LEI ZHU, Ph.D.

Southern University of Science and Technology (SUSTech) zhul3@sustech.edu.cn
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https://www.acmrsg.org/zhu

SCHOLARLY PROFILE

My research goal is to better understand processes governing the distributions of atmospheric species, and their implications for air quality, public health, and climate. My research program combines **remote sensing**, **modeling**, and **data assimilation** techniques.

My **research interests** include: atmospheric chemistry and its implications, modeling of atmospheric chemistry, and observing trace gases from space.

PROFESSIONAL EXPERIENCE

2019.12 – Present	Assistant Professor, Southern University of Science and Technology
2019.07 – 2019.12	Research Scholar, Harvard-Smithsonian Center for Astrophysics
2017.01 – 2019.07	Post-doctoral Fellow, Harvard University

EDUCATION

2016.12	Ph.D. in Environmental Science and Engineering, Harvard University Advisor: Prof. Daniel J. Jacob
2011.06	MSci. in Environmental Science, Peking University Advisor: Prof. Yu Song
2008.06	B.S. in Environmental Science, Nankai University

PUBLICATIONS

First or corresponding author (*)

Pu, D., **Zhu, L.** *, De Smedt, I., Li, X., Sun, W., Wang, D., Liu, S., Li, J., Shu, L., Chen, Y., Sun, S., Zuo, X., Fu, W., Xu, P., Yang, X., and Fu, T.-M.: Response of Anthropogenic Volatile Organic Compound Emissions to Urbanization in Asia Probed with TROPOMI and VIIRS Satellite Observations, *Geophysical Research Letters*, 2022.

Shu, L., **Zhu, L.** *, Bak, J., Zoogman, P., Han, H., Long, X., Bai, B., Liu, S., Wang, D., Sun, W., Pu, D., Chen, Y., Li, X., Sun, S., Li, J., Yang, X., Fu, T.-M.: Improved Ozone Simulation in East Asia via Assimilating Observations from the First Geostationary Air-quality Monitoring Satellite: Insights from an Observing System Simulation Experiment, *Atmospheric Environment*, 2022.

Sun, W., **Zhu, L.** *, De Smedt, I., Bai, B., Pu, D., Chen, Y., Shu, L., Wang, D., Fu, T.-M., Wang, X., and Yang, Y.: Global Significant Changes in Formaldehyde (HCHO) Columns Observed from Space at the Early Stage of the COVID-19 Pandemic, *Geophysical Research Letters*, 2021.

Zhu, L. *, González Abad, G., Nowlan, C. R., Chan Miller, C., Chance, K., Apel, E. C., DiGangi, J. P., Fried, A., Hanisco, T. F., Hornbrook, R. S., Hu, L., Kaiser, J., Keutsch, F. N., Permar, W., St. Clair, J. M., and Wolfe, G. M.: Validation of satellite formaldehyde (HCHO) retrievals using observations from 12 aircraft campaigns, *Atmospheric Chemistry and Physics*, 2020.

Zhu, L. *, Jacob, D. J., Eastham, S. D., Sulprizio, M. P., Wang, X., Sherwen, T., Evans, M. J., Chen, Q., Alexander, B., Koenig, T. K., Volkamer, R., Huey, L. G., Le Breton, M., Bannan, T. J., and Percival, C. J.: Effect of sea salt aerosol on tropospheric bromine chemistry, *Atmospheric Chemistry and Physics,* 2019.

Zhu, L. *, Mickley, L., J., Jacob, D. J., Marais, E. A., Sheng, J., Hu, L., González Abad, G., and Chance, K.: Long-term (2005–2014) trends in formaldehyde (HCHO) columns across North America as seen

by the OMI satellite instrument: Evidence of changing emissions of volatile organic compounds, *Geophysical Research Letters*, 2017.

Zhu, L. *, Jacob, D. J., Keutsch, F. N., Mickley, L. J., Scheffe, R., Strum, M., Abad, G. G., Chance, K., Yang, K., Rappengluck, B., Millet, D. B., Baasandorj, M., Jaegle, L., and Shah, V.: Formaldehyde (HCHO) as a Hazardous Air Pollutant: Mapping surface air concentrations from satellite and inferring cancer risks in the United States, *Environmental Science & Technology*, 2017.

Zhu, L. *, Jacob, D. J., Kim, P. S., Fisher, J. A., Yu, K., Travis, K. R., Mickley, L. J., Yantosca, R. M., Sulprizio, M. P., De Smedt, I., González Abad, G., Chance, K., Li, C., Ferrare, R., Fried, A., Hair, J. W., Hanisco, T. F., Richter, D., Jo Scarino, A., Walega, J., Weibring, P., and Wolfe, G. M.: Observing atmospheric formaldehyde (HCHO) from space: validation and intercomparison of six retrievals from four satellites (OMI, GOME2A, GOME2B, OMPS) with SEAC^{4}RS aircraft observations over the southeast US, *Atmospheric Chemistry and Physics*, 2016.

Zhu, L. *, Jacob, D. J., Mickley, L. J., Marais, E. A., Cohan, D. S., Yoshida, Y., Duncan, B. N., González Abad, G., and Chance, K. V.: Anthropogenic emissions of highly reactive volatile organic compounds in eastern Texas inferred from oversampling of satellite (OMI) measurements of HCHO columns, *Environmental Research Letters*, 2014.

Zhu, L., Huang, X., Shi, H., Cai, X. H., and Song, Y.: Transport pathways and potential sources of PM_{10} in Beijing, *Atmospheric Environment*, 2011.

Co-authorship

Wang, X., Fu, T.-M., Zhang, L., Lu, X., Liu, X., Amnuaylojaroen, T., Latif, M. T., Ma, Y., Zhang, L., Feng, X., **Zhu, L.**, Shen, H., Yang, X.: Rapidly changing emissions drove substantial surface and tropospheric ozone increases over Southeast Asia, *Geophysical Research Letters*, 2022.

Souri, A. H., Johnson, M. S., Wolfe, G. M., Crawford, J. H., Fried, A., Wisthaler, A., Brune, W. H., Blake, D. R., Weinheimer, A. J., Verhoelst, T., Compernolle, S., Pinardi, G., Vigouroux, C., Langerock, B., Choi, S., Lamsal, L., **Zhu, L.**, Sun, S., Cohen, R. C., Min, K.-E., Cho, C., Philip, S., Liu, X., and Chance, K.: Characterization of Errors in Satellite-based HCHO/NO_2 Tropospheric Column Ratios with Respect to Chemistry, Column to PBL Translation, Spatial Representation, and Retrieval Uncertainties, *Atmospheric Chemistry and Physics Discussions*, 2022.

Long, X., Fu, T.-M., Yang, X., Tang, Y., Zheng, Y., **Zhu, L.**, Shen, H., Ye, J., Wang, C., Wang, T., and Li, B.: Efficient Atmospheric Transport of Microplastics over Asia and Adjacent Oceans, *Environmental Science & Technology*, 2022.

Howlett, C., González Abad, G., Chan Miller, C., Nowlan, C. R., Ayazpour, Z., and **Zhu, L.**: The influence of snow cover on Ozone Monitor Instrument formaldehyde observations, *Atmósfera*, 2022.

Zhao, T., Mao, J., Simpson, W. R., De Smedt, I., **Zhu, L.**, Hanisco, T. F., Wolfe, G. M., St. Clair, J. M., González Abad, G., Nowlan, C. R., Barletta, B., Meinardi, S., and Blake, D. R.: Source and variability of formaldehyde (HCHO) at northern high latitude: an integrated satellite, aircraft, and model study, *Atmospheric Chemistry and Physics,* 2022.

Xu, P., Li, G., Houlton, B. Z., Ma, L., Ai, D., **Zhu, L.**, Luan, B., Zhai, S., Hu, S., Chen, A., and Zheng, Y.: Role of Organic and Conservation Agriculture in Ammonia Emissions and Crop Productivity in China, *Environmental Science & Technology*, 2022.

Zhai, J., Yang, X., Li, L., Bai, B., Liu, P., Huang, Y., Fu, T. M., **Zhu, L.**, Zeng, Z., Tao, S., Lu, X., Ye, X., Wang, X., Wang, L., and Chen, J.: Absorption Enhancement of Black Carbon Aerosols Constrained by Mixing-State Heterogeneity, *Environmental Science & Technology*, 2022.

Huang, G., Ponder, R., Bond, A., Brim, H., Temeng, A., Naeger, A., **Zhu, L.**: Impact of traffic reductions on the air quality during the COVID-19 lockdown in the Metro Atlanta Area, United States, *Aerosol and Air Quality Research*, 2021.

Marais, E., Pandey, A., Van Damme, M., Clarisse, L., Coheur, P.-F., Shephard, M., Cady-Pereira, K., Misselbrook, T., **Zhu, L.**, Luo, G., and Yu, F.: UK ammonia emissions estimated with satellite observations and GEOS-Chem, *Journal of Geophysical Research-Atmospheres*, 2021.

Zhai, S., Wang, X., McConnell, J. R., Geng, L., Cole-Dai, J., Sigl, M., Chellman, N., Sherwen, T., Pound,

R., Fujita, K., Hattori, S., Moch, J., M., **Zhu, L.**, Evans, M., Legrand, M., Liu, P., Pasteris, D., Chan, Y.-C., Murray, L. T., Alexander, B.: Anthropogenic Impacts on Tropospheric Reactive Chlorine since the Preindustrial, *Geophysical Research Letters*, 2021.

Wang, X., Jacob, D. J., Downs, W., Zhai, S., **Zhu, L.**, Shah, V., Holmes, C. D., Sherwen, T., Alexander, B., Evans, M. J., Eastham, S. D., Neuman, J. A., Veres, P., Koenig, T. K., Volkamer, R., Huey, L. G., Bannan, T. J., Percival, C. J., Lee, B. H., and Thornton, J. A: Global tropospheric halogen (Cl, Br, I) chemistry and its impact on oxidants, *Atmospheric Chemistry and Physics*, 2021.

Wang, X., Fu, T.-M., Zhang, L., Cao, H., Zhang, Q., Ma, H., Shen, L., Evans, M. J., Ivatt, P. D., Lu, X., Chen, Y., Zhang, L., Feng, X., Yang, X., **Zhu, L.**, Henze, D. K.: Sensitivities of Ozone Air Pollution in the Beijing-Tianjin-Hebei Area to Local and Upwind Precursor Emissions Using Adjoint Modeling, *Environmental Science & Technology*, 2021.

Li, Y., Fu, T.-M., Yu, J., Feng, X., Zhang, L., Chen, J., Boreddy, S., Kawamura, K., Fu, P., Yang, X., **Zhu, L.**, and Zeng, Z.: Impacts of Chemical Degradation on the Global Budget of Atmospheric Levoglucosan and Its Use As a Biomass Burning Tracer, *Environmental Science & Technology*, 2021.

Wang, X., Ye, X., Chen, J., Wang, X., Yang, X., Fu, T.-M., **Zhu, L.**, and Liu, C.: Direct links between hygroscopicity and mixing state of ambient aerosols: estimating particle hygroscopicity from their single-particle mass spectra, *Atmospheric Chemistry and Physics*, 2020.

Souri, A. H., Nowlan, C. R., González Abad, G., **Zhu, L.**, Blake, D. R., Fried, A., Weinheimer, A. J., Wisthaler, A., Woo, J.-H., Zhang, Q., Chan Miller, C. E., Liu, X., and Chance, K.: An Inversion of NOx and NMVOC Emissions using Satellite Observations during the KORUS-AQ Campaign and Implications for Surface Ozone over East Asia, *Atmospheric Chemistry and Physics*, 2020.

Lu, X., Zhang, L., Wu, T., Long, M. S., Wang, J., Jacob, D. J., Zhang, F., Zhang, J., Eastham, S. D., Hu, L., **Zhu, L.**, Liu, X., and Wei, M.: Development of the global atmospheric general circulation-chemistry model BCC-GEOS-Chem v1.0: model description and evaluation, *Geoscientific Model Development*, 2020.

K. Chance, X. Liu, C. Chan Miller, G.González Abad, G. Huang, C. Nowlan, A. Souri, R. Suleiman, K. Sun, H. Wang, **L. Zhu**, P. Zoogman, J. Al-Saadi, J.-C. Antuña-Marrero, J. Carr, R. Chatfield, M. Chin, R. Cohen, D. Edwards, J. Fishman, D. Flittner, J. Geddes, M. Grutter, J.R. Herman, D.J. Jacob, S. Janz J. Joiner, J. Kim, N.A. Krotkov, B. Lefer, R.V. Martin, O.L. Mayol-Bracero, A. Naeger, M. Newchurch, G.G. Pfister, K. Pickering, R.B. Pierce, C. Rivera Cárdenas, A. Saiz-Lopez, W. Simpson, E. Spinei, R.J.D. Spurr, J.J. Szykman, O. Torres, and J. Wang: TEMPO Green Paper; Chemistry, physics, and meteorology experiments with the Tropospheric Emissions: Monitoring of Pollution instrument, Proc. SPIE 11151, *Sensors, Systems, and Next-Generation Satellites XXIII*, 111510B (10 October 2019), 2019.

Shen, L., Jacob, D. J., **Zhu, L.**, Zhang, Q., Zheng, B., Sulprizio, M. P., Li, K., Smedt, I. D., Abad, G. G., Cao, H., Fu, T.-M., and Liao, H.: The 2005–2016 Trends of Formaldehyde Columns Over China Observed by Satellites: Increasing Anthropogenic Emissions of Volatile Organic Compounds and Decreasing Agricultural Fire Emissions, *Geophysical Research Letters*, 2019.

Zhang, Y., Gautam, R., Zavala‐Araiza, D., Jacob, D. J., Zhang, R., **Zhu, L.**, Sheng, J.-X., and Scarpelli, T.: Satellite-Observed Changes in Mexico's Offshore Gas Flaring Activity Linked to Oil/Gas Regulations, *Geophysical Research Letters*, 2019.

Wang, X., Jacob, D. J., Eastham, S. D., Sulprizio, M. P., **Zhu, L.**, Chen, Q., Alexander, B., Sherwen, T., Evans, M. J., Lee, B. H., Haskins, J. D., Lopez-Hilfiker, F. D., Thornton, J. A., Huey, G. L., and Liao, H.: The role of chlorine in tropospheric chemistry, *Atmospheric Chemistry and Physics*, 2019.

Song, S., Gao, M., Xu, W., Sun, Y., Worsnop, D. R., Jayne, J. T., Zhang, Y., **Zhu, L.**, Li, M., Zhou, Z., Cheng, C., Lv, Y., Wang, Y., Peng, W., Xu, X., Lin, N., Wang, Y., Wang, S., Munger, J. W., Jacob, D. J., and McElroy, M. B.: Possible heterogeneous chemistry of hydroxymethanesulfonate (HMS) in northern China winter haze, *Atmospheric Chemistry and Physics*, 2019.

Sun, K., **Zhu, L.**, Cady-Pereira, K., Chan Miller, C., Chance, K., Clarisse, L., Coheur, P.-F., González Abad, G., Huang, G., Liu, X., Van Damme, M., Yang, K., and Zondlo, M.: A physics-based

approach to oversample multi-satellite, multispecies observations to a common grid, *Atmospheric Measurement Techniques*, 2018.

Kaiser, J., Jacob, D. J., **Zhu, L.**, Travis, K. R., Fisher, J. A., González Abad, G., Zhang, L., Zhang, X., Fried, A., Crounse, J. D., St. Clair, J. M., and Wisthaler, A.: High-resolution inversion of OMI formaldehyde columns to quantify isoprene emission on ecosystem-relevant scales: application to the southeast US, *Atmospheric Chemistry and Physics*, 2018.

Chan Miller, C., Jacob, D. J., Marais, E. A., Yu, K., Travis, K. R., Kim, P. S., Fisher, J. A., **Zhu, L.**, Wolfe, G. M., Hanisco, T. F., Keutsch, F. N., Kaiser, J., Min, K.-E., Brown, S. S., Washenfelder, R. A., González Abad, G., and Chance, K.: Glyoxal yield from isoprene oxidation and relation to formaldehyde: chemical mechanism, constraints from SENEX aircraft observations, and interpretation of OMI satellite data, *Atmospheric Chemistry and Physics*, 2017.

Travis, K. R., Jacob, D. J., Fisher, J. A., Kim, P. S., Marais, E. A., **Zhu, L.**, Yu, K., Miller, C. C., Yantosca, R. M., Sulprizio, M. P., Thompson, A. M., Wennberg, P. O., Crounse, J. D., St. Clair, J. M., Cohen, R. C., Laughner, J. L., Dibb, J. E., Hall, S. R., Ullmann, K., Wolfe, G. M., Pollack, I. B., Peischl, J., Neuman, J. A., and Zhou, X.: Why do models overestimate surface ozone in the Southeast United States?, *Atmospheric Chemistry and Physics*, 2016.

Fisher, J. A., Jacob, D. J., Travis, K. R., Kim, P. S., Marais, E. A., Chan Miller, C., Yu, K., **Zhu, L.**, Yantosca, R. M., Sulprizio, M. P., Mao, J., Wennberg, P. O., Crounse, J. D., Teng, A. P., Nguyen, T. B., St. Clair, J. M., Cohen, R. C., Romer, P., Nault, B. A., Wooldridge, P. J., Jimenez, J. L., Campuzano-Jost, P., Day, D. A., Hu, W., Shepson, P. B., Xiong, F., Blake, D. R., Goldstein, A. H., Misztal, P. K., Hanisco, T. F., Wolfe, G. M., Ryerson, T. B., Wisthaler, A., and Mikoviny, T.: Organic nitrate chemistry and its implications for nitrogen budgets in an isoprene- and monoterpene-rich atmosphere: constraints from aircraft (SEAC^{4}RS) and ground-based (SOAS) observations in the Southeast US, *Atmospheric Chemistry and Physics*, 2016.

Yu, K., Jacob, D. J., Fisher, J. A., Kim, P. S., Marais, E. A., Miller, C. C., Travis, K. R., **Zhu, L.**, Yantosca, R. M., Sulprizio, M. P., Cohen, R. C., Dibb, J. E., Fried, A., Mikoviny, T., Ryerson, T. B., Wennberg, P. O., and Wisthaler, A.: Sensitivity to grid resolution in the ability of a chemical transport model to simulate observed oxidant chemistry under high-isoprene conditions, *Atmospheric Chemistry and Physics*, 2016.

Marais, E. A., Jacob, D. J., Jimenez, J. L., Campuzano-Jost, P., Day, D. A., Hu, W., Krechmer, J., **Zhu, L.**, Kim, P. S., Miller, C. C., Fisher, J. A., Travis, K., Yu, K., Hanisco, T. F., Wolfe, G. M., Arkinson, H. L., Pye, H. O. T., Froyd, K. D., Liao, J., and McNeill, V. F.: Aqueous-phase mechanism for secondary organic aerosol formation from isoprene: application to the southeast United States and co-benefit of SO2 emission controls, *Atmospheric Chemistry and Physics*, 2016.

Kim, P. S., Jacob, D. J., Fisher, J. A., Travis, K., Yu, K., **Zhu, L.**, Yantosca, R. M., Sulprizio, M. P., Jimenez, J. L., Campuzano-Jost, P., Froyd, K. D., Liao, J., Hair, J. W., Fenn, M. A., Butler, C. F., Wagner, N. L., Gordon, T. D., Welti, A., Wennberg, P. O., Crounse, J. D., St. Clair, J. M., Teng, A. P., Millet, D. B., Schwarz, J. P., Markovic, M. Z., and Perring, A. E.: Sources, seasonality, and trends of southeast US aerosol: an integrated analysis of surface, aircraft, and satellite observations with the GEOS-Chem chemical transport model, *Atmospheric Chemistry and Physics*, 2015.

Li, M., Huang, X., **Zhu, L.**, Li, J., Song, Y., Cai, X., and Xie S.: Analysis of the transport pathways and potential sources of PM10 in Shanghai based on three methods, *Science of the Total Environment*, 2012.

Huang, X., Li, M., Friedli, H. R. Song, Y., Chang, D., and **Zhu, L.**: Mercury Emissions from Biomass Burning in China, *Environmental Science & Technology*, 2011.

Song, Y., Chang, D., Liu, B., Miao, W., **Zhu, L.**, and Zhang, Y.: A new emission inventory for nonagricultural open fires in Asia from 2000 to 2009, *Environmental Research Letters*, 2010.

Wang, B., **Zhu, L.**, Gong, Z., Wang, R., and Tao, S.: Introduction to the methods of parameter estimation for environmental monitoring data set with truncated data below a detection limit, *Acta Science Circumstantiae*, 2009.

AWARDS & GRANTS

Academic Recognition

American Meteorological Society Special Award for OMI	2020
Recognized reviewer for *Atmospheric Pollution Research*	2019
NASA/DOI William T. Pecora Team Award for OMI	2018
Outstanding reviewer for *Atmospheric Environment*	2017
NASA Group Achievement Award for SEAC^{4}RS	2015
Graduate with honors, Nankai University	2008
Excellent All-round Student, Nankai University	2005 – 2007

Teaching

Harvard University Certificate of Distinction in Teaching	2013

Fellowships

Smithsonian Astrophysical Observatory Visiting Scientist Fellowship	2019
Harvard Graduate Consortium on Energy and Environment Fellowship	2014 – 2016
Graduate Scholarship, Peking University	2008 – 2010
Novozymes Fellowship	2007
China National Educational Opportunity Grant	2007
Undergraduate scholarship, Nankai University	2005 – 2006

PRESENTATIONS

Talks

Satellite remote sensing of trace gases: principles, methods, and applications for air quality studies, Nankai University, Tianjin, China, 2020 **(invited)**.

Validation of satellite formaldehyde (HCHO) retrievals using observations from 12 aircraft campaigns, *AGU Fall Meeting*, 2019, San Francisco, CA, USA.

Satellite remote sensing of trace gases: principles, methods, and applications for air quality studies, *Atmospheric Chemistry Forum* (online), November 30, 2019 (**invited**).

Satellite remote sensing for air quality applications, with a focus on formaldehyde (HCHO), University of Illinois at Urbana–Champaign, Champaign, IL, 2019 **(invited)**.

Satellite remote sensing for air quality applications, with a focus on formaldehyde (HCHO), Institute of Atmospheric Physics Chinese Academy of Sciences, Beijing, China, 2019 **(invited)**.

Satellite remote sensing for air quality applications, with a focus on formaldehyde (HCHO), Peking University, Beijing, China, 2019 **(invited)**.

Satellite remote sensing for air quality applications, with a focus on formaldehyde (HCHO), Southern University of Science and Technology, Shenzhen, China, 2019 **(invited)**.

Modeling of tropospheric halogen (Cl-Br-I) chemistry: cycling, debromination, and impact, *The 1st Regional GEOS-Chem Asia Meeting*, Nanjing, China, 2018.

Mapping surface air concentrations from OMI and inferring cancer risks: implications for TEMPO, *TEMPO Science Meeting*, Cambridge, MA, 2017 **(invited)**.

Observing atmospheric formaldehyde from space: validation, intercomparison, trend analysis and public health implications, *AGU Fall Meeting*, San Francisco, CA, 2016.

Observing atmospheric formaldehyde from space: Validation, intercomparison, trend analysis and public health implications, *Aura Science Meeting*, Rotterdam, The Netherlands, 2016.

Mapping of surface formaldehyde (HCHO) from space for air quality management, *The 9th NASA Air Quality Applied Sciences Team Meeting*, St. Louis University, St. Louis, MO, 2015.

Indirect validation of new OMI, GOME-2B and OMPS formaldehyde retrievals using SEAC^{4}RS data, *The 7th International Conference of GEOS-Chem*, Harvard University, Cambridge, MA, 2015.

Validation of satellite HCHO observations (OMI, GOME-2B, OMPS) using SEAC^{4}RS data, *SEAC^{4}RS*

Science Meeting, Caltech, Pasadena, CA, 2015.

Anthropogenic emissions of highly reactive volatile organic compounds inferred from oversampling of OMI HCHO columns, *EOS Aura Science Team Meeting 10th year anniversary celebration*, College Park, MD, 2014.

Anthropogenic emissions of highly reactive VOCs (HRVOCs) inferred from oversampling of OMI formaldehyde columns, *The 6th NASA Air Quality Applied Sciences Team Meeting*, Rice University, Houston, TX, 2014.

Math in Nature: finding order in chaos, at Harvard Medical School, *Science in News*, Boston, MA, 2013 **(invited)**.

Variability of HCHO over the United States: Implications for VOCs Emissions, *The 5th NASA Air Quality Applied Sciences Team Meeting*, University of Maryland, College Park, MD, 2013.

A spike in electricity demand due to severe summer heatwaves: Increase of SO_2 emissions detected from space, *The 18th Seminar of JSPS-MOE Core University Program*, Beijing, China, 2010.

Estimating of fire emissions in Boreal Siberia by satellite data sets, *The 6th Seminar of Environment Modeling and Pollution Controlling*, Beijing, China, 2009.

Posters

Validation of satellite formaldehyde (HCHO) retrievals using aircraft observations and implication for TEMPO, *TEMPO Science Meeting*, University of Wisconsin–Madison, WI, 2019.

Effect of sea-salt aerosol on tropospheric bromine chemistry, *The 9th International Conference of GEOS-Chem*, Harvard University, Cambridge, MA, 2019.

Effect of sea-salt aerosol on tropospheric bromine chemistry, *AGU Fall Meeting*, Washington, D.C., 2018.

Observing atmospheric formaldehyde from space: trend analysis and public health implications, *The 8th International GEOS-Chem Meeting*, Cambridge, MA, 2017.

Validation of satellite HCHO retrievals with aircraft (SEAC^{4}RS) observations, *Atmospheric Radiation Workshop*, NCAR, Boulder, CO, 2016.

Anthropogenic emissions of highly reactive volatile organic compounds inferred from oversampling of OMI HCHO columns, *AGU Fall Meeting*, San Francisco, CA, 2014.

Indirect validation of GOME-2/MetOp-A and B formaldehyde retrievals using SEAC^{4}RS data: Preliminary results, *The 7th NASA Air Quality Applied Sciences Team Meeting*, Harvard University, Cambridge, MA, 2014.

Indirect Validation of GOME-2/MetOp-A and B and New OMI formaldehyde (HCHO) retrievals using SEAC^{4}RS data: Preliminary results, *SEAC^{4}RS Science Meeting*, NIST, Boulder, CO, 2014.

Variability of HCHO over the Southeastern United States observed from space: Implications for VOC emissions, *AGU Fall Meeting*, San Francisco, CA, 2012.

Spikes in electricity demand during severe summer heat waves: Increased SO_2 emissions detected from space, *AGU Fall Meeting*, San Francisco, CA, 2010.

TEACHING EXPERIENCE

Instructor

- *Computing and Programming for Environmental Research*, Graduate course, SUSTech, 26 students 2020, 43 students 2021, 24 students 2022.
- *Environmental Data Analysis*, Undergraduate course, SUSTech, 15 students 2021, 6 students 2022.

Teaching Assistant

Lab demonstrations/tutoring, grading, exam grading, offering weekly sections

- *Atmospheric Chemistry and Physics*, Graduate course, Harvard University, 12 students, 2017.
- *The Fluid Earth: Oceans, Atmosphere, and Climate*, Undergraduate course, Harvard University, 50 students, 2013.

ADVISING EXPERIENCE

Postdoc

Song Liu 2021–, Lei Shu 2020–2022, Dakang Wang 2020–2022.

Research Assistant

Bin Bai 2020–2021, Wenfu Sun 2020–2021.

Graduate Student

PhD student: Xicheng Li 2022–, Juan Li 2021–, Dongchuan Pu 2020–, Yuyang Chen 2020–
Master student: Weitao Fu 2022–, Xiaoxing Zuo 2021–, Shuai Sun 2020–, Xicheng Li 2020–2022.
Graduate mentoring program at Harvard: Tianjia Liu 2017–2019, Natasha Goss 2014–2015

Undergraduate Student

Liqian Tan 2020–2021, Yuyang Chen 2019–2020

PROFESSIONAL SERVICE

Committee Experience

GEMS Science Team Member	2019 –
OMPS (NPP and NOAA-20) Science Team Member	2018 –
TEMPO Science Team Member	2017 –
NASA Aura Science Team Member	2016 –
Chair of weekly Harvard Atmospheric Sciences seminar series	2016 – 2017
NASA SEAC^{4}RS Flight Campaign Science Team Member	2012 – 2015
NASA Air Quality Applied Sciences Team Member	2011 – 2015

Youth Editor

Journal of Remote Sensing

Guest Editor

Remote Sensing

Peer Review Journals

Atmosphere, *Atmospheric Environment*, *Atmospheric Chemistry and Physics*, *Atmospheric Measurement Techniques*, *Atmospheric Pollution Research*, *Environmental Science & Technology*, *Geophysical Research Letters*, *Journal of Environmental Science and Technology*, *Journal of Geophysical Research*, *Nature Climate Change*, *Remote Sensing*

Proposal Reviewer

NASA proposal review panels

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