

Curriculum Vitae

Gunnar W. Schade

Associate Professor

Department of Atmospheric Sciences, Texas A&M University,
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• **Qualifications**

1997 Dr. rer. nat. (DSc) in Chemistry, *magna cum laude*, Johannes Gutenberg Universität, Mainz, Germany.

Thesis title: "CO emissions from degrading plant litter" (in German).

Subfields: Inorganic & Analytical Chemistry, Physical Chemistry, Physical Geography

Advisors: P.J. Crutzen (MPI-C), W. Baumann (Physical Chemistry), M. Domrös (Physical Geography)

1993 Diplom, University (MSc) degree in Chemistry, Johannes Gutenberg Universität, Mainz, Germany.

Thesis title: "Emissions of volatile aliphatic amines from animal husbandry" (in German); Department of Physical Chemistry; overall grade: 1 (eqv. to an A).

• **Positions and Professional Experience**

2012-present Associate Professor, Texas A&M University, Department of Atmospheric Sciences

2012-2013 Researcher, Kjemisk Institutt, Universitetet i Oslo

2005-2012 Assistant Professor, Texas A&M University, Department of Atmospheric Sciences

2003-2005 *Emmy Noether Research Fellow*, University of Bremen, Germany

2001-2002 *Assistant Specialist*, University of California at Berkeley, Department of Environmental Science, Policy, and Management (ESPM)

1998-2001 *Post-doctoral Research Fellow*, University of California at Berkeley, ESPM

1997-1998 *Post-doctoral Researcher* at the Max-Planck-Institute of Chemistry (MPI-C), Air Chemistry Section, Mainz, Germany

1994-1997 *Post-Graduate Research Assistant* (Doktorstudent) at the MPI-C, Air Chemistry Section

1993-1994 *Graduate Research Assistant* (diploma/masters student) at the MPI-C, Air Chemistry Section

• **Main Research Interests**

Boundary Layer Atmospheric Chemistry and Biogeochemical Cycles, Climate Change Impacts, Analytical Chemistry. The development of instrumentation and methods to measure atmospheric trace gases and their fluxes to improve our understanding of the underlying biogeochemical cycling and their impacts on, and feedbacks with, atmospheric chemistry and climate, including how anthropogenic disturbances have altered these, and how they will be altered in the future.

• **Awards and Funding**

Past

1999 [DAAD](#): Postdoctoral Research Grant (NATO Program): 1 year (salary only)

2003-2005 [DFG](#): Emmy Noether Program Research Grant: 2 years including Research Group complete salary support for myself (PI), graduate student, and postdoctoral researcher; instruments for €250k plus consumables at approx. €200k

2005 [BLE/BMVEL](#): Exploratory research grant on animal husbandry VOC emissions (PI); no salary support; consumables at €9k (in Germany)

2005-2007 DFG: Laboratory and field measurements of methanol fluxes (Co-I with John P. Burrows; in Germany); salary support for graduate student; consumables at approx. €20k

- 2006-2008** USDA: Physical and chemical characterization of particulate matter emissions from Concentrated Animal Feeding Operations, CAFOs (Co-I with Dr. Sarah Brooks); \$499k/3 yrs total including one month summer salary support; award number 2006-35112-16636
- 2006-2009** Texas Air Research Center (TARC): Urban turbulence and trace gas fluxes from a tall lattice tower near downtown Houston, TX (PI); two independent funds (~\$14k/yr + \$59k/2yr) for graduate student salary, travel, and consumables; contact: George Talbert, Lamar University, ph. 409-880-2183; award numbers 066TAM0070A & 077TAM0981A
- 2009** DAAD: Group Study Visit to Germany (~\$5k); taking ten ATMO463 students for a study abroad trip over spring break (co-sponsored by ATMO and College of Geosciences)
- 2007-2010** Characterization of East Texas Air Quality (Co-I; joint project between TAMU and University of Houston researchers); \$48.6k/2 yrs; award number R-07-0157
- 2009-2010** NSF: ARRA-EAGER: Mixing ratio and flux measurements of Volatile Organic Compounds during BEARPEX 2009 using a portable, self-sufficient REA-GC-FID system (PI); ~\$85,000, award-# ATM-0934345
- 2010-2012** NOAA-GCC: Anthropogenic and biogenic carbon fluxes from typical urban land uses in Houston, TX (PI); ~\$250,000; award #NA10OAR4310089 (no-cost extension into 2013)
- 2010-2013** EPA-STAR: Improving emission inventories using direct flux measurements and modeling (PI); ~\$500,000; award-# RD834556 (no-cost extension into 2014)
- 2014-2015** TCEQ-AQRP – Improving Modeled Biogenic Isoprene Emissions under Drought Conditions and Evaluating Their Impact on Ozone Formation (Co-I); ~\$176,000
- 2015** Air quality measurements at the Shaperanch, Dimmit County (PI); ~\$53,000
- 2010-2016** NSF-CAREER – Using an urban-to-rural gradient as a proxy for global change effects on selected biosphere-atmosphere trace gas exchanges (PI); ~\$600,000, award-# 0955438; currently in second no-cost extension
- 2014-2017** TAMU-TierOneProgram – *Development of a Multidisciplinary Climate Change Program at Texas A&M* (PI); ~\$90,000 for three years, renewed annually
- 2016-2018** *Implementing an Environmental Education Program Focused on the Impacts of Oil and Gas Exploration on Land-Use Change and Air Quality in the Eagle Ford Shale Region, South Texas*; an internally funded activity between Drs. J. Loisel (GEOG) and G. Schade (ATMO)

Present

- 2018-2020** *Crowdsourcing hydrocarbon pollution monitoring in shale areas using passive sampling*; a crowd-funded project, <https://experiment.com/projects/crowdsourcing-hydrocarbon-pollution-monitoring-in-shale-areas-using-passive-sampling>
- 2019-2020** *Hydrocarbon Exposure And Public Perceptions In Shale Areas*, Texas A&M Triads for Transformation (T3) project, G.W. Schade, S. Brooks, S. Shafer, and M. Schuett; \$30,000 plus graduate and undergraduate student supplemental support

• Supervised Students

pre-TAMU:

Dr. Gabrielle Dreyfus (Undergraduate at UC Berkeley with Dr. Allen Goldstein): 1999-2001

Dr. Sheena Juliet Solomon (Dr. *rer. nat.* at University of Bremen): 2003-2007

Dr. Ngwa Martin Ngwabie (MSc at University of Bremen): 2004-2005

Faculty Advisor (graduate student advisory committee chair):

Dr. C-H. Park (PhD, ATMO): 2005-2010

L. Zhou (MSc, ATMO): 2006-2010

I. Boedeker (MSc candidate, ATMO): 2006-2011

N. Werner (MSc, ATMO): 2010-2012

J. Gramann (MSc, ATMO): 2010-2014

M. Hale (MSc, ATMO): 2011-2014

Matthew Watson (MSc, ATMO): 2014-2016

Geoffrey Roest (PhD, ATMO): 2014-2018

Undergraduate Research Assistants (major)

Siraj Khan (ENGS): 2006-2007
Seth Adams (GEOG): 2007-2008
Brian Haines (ATMO): Fall 2009
Ayrton Bryan (ATMO): 2010-2011
Laura Hempel & Anna Pfohl (REU students, Dartmouth College & Pac. Luth. University): summer 2011
Ben Stewart (ENGS): 2012-2013
Nicolette Lee (ENST): summer 2013
Amanda Harte (ATMO): 2014 – 2015
Lauren Fontana (CHEM): spring 2015
Jerome Cole (REU student): summer 2015
Kristen Koch (ENGS): spring-fall 2015
Juan Martinez (ENGS): spring 2017
Keiani Smith (CHEM): spring and fall 2018
Olivia Sablan (REU student), summer 2019
Jerald Meadows (ATMO): 2007-2008
Katie Suter (ATMO): Fall 2008
Donald Vierling (ATMO): spring 2010
Stephanie White (CHEM): summer-fall 2011
Chelsea Blakely (ECOR): summer 2013
Caitlin Crossett (REU student): summer 2014
Garret Haas (ENST): summer/fall 2014
Paulina de los Santos (ENST): spring 2015
Shelby Orme (ENST): fall 2015
Kevin Larson (ATMO): spring 2016
Joel Salazar (ATMO): summer 2017
Joel Holliman (ENGS): fall 2018, spring 2019
Kimberly Sayprasith (ENGS), summer 2019

Member of Advisory Committee:

Dr. Naruki Hiranuma (PhD, ATMO): 2005-2010
Dr. Lei Hu (PhD, OCNG): 2008-2012
Dr. Sri H. Kota (PhD, CVEN): 2010-2014
Jessica Mirrieless (PhD, ATMO): 2016-
Lindsey Visser (MSc, OCNG): 2008-2009
Dr. Yina Liu (PhD, OCNG): 2008-2013
Roberto Molar (MSc, STJR): 2015-2017

● **Courses Taught**

At the IUP in Bremen:

Measurement Methods Practical (Lab), co-taught, University of Bremen, 2003-2004
Trace Gas Biogeochemistry, Dept. Environmental Physics, University of Bremen, Fall 2003
Tropospheric Chemistry, Dept. Environmental Physics, University of Bremen, Spring 2004

At Texas A&M University:

UGST 181-503: *Science Denialism*, freshman undergraduate seminar, Fall 2011 (18 students)
ATMO 201: *Weather & Climate*, Sum 2009 & 2010, Spr 2014/17/18, Fall 2016 (>40 students each)
ATMO 326: *Environmental Atmospheric Science*, Spring 2015 (12 students)
ATMO 363: *Atmospheric Chemistry and Air Pollution*, Fall 2013/14/15/17/18 (>35 students each)
GEOS 489/ATMO689: *Global Biogeochemical Cycles*, Fall Sem.2005
I designed this course new for the College and Department in 2005, then went through the admission procedure to make it a writing-intensive (GEOS489-900) in 2006
GEOS 489: *Climate Change Considered*, Spr. 2015, 2016 (>20 students); newly offered campus-wide climate science course, co-taught among three colleges: Geosciences, Agriculture, and Architecture
ATMO 606: *Introduction to Atmospheric Chemistry*, Fall Sem. 2006, 2007, 2008, 2011, 2018
I designed extensive online notes that have been recognized beyond Texas A&M
ATMO 613: *Advanced Atmospheric Chemistry*, Spring Sem. 2006, 2010, 2011
ATMO 463: *Air Pollution Meteorology / Air Quality*, Spring Sem. 2007, 2008, 2009, 2019
I redesigned this course including the use of an online platform; I further included an externally funded excursion to Germany for 10 students in 2009
GEOS 405: Environmental Science Capstone course, Fall 2015 & 2017 (15 students each); a PBL course
GEOS 444: Science and Policy of Climate Change, Spring 2018 (42 students)
ATMO485 & 491: directed studies and undergraduate research
ATMO691: Research
guest-taught in IPY course, GEOS 489, in Fall Sem. 2007 and 2008
guest-taught in HLTH 429 in Fall Sem. 2016
guest-taught in HIST 360 and HIST 361 in Fall Sem. 2017

• Service

Departmental/College Service:

- Geosciences Faculty Advisory Committee (GFAC): Member 2018-present
- Department of Atmospheric Sciences Graduate Committee: Member 2014-present
- Department of Atmospheric Sciences Undergraduate Committee: Member 2005-2011
- Department of Atmospheric Sciences Qualifying Exam Committee: Member since 2007
- College Undergraduate Curriculum Committee: Member 2007-2009

Outside Service:

- Taught a continuing education credit [Climate Science workshop for TX teachers](#) in Summers 2016/17/19
- American Geophysical Union (AGU) member since 1997
- Air & Waste Management Association (AWMA) member 2006-2014
- Section Editor for *Atmosphere*, an open-access journal (MDPI), since 2017
- Proposal Reviewer for NSF, NOAA, DFG (Germany), NERC, and European Science Foundation (ESF)
- Review Panel member for ESF, NOAA and NASA
- Journal reviewer for
 - o Atmospheric Environment
 - o JGR–Atmospheres (AGU)
 - o Atmospheric Chemistry and Physics (EGU)
 - o Global Biogeochemical Cycles
 - o Tellus B (closed)
 - o Geophysical Research Letters (AGU)
 - o Journal of Environmental Quality
 - o Canadian Journal of Forest Research
 - o Plant Biology
 - o European Journal of Soil Science
 - o Biogeosciences (EGU)
 - o JGR–Biogeosciences (AGU)
 - o Biogeochemistry
 - o Agricultural and Forest Meteorology
 - o Field Crops Research
 - o Environmental Chemistry
 - o Environmental Science & Technology (ACS)
 - o Journal of the AWMA
 - o Atmospheric Measurement Techniques (EGU)
 - o Atmosphere (MDPI)
 - o Elementa – Science of the Anthropocene
 - o Science of the Total Environment
 - o Air Pollution Research

• Publications

Published or in press in the peer-reviewed literature (advised students in *italic*):

51. *Katherine Willyard* and **Gunnar W. Schade**, Flaring in Two Texas Shale Areas: Comparison of bottom-up with top-down volume estimates for 2012 to 2015, *Science of the Total Environment*, 691, 243-251
50. **Gunnar W. Schade** and *Geoff S. Roest*, Source apportionment of non-methane hydrocarbons, NO_x and H₂S data from a central monitoring station in the Eagle Ford shale, Texas. *Elementa, Science of the Anthropocene* 6(1): 35. doi:10.1525/elementa.289, 2018
49. *Geoffrey Roest* and **Gunnar Schade**, Quantifying alkane emissions in the Eagle Ford Shale using boundary layer enhancement, *Atmos. Chem. Phys.*, 17, 11163-11176, <https://doi.org/10.5194/acp-17-11163-2017>, 2017
48. Peng Wang; **Gunnar W Schade**, Mark Estes, Qi Ying, Improved MEGAN Predictions of Biogenic Isoprene in the Continental United States, 2017, *Atmospheric Environment*, 148, 337-352, doi:10.1016/j.atmosenv.2016.11.006
47. *Kristen Koch, Shelby Thomas, Elora Arana, Geoff Roest, Gunnar Schade*, On Methane Leaks from Pipelines in Bryan and College Station, TX, 2016, *The Open Atmospheric Science Journal*, 10, 56-62, doi:10.2174/1874282301610010056

46. **Gunnar W. Schade** and *Geoff S. Roest*, Analysis of non-methane hydrocarbon data from a monitoring station affected by oil and gas development in the Eagle Ford shale, Texas, *Elementa - Science of the Anthropocene*, 2016. 4: 000096.
45. *Changhyoun Park*, and **Gunnar W. Schade**, Long-term CO₂ flux measurements in north downtown Houston, Texas, 2016. *Journal of Environmental Quality Special Section on Urban Forest and Ecosystem Services*, 45, 253-265, doi:10.2134/jeq2015.02.0115
44. *Changhyoun Park*, **Gunnar W. Schade**, *Nicholas D. Werner*, David J. Sailor, and Hwa Woon Lee, Comparative estimates of anthropogenic heat emission in relation to surface energy balance of a subtropical urban neighborhood, 2016. *Atmospheric Environment*, 126, 182-191, doi:10.1016/j.atmosenv.2015.11.038
43. Eleanor C. Lahr, **Gunnar W. Schade**, *Caitlin C. Crossett*, and *Matthew R. Watson*, Photosynthesis and isoprene emission from trees along an urban-rural gradient in Texas, 2015. *Global Change Biology*, 21(11), 4221-4236, 2015, doi:10.1111/gcb.13010
42. G. Wohlfahrt, C. Amelynck, C. Ammann, A. Arneth, I. Bamberger, A. H. Goldstein, L. Gu, A. Guenther, A. Hansel, B. Heinesch, T. Holst, L. Hörtnagl, T. Karl, Q. Laffineur, A. Neftel, K. McKinney, W. Munger, S. Pallardy, **G. W. Schade**, R. Seco, and N. Schoon, 2015. An ecosystem-scale perspective of the net land methanol flux: synthesis of micrometeorological flux measurements, *Atmospheric Chemistry and Physics*, 15, 7413-7427, doi:10.5194/acp-15-7413-2015
41. *Sri H. Kota*, **Gunnar W. Schade**, Mark Estes, Dough Boyer, and Qi Ying, 2015. Evaluation of MEGAN Predicted Biogenic Isoprene Emissions at Urban Locations using a Source-Oriented Community Multiscale Air Quality Model, *Atmospheric Environment*, 110, 54-64, doi:10.1016/j.atmosenv.2015.03.027
40. **Gunnar W. Schade** and *Geoffrey Roest*, Is the shale boom reversing ozone air quality progress? *EOS*, 96, 2015, doi:10.1029/2015EO028279.
39. *Sri H. Kota*, Hongliang Zhang, Gang Chen, **Gunnar W. Schade**, and Qi Ying, 2014. Evaluation of On-road Vehicle CO and NO_x Emission Inventories Using a Source-oriented Air Quality Model, *Atmospheric Environment*, 85, 99-108
38. *Kota, S.H., Park, C., Hale, M.C., Werner, N.D., Schade, G.W., Ying, Q.*, 2014. Estimation of VOC emission factors from flux measurements using a receptor model and footprint analysis. *Atmospheric Environment* 82, 24-35.
37. Liang Zhu, **Gunnar W. Schade**, and Claus J. Nielsen, Real time monitoring of emissions from monoethanolamine-based industrial scale carbon capture facilities, *Environmental Science and Technology*, November 11, 2013, DOI: 10.1021/es4035045
36. David R Worton, Jason D Surratt, Brian W LaFranchi, Arthur WH Chan, Yunliang Zhao, Robin J Weber, Jeong-Hoo Park, Jessica B Gilman, Joost de Gouw, *Changhyoun Park*, **Gunnar Schade**, Melinda Beaver, Jason M St Clair, John Crouse, Paul Wennberg, Glenn M Wolfe, Sara Harrold, Joel A Thornton, Delphine K Farmer, Kenneth S Docherty, Michael J Cubison, Jose-Luis Jimenez, Amanda A Frossard, Lynn M Russell, Kasper Kristensen, Marianne Glasius, Jingqiu Mao, Xinrong Ren, William Brune, Eleanor C Browne, Sally E Pusede, Ronald C Cohen, John H Seinfeld, Allen H Goldstein, 2013. Observational Insights into Aerosol Formation from Isoprene, *Environmental Science & Technology*, 47(20), 11403-11413
35. H. Zhang, D.R. Worton, M. Lewandowski, J. Ortega, C.L. Rubitschun, J.-H. Park, K. Kristensen, P. Campuzano-Jost, D.A. Day, J.L. Jimenez, M. Jaoui, J.H. Offenberg, T.E. Kleindienst, J. Gilman, W.C. Kuster, J. de Gouw, *C. Park*, **G.W. Schade**, A.A. Frossard, L. Russell, L. Kaser, W. Jud, A. Hansel, L. Cappellin, T. Karl, M. Glasius, A. Guenther, A.H. Goldstein, J.H. Seinfeld, A. Gold, R.M. Kamens, and J.D. Surratt, Organosulfates as Tracers for Secondary Organic Aerosol (SOA) Formation from 2-Methyl-3-Buten-2-ol (MBO) in the Atmosphere, *Environmental Science and Technology*, 46 (17), 9437-9446, doi: 10.1021/es301648z, 2012.

34. N.C. Bouvier-Brown, **G.W. Schade**, L. Misson, A. Lee, M. McKay, and A.H. Goldstein, Contributions of biogenic volatile organic compounds to net ecosystem carbon flux in a ponderosa pine plantation, *Atmospheric Environment* 60, 527–533, 2012.
33. Mao, J., X. Ren, L. Zhang, D. M. Van Duin, R. C. Cohen, J.-H. Park, A. H. Goldstein, F. Paulot, M. R. Beaver, J. D. Crouse, P. O. Wennberg, J. P. DiGangi, S. B. Henry, F. N. Keutsch, C. Park, **G. W. Schade**, G. M. Wolfe, J. A. Thornton, and W. H. Brune, Insights into hydroxyl measurements and atmospheric oxidation in a California forest, *Atmospheric Chemistry and Physics*, 12, 8009-8020, 2012
32. Beaver, M.R.; St Clair, J.M.; Paulot, F.; Spencer, K. M.; Crouse, J.D.; LaFranchi, B.W.; Min, K.E.; Pusede, S. E.; Wooldridge, P. .; **Schade, G. W.**; Park, C.; Cohen, R.C.; Wennberg, P.O., Importance of biogenic precursors to the budget of organic nitrates: observations of multifunctional organic nitrates by CIMS and TD-LIF during BEARPEX 2009. *Atmospheric Chemistry and Physics*, 12 (13), 5773-5785, 2012.
31. Park, C., **G.W. Schade**, and I. Boedeker, Correction to “Characteristics of the flux of isoprene and its oxidation products in an urban area”, *JGR-Atmospheres*, 117, D01304, doi 10.1029/2011jd017254, 2012
30. **Schade, G.W.**, S. Khan, C. Park, and I. Boedeker, Rural southeast Texas air quality measurements during the 2006 Texas Air Quality Study, *Journal of the Air and Waste Management Association*, 61, 1070-1081, 2011
29. Park, C., **G.W. Schade**, and I. Boedeker, Characteristics of the flux of isoprene and its oxidation products in an urban area, *JGR-Atmospheres*, 116, D21303, doi 10.1029/2011jd015856, 2011
28. **G. W. Schade**, S. J. Solomon, E. Dellwik, K. Pilegaard, A. Ladstätter-Weissenmayer, Methanol and other VOC fluxes from a Danish beech forest during springtime, *Biogeochemistry*, 106(3), 337-355, 2011
27. C. Park, **G.W. Schade**, I. Boedeker, Flux Measurements of Volatile Organic Compounds by the Relaxed Eddy Accumulation method combined with a GC-FID system north of downtown Houston, Texas, *Atmospheric Environment*, 44, 2605-2614, 2010
26. **G. W. Schade**, and B. Rappenglück, Unique Meteorological Measurements during hurricane Ike’s passage over Houston, *EOS*, 90(25), 215-216, 2009.
25. Apel, E. C., Brauers, R. Koppmann, R. Tillmann, C. Holzke, R. Wegener, J. Boßmeyer, A. Brunner, T. Ruuskanen, M. Jocher, C. Spirig, R. Steinbrecher, R. Meier, D. Steigner, E. Gomez Alvarez, K. Müller, S.J. Solomon, **G. Schade**, D. Young, P. Simmonds, J.R. Hopkins, A.C. Lewis, G. Legreid, A. Wisthaler, A. Hansel, R. Blake, K. Wyche, A. Ellis, P.S. Monks, Intercomparison of oxygenated volatile organic compound measurements at the SAPHIR atmosphere simulation chamber, *J. Geophys. Res.*, 113, D20307, doi:10.1029/2008JD009865, 2008
24. Solomon, S. J., **Schade, G. W.**, Ladstätter-Weissenmayer, A., and Burrows J., VOC concentrations in an indoor workplace environment of a university building, *Indoor and Built Environment*, 17(4), 260-268, 2008
23. Steiner, A.L., Cohen, R.C., Harley, R.A., Tonse, S., Goldstein, A.H., Millet, D.B., and **Schade, G.W.**, VOC reactivity in central California: Comparing an air quality model to ground based measurements, *Atmos. Chem. Phys.*, 8, 351–368, 2008
22. Ngwabie, N.M., **Schade, G.W.**, Custer, T.G., Linke, S., Hinz, T., Abundances and flux estimates of VOCs from a dairy cowshed in Germany, *Journal of Environmental Quality*, 37, 565-573, 2008
21. H. J. Hellebrand and **G. W. Schade**, Carbon monoxide from composting due to thermal oxidation of biomass, *Journal of Environmental Quality*, 37, 592-598, 2008
20. T. G. Custer and **G. W. Schade**, Methanol and Acetaldehyde Fluxes Over Ryegrass, *Tellus B*, 59, 673-684, 2007
19. **Schade, G. W.**, and A. H. Goldstein, Seasonal measurements of acetone and methanol: Abundances and implications for atmospheric budgets, *Global Biogeochem. Cycles*, 20, GB1011, doi:10.1029/2005GB002566, 2006.

18. S. J. Solomon, Custer, T.G., **Schade, G.W.**, Soares Dias, A.P., Atmospheric methanol measurement using selective catalytic methanol to formaldehyde conversion, *Atmospheric Chemistry and Physics*, 5, 1-27, 2005.
17. A. Lee, **G. W. Schade**, R. Holzinger, and A. H. Goldstein, A comparison of new measurements of total monoterpene flux with improved measurements of speciated monoterpene flux, *Atmos. Chem. Phys.* 5, 505-513, 2005.
16. **G. W. Schade** and T. G. Custer, OVOC emissions from agricultural soil in northern Germany during the 2003 European heat wave, *Atmos. Environ.*, 38(36), 6105-6114, 2004.
15. A.H. Goldstein, M. McKay, M.R. Kurpius, **G. W. Schade**, A. Lee, R. Holzinger, and R. A. Rasmussen, Forest thinning experiment confirms ozone deposition to forest canopy is dominated by reaction with biogenic VOCs, *Geophys. Res. Lett.* 31, L22106, doi:10.1029/2004GL021259, 2004.
14. **Schade, G.W.**, and Goldstein, A.H., Increase of monoterpene emissions from a pine plantation as a result of mechanical disturbances, *Geophys. Res. Lett.* 30(7), doi:10.1029/2002GL016138, 2003.
13. Spaulding, R., **Schade, G.W.**, Goldstein, A.H., and Charles, M.J., Characterization of Secondary Atmospheric Photooxidation Products: Evidence for Biogenic and Anthropogenic Sources, *J. Geophys. Res.*, 108(D8), 4247, doi:10.1029/2002JD002478, 2003.
12. Dreyfus, G., **Schade, G.W.**, and Goldstein, A.H., Observational Constraints on the Contribution of Isoprene Oxidation to Ozone Production on the Western Slope of the Sierra Nevada, CA, *J. Geophys. Res.*, 107(D19), 4365, DOI:10.1029/2001JD001490, 2002.
11. **Schade, G.W.**, Dreyfus, G., and Goldstein, A.H., Atmospheric methyl-tertiary-butyl-ether (MTBE) at a rural mountain site in California, *J. Environ. Qual.*, 31(4), 1088-1094, 2002.
10. **Schade, G.W.**, and Goldstein, A.H., Plant physiological influences on the fluxes of oxygenated volatile organic compounds from ponderosa pine trees, *J. Geophys. Res.*, 107(D10), DOI: 10.1029/2001JD000532, 2002.
9. Dillon, M. B., Lamanna, M.S., **Schade, G.W.**, Goldstein, A.H., and Cohen, R.C., Chemical evolution of the Sacramento urban plume: transport and oxidation, *J. Geophys. Res.*, 107(D5), doi:10.1029/2001JD000969, 2002.
8. **Schade, G.W.**, and Goldstein, A.H., Fluxes of oxygenated volatile organic compounds from a ponderosa pine plantation, *J. Geophys. Res.*, 106(D3), 3111-3124, 2001.
7. Goldstein, A.H., and **Schade, G.W.**, Quantifying biogenic and anthropogenic contributions to acetone mixing ratios in a rural environment, *Atmos. Environ.*, 34 (29-30), 4997-5006, 2000.
6. **Schade, G.W.**, Goldstein, A.H., Gray, D.W., and Lerdau, M., Canopy scale and leaf level 2-methyl-3-buten-2-ol fluxes from a ponderosa pine plantation, *Atmos. Environ.*, 34, 3535-3544, 2000.
5. **Schade, G.W.**, Goldstein A.H., and Lamanna M.S., Are monoterpene emissions influenced by humidity?, *Geophys. Res. Lett.*, 26(14), 2187-2190, 1999.
4. Holzinger, R., C. Warnecke, A. Hansel, A. Jordan, W. Lindinger, D.H. Scharffe, **G.W. Schade**, and P.J. Crutzen 1999, Biomass Burning as a Source of Formaldehyde, Acetaldehyde, Methanol, Acetone, Acetonitrile, and Hydrogen Cyanide, *Geophys. Res. Lett.*, 26(8), 1161-1164, 1999.
3. **Schade, G.W.**, R.M. Hofmann, and P.J. Crutzen, 1999: CO emissions from degrading plant matter, (I) Measurements, *Tellus*, 51(5), 889-908, 1999.
2. **Schade, G.W.**, and P.J. Crutzen, CO emissions from degrading plant matter, (II) Estimate of a global source strength, *Tellus*, 51(5), 909-918, 1999.

1. **Schade, G.W.** and P.J. Crutzen, Emissions of Aliphatic Amines from Animal Husbandry and their Reactions: Potential Source of N₂O and HCN, *J. Atmos. Chem.*, 22, 319-346, 1995.

Submitted/Accepted/in preparation:

Joel Holliman and **Gunnar W. Schade**, Comparing Permitted Emissions to Atmospheric Observations of Hydrocarbons in the Eagle Ford Shale, in prep. for *Atmosphere*

Geoff Roest, and **Gunnar Schade**, Air Quality Measurements in the western Eagle Ford Shale, *submitted to Elementa – Science of the Anthropocene*, August 2019

Book Chapters

Kristen Koch, **Gunnar Schade**, Garrison Goessler, Anthony Filippi and Burak Gunalp, Low-key stationary and mobile tools for probing the atmospheric UHI effect, IntechOpen bookchapter on the UHI, *submitted*, August 2019

G.W. Schade, Meteorological Characteristics of Hurricane Ike During its Passage over Houston, Texas, in: *Hurricane Research*, edited by Kieran Hickey, IntechOpen, ISBN 980-953-307-559-9, 2012

Non peer-reviewed publications:

Posters and Presentations

Gunnar W. Schade, *Geoff Roest*, *Kate Willyard*: Air Quality Issues in Shale Oil & Gas Production Areas, *public presentation*, Alpine, TX, 30 Nov. 2018

Katherine Ann Willyard, *Nina Canal*, *Miranda Hooper*, *William Thompson*, **Gunnar Schade**, Estimation of Texas Flaring and Venting Volumes from Upstream Oil and Gas Facilities Using Texas Railroad Commission Reports and National Oceanic and Atmospheric Administration Satellite Imagery, 2012-2015, **Presentation** (by. K.A. Willyard) at the 2018 Texas A&M Conference on Energy, ERS, College Station, TX, 24 Sep. 2018

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