DANDAN ZHANG

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APPOINTMENTS

Harvard University — Cambridge, USA

Postdoctoral Fellow (Advisor: Daniel Jacob) — Apr. 2025 – Present

EDUCATION

Washington University in St. Louis — St. Louis, USA

Ph.D. in Environmental Engineering (Advisor: Randall Martin) — Aug. 2019 – Apr. 2025

Peking University — Beijing, China

B.S. in Environmental Science and B.A. in Economics (Advisor: Wen Liu) — Sep. 2015 – Jul. 2019

RESEARCH EXPERIENCE

Randall Martin's Group, Washington University in St. Louis — St. Louis, USA

PhD student — Dec. 2020 – Apr. 2025

- Improve windblown dust representation in GEOS-Chem with emission schemes, below-cloud scavenging, and submicron size bins.
- Study the global spatial heterogeneity of air quality by a chemical transport model (GEOS-Chem) in its high-performance implementation (GCHP) at a high spatial resolution globally (~25 km)
- Investigate source sector contributions to surface air pollution and implications to pollution management

Young-Shin Jun's Group, Washington University in St. Louis — St. Louis, USA

PhD student — Sep. 2019 – Dec. 2020

- Study the formation processes of manganese oxides minerals with oxidants generated during redox reactions of manganese minerals under simulated sunlight

Wen Liu's Group, Peking University — Beijing, China

Research Assistant — Oct. 2017 – Jun. 2019

- Investigate the degradation processes of trace antibiotics in polluted aquatic systems by oxidants generated by engineered catalysts under simulated sunlight

RESEARCH INTERESTS

- Air quality modeling
- Source sector contributions to air quality and pollution management
- Effects of air pollution on human health

My research focuses on understanding the effects of spatial resolution of air quality simulations on population exposure to air pollutants, investigating different emission source contributions to surface air pollution, and improving simulation performance, specifically the representation of windblown mineral dust against ground-based observations.

SKILLS

- Experiences in modeling global air quality with a chemical transport model, GEOS-Chem
- Programming: Python, Fortran, C/C++
- Software: Matlab, Originlab, SPSS, Stata
- Language: Chinese (native); English (professional)

SCHOLARSHIPS AND AWARDS

- AGU Outstanding Student Presentation Award, American Geophysical Union 2022
- Award for Academic Excellence, Peking University 2016
- Top Talent Project Scholarship, Peking University 2015, 2016
- May 4th Scholarship, Peking University 2015
- Award for Academic Diligence, Peking University 2015

INVITED TALKS AND SEMINARS

- The Pacific Northwest National Laboratory (PNNL) 2024
  The Atmospheric and Global Change Division
- The École Polytechnique Fédérale de Lausanne (EPFL) 2024
  The Extreme Environments Research Laboratory

CONFERENCE PRESENTATIONS

- Impact of GCHP Spatial Resolution on Global Geophysical Satellite-Derived Fine Particulate Matter, 11th International GEOS-Chem Meeting, St. Louis, June 2024 (Talk)
- Advances in Simulating the Global Spatial Heterogeneity of Air Quality Using GCHP and Its Implications for the Relation of AOD with $PM_{2.5}$, 2nd Regional GEOS-Chem Europe User's Meeting, London, August 2023 (Talk)
- Advances in Simulating the Global Spatial Heterogeneity of Air Quality and Source Sector Contributions: Insights into the Global South, American Geophysical Union Conference, Chicago, Dec 2022. (Poster)
- Advances in Simulating the Spatial Heterogeneity of Air Quality and Source Contributions Using GCHP, 10th International GEOS-Chem Meeting, St. Louis, June 2022 (Talk)

TEACHING

Teaching Assistant:

- **Air Quality Engineering with Lab** (EECE 314/521), Washington University in St. Louis Fall 2021
  Undergraduate/graduate course, Department of Energy, Environmental and Chemical Engineering.
  This course introduces governing concepts and processes relevant to air quality and pollution control.
- **Mass Transfer Operations** (EECE 304), Washington University in St. Louis Spring 2021
  Undergraduate course, Department of Energy, Environmental and Chemical Engineering.
  This course introduces theory and design of various unit operations for separation of products, including distillation, absorption/stripping, liquid-liquid extraction, membrane separations, and packed bed adsorption.
- **Aquatic Chemistry** (EECE 505), Washington University in St. Louis Fall 2020
  Graduate course, Department of Energy, Environmental and Chemical Engineering.
  This course examines chemical reactions relevant to natural and engineered aquatic systems with an analytical emphasis on chemical equilibrium and kinetics.

PUBLICATIONS

Peer-reviewed:

[13] Lu, G., Marais, E. A., Vohra, K., Horner, R. P., **Zhang, D.**, Martin, R. V., & Guttikunda, S. (2025). Near-automated estimate of city nitrogen oxides emissions applied to South and Southeast Asia. *Journal of Geophysical Research: Atmospheres*, *130*(2), e2024JD041000. https://doi.org/10.1029/2024JD041000

[12] Chatterjee, D., Martin, R. V., Li, C., **Zhang, D.**, Zhu, H., Henze, D. K., Crawford, J. H., Cohen, R. C., Lamsal, L. N., Cede, A. M. (2024). Interpreting Summertime Hourly Variation of NO_2 Columns with

Implications for Geostationary Satellite Applications. *Atmospheric Chemistry and Physics*, 24 (22), 12687–12706. https://doi.org/10.5194/acp-24-12687-2024

[11] van Donkelaar, A., Martin, R. V., Ford, B., Li, C., Pappin, A. J., Shen, S., **Zhang, D.** (2024). North American Fine Particulate Matter Chemical Composition for 2000-2022 from Satellites, Models, and Monitors: The Changing Contribution of Wildfires. *ACS ES&T Air*, https://doi.org/10.1021/acsestair.4c00151

[10] Zhu, H., Martin, R. V., van Donkelaar, A., Hammer, M. S., Li, C., Meng, J., Oxford, C. R., Liu, X., Li, Y., **Zhang, D.**, Singh, I., Lyapustin, A. (2024). Importance of Aerosol Composition and Aerosol Vertical Profile in Global Spatial Variation in the $PM_{2.5}$ to AOD Relationship. *Atmospheric Chemistry and Physics*, 24(20), 11565–11584. https://doi.org/10.5194/acp-24-11565-2024

[9] Croft, B., Martin, R. V., Chang, R. Y-W., Bindle, L., Eastham, S. D., Estrada, L., Ford B., Li, C., Long, M. S., Lundgren, E. W., Sinha, S., Sulprizio, M. P., Tang Y., van Donkelaar, A., Yantosca, R. M., **Zhang, D.**, Zhu, H., Pierce, J. R. (2024). Towards fine horizontal resolution global simulations of aerosol sectional microphysics: Advances enabled by GCHP-TOMAS. *Journal of Advances in Modeling Earth Systems*, 16, e2023MS004094. https://doi.org/10.1029/2023MS004094

[8] **Zhang, D.**, Martin, R. V., van Donkelaar, A., Li, C., Zhu, H., & Lyapustin, A. (2024). Impact of Model Spatial Resolution on Global Geophysical Satellite-Derived Fine Particulate Matter. *ACS ES&T Air*, 1(9), 1112-1123. https://doi.org/10.1021/acsestair.4c00084

[7] **Zhang, D.**, Martin, R. V., Bindle, L., Li, C., Eastham, S. D., van Donkelaar, A., & Gallardo, L. (2023). Advances in Simulating the Global Spatial Heterogeneity of Air Quality and Source Sector Contributions: Insights into the Global South. *Environmental Science & Technology*, 57(17), 6955-6964. https://doi.org/10.1021/acs.est.2c07253

[6] Li, C., Martin, R. V., Cohen, R. C., Bindle, L., **Zhang, D.**, Chatterjee, D., Weng H., & Lin, J. (2023). Variable Effects of Spatial Resolution on Modeling of Nitrogen Oxides. *Atmospheric Chemistry and Physics*, 23(5), 3031-3049. https://doi.org/10.5194/acp-23-3031-2023

[5] Martin, R. V., Eastham, S. D., Bindle, L., Lundgren, E. W., Clune, T. L., Keller, C. A., Downs, W., **Zhang, D.**, Lucchesi, R. A., Sulprizio, M. P., Yantosca, R. M., Li, Y., Estrada, L., Putman, W. M., Auer, B. M., Trayanov, A. L., Pawson, S., & Jacob, D. J. (2022). Improved Advection, Resolution, Performance, and Community Access in the New Generation (Version 13) of the High Performance GEOS-Chem Global Atmospheric Chemistry Model (GCHP). *Geoscientific Model Development*, 15(23), 8731-8748. https://doi.org/10.5194/gmd-15-8731-2022

[4] Gao, Z., **Zhang, D.**, & Jun, Y. S. (2021). Does *Tert*-Butyl Alcohol Really Terminate the Oxidative Activity of ·OH in Inorganic Redox Chemistry? *Environmental Science & Technology*, 55(15), 10442-10450. https://doi.org/10.1021/acs.est.1c01578

[3] **Zhang, D.**, Qi, J., Ji, H., Li, S., Chen, L., Huang, T., Xu, C., Chen, X., & Liu, W. (2020). Photocatalytic degradation of ofloxacin by perovskite-type $NaNbO_3$ nanorods modified g-C_3N_4 heterojunction under simulated solar light: Theoretical calculation, ofloxacin degradation pathways and toxicity evolution. *Chemical Engineering Journal*, 400, 125918. https://doi.org/10.1016/j.cej.2020.125918

[2] Liu, W., Li, Y., Liu, F., Jiang, W., **Zhang, D.**, & Liang, J. (2019). Visible-light-driven photocatalytic degradation of diclofenac by carbon quantum dots modified porous g-C_3N_4: Mechanisms, degradation pathway and DFT calculation. *Water Research*, 151, 8-19. https://doi.org/10.1016/j.watres.2018.11.084

[1] Cheng, K., Cai, Z., Fu, J., Sun, X., Sun, W., Chen, L., **Zhang, D**., & Liu, W. (2019). Synergistic adsorption of Cu (II) and photocatalytic degradation of phenanthrene by a jaboticaba-like TiO_2/titanate nanotube composite: An experimental and theoretical study. *Chemical Engineering Journal*, 358, 1155-1165. https://doi.org/10.1016/j.cej.2018.10.114