Chenchong Zhang

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Climate Scientist | Remote Sensing | AI & Numerical Modeling

Background Descriptions & Career Objectives

Postdoctoral researcher at Stanford University's Department of Earth System Science with a Ph.D. in Energy, Environmental, and Chemical Engineering from Washington University in St. Louis. Experienced in developing multi-scale climate and chemical transport models, advancing remote sensing retrievals, and applying AI/ML for environmental applications. Seeking to translate rigorous, innovative research into actionable insights that support climate mitigation policy.

Core Research Skills

Modeling and AI/ML Techniques: Deep learning, clustering algorithm, model development in general circulation models (e.g. CESM) and chemical transport models (e.g. WRF-Chem).

Data Engineering & Analytics: Large-scale data integration, statistical modeling, and geospatial mapping from remote sensing and sensor networks, postprocessing of multidimensional metadata (satellite data, climate model outputs, etc.)

Programming Languages: Python, C++, R, MATLAB.

Cross-Functional Collaboration: Proven record working with science and engineering teams to deliver scientific outcomes and scalable solutions.

Education

Washington University in St. Louis, St. Louis, MO, USA Aug 2017 - Oct 2022

Ph. D. in Energy, Environmental and Chemical Engineering

Fellow of McDonnell International Scholars Academy, cohort 2017

Tsinghua University, Beijing, China Aug 2012 - Aug 2016

BSE in Environmental Engineering, Global Environment Program (GEP)

Minor in Mathematics and Applied Mathematics

Research/Work Experience Closely Related to This Position

Postdoctoral appointments (Purdue, California Institute of Technology, Stanford) Nov 2022 - Present

Developments of Physical Parameterizations in Atmospheric Modeling Frameworks

- Built new modules in climate models to simulate the optical properties and radiative transfer effects of emerging wildfire-emitted aerosols, addressing critical gaps in understanding their climate impacts.
- Advanced knowledge of aerosol–radiation–cloud interactions by integrating aerosol physicochemical and optical properties into coupled modeling frameworks.

Physics-informed Approach for Data/Model Downscaling

- Designed a physics-constrained framework to downscale satellite wildfire observations, resolving subpixel fire extent and combustion phase heterogeneity to improve system-level emission estimates.
- Reduced model biases stemming from unevenly distributed high-resolution observations during AI model training, enhancing the robustness of data-driven climate and air quality applications.

Inter-institutional Collaboration and Scientific Synthesis of Research Findings

- Collaborated with NASA, JPL, and academic teams to develop atmospheric data pipelines and analytics tools, quantifying ammonia and $PM_{2.5}$ emissions from California agriculture by combining infrared satellite retrievals with in-situ measurements to inform policy and regulatory actions.
- Published scientific papers in specialized topics including atmospheric science, remote sensing, radiative transfer, etc. and top multidisciplinary journals like PNAS, One Earth, Nature Geoscience.

Proposals & Grants

1. "Mitigating Uncertainty in the Radiative Forcing by Stratospheric Aerosol Injection for Solar Geoengineering in a Multiscale Modeling Framework" | 2024 Stanford Doerr Discovery Grants | Co-Investigator and proposal lead writer | 2024 – 2026
2. "Constraining modeled emissions and transformation of light-absorbing organic aerosols from wildfires using in situ and space-borne measurements" | NASA Atmospheric Composition: Modeling and Analysis Program | Co-Investigator and proposal lead writer

Selected Journal Publications (Air Pollution, Climate Change, etc.)

1. **Zhang, C.,** Wang, Y., Wang, J., Soja, A., Gargulinski, E., Peterson, D., Kalashnikova, O., Zhao, B., Cheng, Y., Li, F. and Chakrabarty, R.K., 2025. Thermodynamically constrained retrieval algorithm to estimate subpixel fire properties. ***Remote Sensing of Environment***, 328, 114871.(Premier journal in the field of remote sensing)
2. **Zhang, C.,** Heinson, W.R., Garay, M.J., Kalashnikova, O. and Chakrabarty, R.K., 2021. Polarimetric Sensitivity of Light-Absorbing Carbonaceous Aerosols Over Ocean: A Theoretical Assessment. ***Journal of Quantitative Spectroscopy and Radiative Transfer***, p.107759.
3. **Zhang, C.,** Heinson, W.R., Liu, P., Beeler, P., Li, Q., Jiang, J. and Chakrabarty, R.K., 2020. Three-dimensional tomography reveals distinct morphological and optical properties of soot aggregates from coal-fired residential stoves in China. ***Journal of Quantitative Spectroscopy and Radiative Transfer***, 254, p.107184.
4. Wu, J., Bei, N., Wang, Y., Su, X., Wang, L., Hu, B., Wang, Q., Jiang, Q., **Zhang, C.,** Liu, Y., Wang, R., Li, X., Lu, Y., Liu, Z., Cao, J., Tie, X., Seinfeld, J.H., Li, G., 2024. Aerosol light absorption alleviates particulate pollution during wintertime haze events. ***Proceedings of the National Academy of Sciences***
5. Wang, Y., **Zhang, C.,** Pennington, E., He, L., Yang, J., Yu, X., Liu, Y., Seinfeld, J.H., 2024. Short-lived air pollutants and climate forcers through the lens of the COVID-19 pandemic. ***Review of Geophysics***.
6. Huang, X. F., Peng, Y., Wei, J., Peng, J., Lin, X. Y., Tang, M. X., Cheng, Y., Men Z., Fang, T., Zhang, J., He, L. Y., Cao, L. M., Liu, C., **Zhang, C.,** Mao, H., Seinfeld, J. H., and Wang, Y., 2023. Microphysical complexity of black carbon particles restricts their warming potential. ***One Earth***.
7. Chakrabarty, R.K., Shetty, N.J., Thind, A.S., Beeler, P., Sumlin, B.J., **Zhang, C.,** Liu, P., Idrobo, J.C., Adachi, K., Wagner, N.L. and Schwarz, J.P., 2023. Shortwave absorption by wildfire smoke dominated by dark brown carbon. ***Nature Geoscience***.
8. Luo, J., Li, Z., **Zhang, C.,** Zhang, Q., Zhang, Y., Zhang, Y., Curci, G. and Chakrabarty, R.K., 2022. Regional impacts of black carbon morphologies on shortwave aerosol–radiation interactions: a comparative study between the US and China. ***Atmospheric Chemistry and Physics***, 22(11), pp.7647-7666.

AWARDS AND HONORS

Oct 2011, 1st Prize of Chinese Mathematical Olympiad (Rank 12 in Regional Competition)
2017 – 2022 Scholarship, McDonnell International Scholars Academy (includes full tuition scholarship, monthly living stipend, annual travel allowance, individual leadership training by Prof. Tao Ju)
2020, 2021 Travel grant (registration fee waiver for the virtual conference), AAAR 38th, 39th Annual Conference
2019 NASA travel grant award, 18th Electromagnetic and Light Scattering Conference
2017 – 2018 Fellowship, ENVIRSAN Graduate, first-year Ph.D. student fellowship

PROFESSIONAL ACTIVITIES

Session convenor and liaison: Light-Absorbing Carbon Aerosols: Observations, Models, Processes, and Impacts session, Washington, D.C., AGU 2024
Journal Referee: Remote Sensing of Environment; GIScience & Remote Sensing; Atmospheric Chemistry and Physics; Journal of Geophysical Research: Atmospheres; Journal of Advances in Modeling Earth Systems; Aerosol Science and Technology; Environmental Science and Technology; Journal of Statistical Physics; Journal of Quantitative Spectroscopy and Radiative Transfer.
Proposal-review Experience: Research Opportunities in Space and Earth Sciences 2018, 2020 (ROSES-2018, 2020), FICUS Research Proposals with ARM and EMSL, FY 2025