Antarctic Vortex - an Analysis Based on in situ ER-2 Data, *J. Geophys. Res.* **1989**, *94*, 11480.
25. Sander, S. P.; Friedl, R. R. Kinetics and Mechanism of the $\text{BrO} + \text{ClO}$ Reaction by Flash Photolysis-Ultraviolet Absorption, *J. Phys. Chem.* **1989**, *93*, 4764.
24. Friedl, R. R.; Sander, S. P. Kinetics and Product Studies of the Reaction $\text{ClO} + \text{BrO}$ Using Discharge Flow-Mass Spectrometry, *J. Phys. Chem.* **1989**, *93*, 4756.
23. Wahner, A.; Ravishankara, A. R.; Sander, S. P.; Friedl, R. R. Absorption Cross Section of BrO Between 312 and 385 nm at 298 K and 225 K, *Chem. Phys. Lett.* **1988**, *152*, 507.

22. Lang, V. I.; Sander, S. P.; Friedl, R. R. Absolute Infrared Band Strength Measurement of the ClO Radical by Fourier-Transform Infrared Spectroscopy, *J. Mol. Spectrosc.* **1988**, *132*, 89.
21. Sander, S. P.; Friedl, R. R. Kinetics and Product Studies of the BrO + ClO Reaction - Implications for Antarctic Chemistry, *Geophys. Res. Lett.* **1988**, *15*, 887.
21. DeMore, W. B., Molina, M. J., Sander, S. P., Golden, D. M., Hampson, R. F., Kurylo, M. J., Howard, C. J. and Ravishankara, A. R., Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling, Evaluation Number 8, JPL Publication 87-41, Jet Propulsion Laboratory, Pasadena (1987).
20. Friedl, R. R.; Sander, S. P. Fourier-Transform Infrared-Spectroscopy of the NO₃ ν_2 Band and ν_3 Band - Absolute Line Strength Measurements, *Journal of Physical Chemistry* **1987**, *91*, 2721.
19. Friedl, R. R.; Goble, J. H.; Sander, S. P.; A Kinetics Study of the Homogeneous and Heterogeneous Components of the HCl+ClONO₂ Reaction, *Geophys. Res. Lett.* **1986**, *13*, 1351.
18. Sander, S. P. Temperature Dependence of the NO₃ Absorption Spectrum, *J. Phys. Chem.* **1986**, *90*, 2194.
17. Sander, S. P. Kinetics and Mechanism of the Disproportionation of IO Radicals, *J. Phys. Chem.* **1986**, *90*, 4135.
16. Sander, S. P.; Kircher, C. C. Temperature Dependence of the Reaction NO + NO₃ → 2NO₂, *Chem. Phys. Lett.* **1986**, *126*, 149.
15. Sander, S. P. Low-Pressure Study of the HO₂+HO₂ Reaction at 298 K, *J. Phys. Chem.* **1984**, *88*, 6018.
14. Kircher, C. C.; Margitan, J. J.; Sander, S. P. Temperature and Pressure Dependence Study of the Reaction NO₂ + NO₃ + M → N₂O₅ + M, *J. Phys. Chem.* **1984**, *88*, 4370.
13. Kircher, C. C.; Sander, S. P. Kinetics and Mechanism of HO₂ and DO₂ Disproportionations, *J. Phys. Chem.* **1984**, *88*, 2082.
12. Sander, S. P.; Peterson, M. Kinetics of the Reaction HO₂+NO₂+M→HO₂NO₂+M, *J. Phys. Chem.* **1984**, *88*, 1566.
11. Sander, S. P.; Peterson, M.; Watson, R. T.; Patrick, R. Kinetics Studies of the HO₂+HO₂ and DO₂+DO₂ Reactions at 298 K, *J. Phys. Chem.* **1982**, *86*, 1236.
10. Sander, S. P.; Watson, R. T. Kinetics and Mechanism of the Disproportionation of BrO Radicals, *J. Phys. Chem.* **1981**, *85*, 4000.
9. Sander, S. P.; Watson, R. T. Temperature Dependence of the Self-Reaction of CH₃O₂ Radicals, *J. Phys. Chem.* **1981**, *85*, 2960.
8. Sander, S. P.; Ray, G. W.; Watson, R. T. Kinetics Study of the Pressure Dependence of the BrO+NO₂ Reaction at 298 K, *J. Phys. Chem.* **1981**, *85*, 199.
7. Sander, S. P.; Watson, R. T. A Kinetics Study of the Reaction of SO₂ with CH₃O₂, *Chem. Phys. Lett.* **1981**, *77*, 473.

6. Sander, S. P.; Watson, R. T. Kinetic Studies of the Reactions of CH₃O₂ with NO, NO₂ and CH₃O₂ at 298 K, *J. Phys. Chem.* **1980**, *84*, 1664.
5. Yung, Y. L.; Pinto, J. P.; Watson, R. T.; Sander, S. P. Atmospheric Bromine and Ozone Perturbations in the Lower Stratosphere, *J. Atmos. Sci.* **1980**, *37*, 339.
4. Lewis, R. S.; Sander, S. P.; Wagner, S.; Watson, R. T. Temperature-Dependent Rate Constants for the Reaction of Ground-State Chlorine with Simple Alkanes, *J. Phys. Chem.* **1980**, *84*, 2009.
3. Watson, R. T.; Sander, S. P.; Yung, Y. L. Pressure and Temperature Dependence Kinetics Study of the NO + BrO → NO₂ + Br Reaction - Implications for Stratospheric Bromine Photochemistry, *J. Phys. Chem.* **1979**, *83*, 2936.
2. Geaga, J. V.; Igo, G. J.; McClelland, J. B.; Nasser, M. A.; Sander, S.; Spinka, H.; Treadway, D. A.; Carroll, J. B.; Fredrickson, D.; Perezmendez, V.; Whipple, E. T. B. Scintillation-Counter Hodoscope for Low-Energy Light-Ions, *Nuclear Instruments & Methods* **1977**, *141*, 263.
1. Sander, S. P.; Seinfeld, J. H. Chemical Kinetics of Homogeneous Atmospheric Oxidation of Sulfur Dioxide, *Environ. Sci. Technol.* **1976**, *10*, 1114.

WORKSHOP AND REVIEW PANEL PUBLICATIONS

5. Ravishankara, A. R., Shepherd, T. G., Sander, S. P. et al. "Lower Stratospheric Processes", Chapter 7 in Scientific Assessment of Ozone Depletion: 1998, WMO/Global Ozone Research and Monitoring - Report No. 44 (1998).
4. Sander, S. P. et al., "Laboratory Studies of Halocarbon Loss Processes", Chapter 4 in Report on Concentrations, Lifetimes, and Trends of CFCs, Halons and Related Species, NASA Reference Publication 1339, NASA, Washington, D.C., (1994).
3. Hampson, R. F., Kurylo, M. J. and Sander, S. P., "Evaluated Rate Constants for Selected HCFC's and HFC's with OH and O(1D)", Report prepared for the Alternative Fluorocarbon Environmental Acceptability Study, in Scientific Assessment of Stratospheric Ozone: 1989, WMO/Global Ozone Research and Monitoring Project - Report No. 20, Vol. II (1990).
2. Cox, R. A., DeMore, W. B., Ferguson, E. E., Lesclaux, R. R., Ravishankara, A. R., Sander, S. P., Sze, N. D. and Zellner, R., "Stratospheric Chemistry", in Atmospheric Ozone - 1985, World Meteorological Organization Report No. 16, Washington, D. C. (1986).
1. Anderson, J. G., Atkinson, R., Fehsenfeld, F. C., Hard, T. M., Howard, C.J., Kolb, C. E., Liu, S.C., Niki, H., Ravishankara, A. R., Ridley, B. A., Rodgers, M. D., Sander, S. P. and Torres, A. L., "Gas Phase Photochemistry", in Global Tropospheric Chemistry: Plans for the U. S. Research Effort, UCAR - OIES Report No. 3, Boulder (1986).

BOOK CHAPTER

Sander, S. P., Friedl, R. R. and Francisco, J. S., "Experimental and Theoretical Studies of Atmospheric Inorganic Chlorine Chemistry", in *Current Problems and Progress in Atmospheric Chemistry*", J. R. Barker, ed., World Scientific Publishing Co., Singapore (1995).