

SHAN ZHOU, Ph.D.

University of Houston | Department of Earth & Atmospheric Sciences
3507 Cullen Blvd, Room 432E | Houston, Texas 77204
(713) 743-4513 | szhou10@uh.edu

EDUCATION Ph.D., Atmospheric Science, University of California, Davis, Davis, CA 2017
B.S., Atmospheric Science, Sun Yat-sen University, Guangzhou, China 2011

RESEARCH **Research Assistant Professor** 2022/7 – present
EXPERIENCE *University of Houston* | Dept. of Earth & Atmospheric Sciences

Research Scientist, Supervisor: Rob Griffin 2020/8 – 2022/6
Rice University | Dept. of Civil and Environmental Engineering

- Research Topics: Racial/ethnic and socioeconomic disparities in air quality; studying urban scale aerosols chemistry using a Mobile Air Quality Laboratory (MAQL)
- Funding: National Institute of Environmental Health Sciences, Texas Commission on Environmental Quality
- Collaborators: Marie Lynn Miranda (*U Notre Dame*), James Flynn (*U Houston*), Rebecca Sheesley (*Baylor U*), Sascha Usenko (*Baylor U*)

Postdoctoral Research Fellow, Advisor: Tara Kahan 2017 – 2020
Syracuse University | Dept of Chemistry

- Research Topic: investigating the sources and sinks of indoor oxidants and precursors using a combination of field, laboratory, and chamber studies
- Funding: Alfred P. Sloan Foundation
- Collaborators: Cora Young and Trevor VandenBoer (*York U, Canada*), Jianshun Zhang (*Syracuse U*), Nicola Carslaw (*U of York, UK*), Philip Stevens (*Indiana U*), Delphine Farmer (*Colorado State U*)

Graduate Student Researcher, Advisor: Qi Zhang 2012 – 2017
University of California, Davis | Dept. of Environmental Toxicology

- Dissertation: Characterizing Ambient Organic Aerosol Properties, Sources, and Processes via Aerosol Mass Spectrometry
- Funding: Department of Energy, Matsumura Memorial and Donald G. Crosby fellowships
- Collaborators: Dan Jaffe (*U Washington*), Jian Wang (*Washington U St. Luis*), Larry Kleinman (*BNL*), Art Sedlacek (*BNL*), Timothy Onasch (*Aerodyne Research Inc.*)

RESEARCH Texas Commission on Environmental Quality “San Antonio Field \$150,000
GRANTS Study Analysis”, 6/2022 to 5/31/2023, Role: PI

Texas Commission on Environmental Quality “Corpus Christi Field \$125,000
Study Analysis”, 6/2022 to 5/31/2023, Role: PI

Alfred P. Sloan Foundation “Indoor sources and sinks of gas-phase \$749,933
Oxidants”, 2018 – 2023, Role: Senior Personnel

FIELD 2021 TCEQ San Antonio – Corpus Christi mobile field campaign
CAMPAIGNS 2018 Sloan Radicals and Oxidants from Cooking and Cleaning chamber campaign

2018 Sloan HOMEChem (House Observations of Microbial and Environmental Chemistry)
 2013 DOE BBOP (Biomass Burning Observation Project)
 2013 NASA DISCOVER-AQ (Deriving Information on Surface conditions from Column and Vertically Resolved Observations Relevant to Air Quality)
 2011 DOE ALC-IOP (Aerosol Life cycle Intensive Operational Period)

HONORS & AWARDS

Civil and Environmental Engineering Rising Stars, <i>Carnegie Mellon University</i>	2020
Early-career travel award, <i>Chemistry of Indoor Environments Science Meeting</i>	2018
Matsumura Memorial Fellowship, <i>UC Davis</i>	2016 – 2017
Graduate Student Travel Award, <i>UC Davis</i>	2016
Donald G. Crosby Fellowship, <i>UC Davis</i>	2015 – 2016
Department of Energy Travel Grant, <i>US Department of Energy</i>	2014
Atmospheric Science Graduate Group Fellowship, <i>UC Davis</i>	2011 – 2012
Klaus Toepfer Environmental Scholarship, <i>United Nations Environment - Tongji Institute of Environment for Sustainable Development</i>	2011
National Scholarship, <i>Ministry of Education, China</i>	2009
First-Class Scholarship, <i>Sun Yat-sen University (Awarded three times)</i>	2008 – 2010

PUBLICATIONS

Google Scholar (updated 10/2022): h-index 16, i10-index 17, Citations 1069

UNDER REVIEW

4. Souza, A. F. P., **Zhou, S.**, Kahan, F. T., Hydrogen peroxide emissions from surface cleaning in a single-family residence, *Environ. Sci.: Processes Impacts*, submitted October 2022
3. *Fu, B., Mao, Z', Cui, Y., Zhu, P., Albertson, J., Shin, J., ***Zhou, S.**, Development of a Real-Time Infrared Methane Emissions Surveillance (RIMES) System for Detection and Quantification of Methane Emissions, *Environ Sci Technol Letters*, submitted September 2022
2. Reidy, E., Bottorff, P.B., Rosales, M.C., Cardoso-Saldaña, J.F., Arata, C., **Zhou, S.**, Wang, C., Abeleira, A., Hildebrandt Ruiz, L., Goldstein, H.A., Novoselac, A., Kahan, F.T., Abbatt, P.D.J., Vance, E.M., Farmer, K.D., *Stevens, S.P., Measurements of hydroxyl radical concentrations during indoor cooking events: evidence of an unmeasured photolytic source of radicals, *Environ Sci Technol*, submitted August 2022
1. ***Zhou, S.**, Guo, F., Chao, C.Y., Yoon, S., Alvarez, S., Shrestha, S., Flynn, J., Usenko, S., Sheesley, R., *Griffin, R., Marine submicron aerosols from the Gulf of Mexico: polluted and acidic with rapid production of sulfate and organosulfates, *Environ Sci Technol*, submitted August 2022

PEER-REVIEWED

28. Zhang, J., Wang, J., Sun, Y., **Zhou, S.**, Shrivastava, M., Catena, A., Ng, N. L., Zhang, Q., Schwab, J. (2022) The response of summertime organic aerosol composition to emission controls in the northeastern United States. *Journal of Geophysical Research: Atmospheres* 127(20): e2022JD037056. [Link](#)
27. ***Zhou, S.**, Griffin, R. J., Bui, A., Bravo, M., Osgood, C., Miranda, M. L. (2022) Disparities in air quality downscaler model uncertainty across socioeconomic and demographic indicators in North Carolina, *Environ. Res.*, 212, 113418 ([Link](#))

26. Farley, R., Bernays, N., Jaffe, D., Ketcherside, D., Hu, L., **Zhou, S.**, Collier, S., *Zhang, Q. (2022) Persistent influence of biomass burning aerosols during clean air conditions in the western United States, *Environ Sci Technol*, 56, 3645-3657 ([Link](#))
25. ***Zhou, S.**, *Kahan, T. F. (2022) Spatiotemporal characterization of irradiance and photolysis rate constants of indoor gas-phase species in the UTest house during HOMEChem, *Indoor Air*, 32:e12966 ([Link](#))
24. *Mei, F., Wang, J., **Zhou, S.**, Zhang, Q., Collier, S., Xu, J. (2021) Measurement report: CCN activity and its variation with organic oxidation level and volatility observed during aerosol life cycle intensive operational period (ALC-IOP). *Atmos. Chem. Phys.*, 21 (17), 13019–13029 ([Link](#))
23. Lakey, P. S. J., Won, Y., Shaw, D., Østerstrøm, F. F., Mattila, J., Reidy, E., Bottorff, B., Rosales, C., Wang, C., Ampollini, L., **Zhou, S.**, Novoselac, A, Kahan, T., DeCarlo, P. F., Abbatt, J. P. D., Stevens, P., Farmer, D., Carslaw, N., *Rim, D., *Shiraiwa, M. (2021) Spatial and temporal scales of variability for indoor air constituents. *Communications Chemistry*, 4 (1), 110 ([Link](#))
22. Li, J., Xu, W., Li, Z., Duan, M., Ouyang, B., **Zhou, S.**, Lei, L., He, Y., Sun, J., Wang, Z., Du, L., *Sun, Y. (2021) Real-time characterization of aerosol particle composition, sources and influences of increased ventilation and humidity in an office. *Indoor Air*, 31 (5), 1364-1376 ([Link](#))
21. **Zhou, S.**, Kowal, S. F., Cregan, A. R., *Kahan, T. F. (2021) Factors affecting wavelength-resolved ultraviolet irradiance indoors and their impacts on indoor photochemistry. *Indoor Air*, 31 (4), 1187-1198 ([Link](#))
20. **Zhou, S.**, Liu, Z., Wang, Z, Young, C. J., Vandenboer, T., Zhang, J., Carslaw, N., *Kahan, T.F. (2020) Hydrogen peroxide emission and fate indoors during non-bleach cleaning: a chamber and modeling study. *Environ Sci Technol*, 54 (24), 15643-15651. ([Link](#))
19. *Kleinman, L. I., Sedlacek Iii, A. J., Adachi, K., Buseck, P. R., Collier, S., Dubey, M. K., Hodshire, A. L., Lewis, E., Onasch, T. B., Pierce, J. R., Shilling, J., Springston, S. R., Wang, J., Zhang, Q., **Zhou, S.**, Yokelson, R. J. (2020) Rapid evolution of aerosol particles and their optical properties downwind of wildfires in the western US. *Atmos. Chem. Phys.*, 20 (21), 13319-13341. ([Link](#))
18. Mattila, J., Arata, C., Wang, C., Katz, E., Abeleira, A., Zhou, Y., **Zhou, S.**, Goldstein, A., Abbatt, J., DeCarlo, P., *Farmer, D. (2020) Dark chemistry during bleach cleaning enhances oxidation of organics and secondary organic aerosol production indoors, *Environ. Sci. Technol Letters*, 7 (11), 795-801 ([Link](#))
17. Kropavich, C., **Zhou, S.**, Kowal, S., *Kahan, T. (2020) Physical and chemical characterization of urban grime sampled from two cities. *ACS Earth and Space Chemistry*, 4, 10, 1813–1822 ([Link](#))
16. Mattila, J., Lakey, P., Shiraiwa, M., Wang, C., Abbatt, J, Arata, C, Goldstein, A, Ampollini, L., Katz, E., DeCarlo, P., **Zhou, S.**, Kahan, T., Cardoso Saldaña, F., Hildebrandt Ruiz, L., Abeleira, A., Boedicker, E., Vance, M., *Farmer, D. (2020) Multiphase chemistry controls inorganic chlorinated and nitrogenated compounds in indoor air during bleach cleaning. *Environ. Sci. Technol*, 54 (3), 1730-1739 ([Link](#))

15. *Farmer, D. K., Vance, M. E., Abbatt, J. P., Abeleira, A., Alves, M. R., Arata, C., Boedicker, E., Bourne, S., Cardoso-Saldaña, F., Corsi, R., DeCarlo, P. F., Goldstein, A. H., Grassian, V. H., Hildebrandt Ruiz, L., Jimenez, J. L., Kahan, T. F., Katz, E. F., Mattila, J. M., Nazaroff, W. W., Novoselac, A., Or, V. W., O'Brien, R. E., Patel, S., Sankhyan, S., Stevens, P. S., Tian, Y., Wade, M., Wang, C., **Zhou, S.**, Zhou, Y. (2019) Overview of HOMEChem: House Observations of Microbial and Environmental Chemistry. *Environ. Sci.: Processes Impacts*, 21, 1280-1300 ([Link](#))
14. **Zhou, S.**, Young, C. J., VandenBoer, T. C., *Kahan, T. F. (2019) Role of location, season, occupant Activity, and chemistry on indoor ozone and nitrogen oxide mixing ratios. *Environ. Sci.: Processes Impacts*, 21, 1374-1383 ([Link](#))
13. *Young, C. J., **Zhou, S.**, Siegel, J. A., Kahan, T. F. (2019) Illuminating the dark side of indoor oxidants. *Environ. Sci.: Processes Impacts*, 21, 1229-1239 ([Link](#))
12. **Zhou, S.**, Collier, S., Jaffe, D. A., *Zhang, Q. (2019) Free tropospheric aerosols at the Mt. Bachelor Observatory: more oxidized and higher sulfate content compared to boundary layer aerosols. *Atmos. Chem. Phys.*, 19 (3), 1571-1585. ([Link](#))
11. Huang, D. D., *Zhang, Q., Cheung, H. H. Y., Yu, L., **Zhou, S.**, Anastasio, C., Smith, J. D., *Chan, C. K. (2018) Formation and evolution of aqSOA from aqueous-phase reactions of phenolic carbonyls: comparison between ammonium sulfate and ammonium nitrate solutions. *Environ. Sci. Technol.*, 52 (16), 9215-9224. ([Link](#))
10. **Zhou, S.**, Young, C. J., VandenBoer, T. C., Kowal, S. F., *Kahan, T. F. (2018) Time-resolved measurements of nitric oxide, nitrogen dioxide, and nitrous acid in an occupied New York home. *Environ. Sci. Technol.*, 52 (15), 8355-8364. ([Link](#))
9. Wang, J., Zhang, Q., Chen, M., Collier, S., **Zhou, S.**, *Ge, X., *Xu, J., Shi, J., Xie, C., Hu, J., Ge, S., Sun, Y., Coe, H. (2017) First chemical characterization of refractory black carbon aerosols and associated coatings over the Tibetan Plateau (4730 m a.s.l). *Environ. Sci. Technol.*, 51 (24), 14072-14082. ([Link](#))
8. Li, H., Zhang, Q., *Zhang, Q., Chen, C., Wang, L., Wei, Z., **Zhou, S.**, Parworth, C., Zheng, B., Canonaco, F., Prevot, A. S. H., Chen, P., Zhang, H., Wallington, T. J., *He, K. (2017) Wintertime aerosol chemistry and haze evolution in an extremely polluted city of the North China Plain: significant contribution from coal and biomass combustion. *Atmos. Chem. Phys.*, 17 (7), 4751-4768. ([Link](#))
7. **Zhou, S.**, Collier, S., Jaffe, D. A., Briggs, N. L., Hee, J., Sedlacek, A. J., III, Kleinman, L., Onasch, T. B., *Zhang, Q. (2017) Regional influence of wildfires on aerosol chemistry in the western US and insights into atmospheric aging of biomass burning organic aerosol. *Atmos. Chem. Phys.*, 17 (3), 2477-2493. ([Link](#))
6. Collier, S., **Zhou, S.**, Onasch, T. B., Jaffe, D. A., Kleinman, L., Sedlacek, A. J., III, Briggs, N. L., Hee, J., Fortner, E., Shilling, J. E., Worsnop, D., Yokelson, R. J., Parworth, C., Ge, X., Xu, J., Butterfield, Z., Chand, D., Dubey, M. K., Pekour, M. S., Springston, S., *Zhang, Q. (2016) Regional influence of aerosol emissions from wildfires driven by combustion efficiency: insights from the BBOP campaign. *Environ. Sci. Technol.*, 50 (16), 8613-8622. ([Link](#))
5. *Briggs, N. L., Jaffe, D. A., Gao, H., Hee, J. R., Baylon, P. M., Zhang, Q., Zhou, S., Collier, S. C., Sampson, P. D., Cary, R. A. (2016) Particulate matter, ozone, and nitrogen species in aged wildfire plumes observed at the Mount Bachelor Observatory. *Aerosol Air Qual. Res.*, 16 (12), 3075-3087. ([Link](#))

4. **Zhou, S.**, Collier, S., Xu, J., Mei, F., Wang, J., Lee, Y.-N., Sedlacek, A. J., III, Springston, S. R., Sun, Y., *Zhang, Q. (2016) Influences of upwind emission sources and atmospheric processing on aerosol chemistry and properties at a rural location in the Northeastern US. *J. Geophys. Res. Atmos.*, 121 (10), 6049-6065. ([Link](#))
3. Young, D. E., Kim, H., Parworth, C., **Zhou, S.**, Zhang, X., Cappa, C. D., Seco, R., Kim, S., *Zhang, Q. (2016) Influences of emission sources and meteorology on aerosol chemistry in a polluted urban environment: results from DISCOVER-AQ California. *Atmos. Chem. Phys.*, 16 (8), 5427-5451. ([Link](#))
2. Collier, S., **Zhou, S.**, Kuwayama, T., Forestieri, S., Brady, J., Zhang, M., Kleeman, M., Cappa, C., Bertram, T., *Zhang, Q. (2015) Organic PM emissions from vehicles: composition, O/C ratio, and dependence on PM concentration. *Aerosol Sci. Technol.*, 49 (2), 86-97. ([Link](#))
1. *Vladutescu, D. V., Madhavan, B. L., Gross, B. M., Zhang, Q., **Zhou, S.** (2013) Aerosol transport and source attribution using sunphotometers, models and in-situ chemical composition measurements. *IEEE Transactions on Geoscience and Remote Sensing*, 51 (7), 3803-3811. ([Link](#))

BOOK
CHAPTERS

2. *Kahan, T.F., Young, C.J., **Zhou, S.** (2022). Indoor Photochemistry. In: Zhang, Y., Hopke, P.K., Mandin, C. (eds) Handbook of Indoor Air Quality. Springer, Singapore. doi:10.1007/978-981-10-5155-5_30-1 ([link](#))
1. *Zhang, Q., **Zhou, S.**, Collier, S., Jaffe, D., Onasch, T., Shilling, J., Kleinman, L., Sedlacek, A. (2018) Understanding composition, formation, and aging of organic aerosols in wildfire emissions via combined mountain top and airborne measurements In *Multiphase Environmental Chemistry in the Atmosphere*, American Chemical Society: 1299, 363-385. ([Link](#))

INVITED
TALKS

- Chemistry of Indoor Environments Science Meeting**, April 2021, webinar, "Combining measurements and models to predict indoor radical concentrations: effects of non-bleach (hydrogen peroxide) cleaning and indoor lighting conditions"
- Brookhaven National Laboratory Environmental and Climate Science Department**, April 2020, Upton, NY (webinar) "Gas and aerosol chemistry in the atmosphere around us, indoors and out"
- Chinese Academy of Science Institute of Atmospheric Physics**, December 2019, Beijing, China, "Sources and sinks of oxidants indoors"
- Beihang University 7th Vision Forum for International Young Scholars**, December 2019, Beijing, China, "Oxidative capacity of air in a residence"
- Syracuse University Department of Chemistry**, October 2017, Syracuse, NY, "Field measurements of atmospheric aerosols using aerosols mass spectrometry"
- Aerodyne Research Inc.**, Billerica, MA, May 2017, "Characterizing ambient organic aerosol properties, sources, and processes via aerosol mass spectrometry"
- Paul Scherrer Institute Energy and Environment Research Division**, Switzerland, May 2017, webinar, "Influence of wildfires on aerosol chemistry in the western US and insights into atmospheric aging of biomass burning organic aerosols: results from the BBOP campaign"

- CONFERENCE
PREZ
- American Association of Aerosol Research 40th Annual Conference, October 2022, "Marine submicron aerosols from the Gulf of Mexico: polluted and acidic with rapid production of sulfate and organosulfates" (oral)
- 102nd American Meteorology Society Annual Meeting, 24th Atmospheric Chemistry, February 2022, webinar, "Local and regional sources and chemical processing of coastal submicron aerosol at a beachfront site in Texas" (oral)
- American Association of Aerosol Research 39th Annual Conference, October 2021, webinar, "Spatial characterization of the composition and sources of submicron aerosols in the Corpus Christi - San Antonio area based on mobile measurements" (oral)
- American Association of Aerosol Research 39th Annual Conference, October 2021, webinar, "Disparities in air quality downscaler model uncertainty across socioeconomic and demographic indicators in North Carolina" (oral)
- Prairie Environmental Chemistry Colloquium, June 2020, webinar, "Hydrogen peroxide emission and fate indoors during non-bleach cleaning: a chamber study" (poster)
- 2019 HOMEChem Data Meeting, September 2019, Boulder, CO, "Actinic fluxes and photolysis kinetics of key species in the UTest house" (poster)
- 2019 Chinese Environmental Scholar Forum, May 2019, Houston, TX, "Oxidant levels in an occupied residence: impact of human activity and indoor lighting" (oral)
- 2018 Chemistry of Indoor Environments Science Meeting, October 2018, Boulder, CO, "Spectrally resolved actinic fluxes and photolysis kinetics of key species during HOMEChem" (poster)
- 2018 Indoor Air, July 2018, Philadelphia, PA, "Time-resolved characterization of indoor oxidants in a New York home" (oral)
- American Association of Aerosol Research 36th Annual Conference, October 2017, Raleigh, NC, "Chemical and physical properties of remote aerosols in regional air masses and the free troposphere over the Western US." (oral)
- 2016 American Geophysical Union Fall Meeting, December 2016, San Francisco, CA, "Chemical and physical properties of aerosols in regional background air masses and free troposphere in the Western US." (poster)
- 15th Annual Berkeley Atmospheric Sciences Symposium, February 2016, Berkeley, CA, "Observations of organic nitrogen compounds in submicrometer aerosols in New York using high resolution aerosol mass spectrometry" (poster)
- American Association of Aerosol Research 35th Annual Conference, Portland, OR, October 2016, "Influence of wildfires on aerosol chemistry in the Western US and insights into atmospheric aging of biomass burning organic aerosol: results from the BBOP campaign" (oral)
- 2015 American Geophysical Union Fall Meeting, December 2015, San Francisco, CA, "Observations of organic nitrogen compounds in submicrometer aerosols in New York using high resolution aerosol mass spectrometry" (poster)
- 2014 American Geophysical Union Fall Meeting, December 2014, San Francisco, CA, "Atmospheric processing of aerosols from forest fires at Mt. Bachelor summit during BBOP" (poster)

American Association of Aerosol Research 33rd Annual Conference, Orlando, FL, October 2014, "Secondary organic aerosol formation at an urban downwind location in NY state" (oral)

American Association of Aerosol Research 33rd Annual Conference, Orlando, FL, October 2014, "Aerosol chemistry and processing at Mt. Bachelor summit: influences from wildfire plumes" (oral)

International Aerosol Conference 2014, Busan, South Korea, August 2014, "Atmospheric processing of organic aerosols at an urban downwind location in Long Island, New York" (oral)

American Association of Aerosol Research 32nd Annual Conference, October 2013, Portland, OR, "Sources and processes of submicron particles at an urban downwind location - Long Island New York" (poster)

TEACHING
EXPERIENCE

Teaching Assistant

- Analysis of Toxicants, UC Davis (ETX 220, graduate level)
- Air as a Resource, UC Davis (ESM 131, upper undergraduate level)
- Analysis of Toxicants Laboratory, UC Davis (ETX 220L, graduate level)

Guest lecturer

- Atmospheric Chemistry and Climate, Rice University (CEVE 411/511, mixed)
- Atmospheric Aerosol Chemistry, Syracuse University (CHE 600, graduate level)

Certificate

For completing the workshop series: "Learner-Centered Teaching: Designing Courses for Inclusivity and Student Success", Center for Educational Effectiveness, UC Davis
Capstone Project: Designed and developed a learner-centered syllabus for an undergraduate course: "Introduction to Atmospheric Chemistry"

OTHER
ACTIVITIES &
SERVICE

1) Women in Science and Engineering (WiSE) member: co-organized professional development workshops, participated in panels for students and early-career scientists at Syracuse University.

2) Mentoring:

- Mentored research projects for 3 undergraduate and 4 graduate students at UC Davis, Syracuse University, and Rice University (2016 – present)
- Mentored 2 undergraduate students through the Grad-Undergrad mentorship program at UC Davis (2013 – 2016)

3) Outreach:

- Co-organized the "Amazing Atmosphere Show" and "Climate Change Forum" of the Department of Atmospheric Science on UC Davis open house Picnic Day (2014)
- Co-found the volunteer teaching program of the School of Environmental Science and Engineering at SYSU, organized volunteer teaching in K-12 schools (2007 – 2011)

4) Proposal reviewer:

NOAA AC4 program

5) Guest Editor: Frontiers in Built Environment: Global Excellence in Indoor Environment: 'North America'

6) Journal reviewer:

ACS Earth and Space Chemistry
Aerosol and Air Quality Research
Atmospheric Environment
Current Pollution Reports
RSC Advances, Environmental Pollution
Environment International
Environmental Science, Processes & Impacts
Environmental Science & Technology

7) Conference services: *Working Group Member in AAAR division: Aerosol Chemistry, Atmospheric Aerosols, Aerosol Exposure & Indoor Aerosols, Poster judge: Prairie Environmental Chemistry Colloquium (2020), American Association for Aerosol Research annual conference (2017 – 2022)*

8) Professional Society Memberships:

American Association for Aerosol Research (AAAR, since 2013)
American Geophysical Union (AGU, since 2014)
American meteorological society (AMS, since 2020)
International Society of Indoor Air Quality and Climate (ISIAQ, since 2018)