Jia Jiang

Postdoctoral Associate

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Department of Civil and Environmental Engineering | Massachusetts Institute of Technology

EDUCATION

Ph.D. in Chemical and Environmental Engineering, University of California, Riverside	2021
M.E. in Geological Engineering, Zhejiang University	2014
B.S. in Atmospheric Science, Zhejiang University	2011

EXPERIENCE

Postdoctoral Associate, Massachusetts Institute of Technology	Feb 2024 - Present
Postdoctoral Associate, University of California, Davis	Jan 2022 - Dec 2023
Graduate Student Researcher, University of California, Riverside	Sep 2016 - Dec 2021
Volunteer, University of California, Irvine	Oct 2015 - May 2016
Meteorologist, Taizhou Meteorological Bureau	Jul 2014 - Aug 2015
Graduate Student Researcher, Zhejiang University	Sep 2011 - Jun 2014

PROJECTS

(i) Atmospheric Chemical Mechanism Development

Framework of Chemical Assessment for Mechanism Evaluation and Optimization (CAMEO)　　　Oct 2024 - Present

- Developed the Chemical Assessment for Mechanism Evaluation and Optimization (CAMEO) framework to systematically compare atmospheric model mechanisms with laboratory data.
- Designed a unified relational database integrating chamber observations, box model outputs, and mechanistic metadata to evaluate gas- and particle-phase oxidation products.
- Implemented tools for automated species mapping, interactive visualization, and transparent performance diagnostics to identify gaps and uncertainties in current mechanisms.

Evaluation and Refinement of the CARCMM Monoterpene Mechanism　　　Feb 2024 - Present

- Led mechanism evaluation of monoterpene oxidation chemistry within the Community Regional Atmospheric Chemistry Multiphase Mechanism (CRACMM) using data from laboratory chamber studies.
- Analyzed gas- and particle-phase product distributions from mass spectrometric measurements to identify discrepancies between model predictions and experimental outcomes under varied oxidant and NO_x regimes.
- Proposed updates to reaction pathways and yields to improve CRACMM's performance in representing monoterpene contributions to ozone and SOA formation under both biogenic and wildfire emission scenarios.

Development of SAPRC Chemical Mechanisms for Wildfire Precursors　　　Jan 2017 - Present

- Developed and evaluated new gas-phase oxidation mechanisms for wildfire-relevant VOCs (e.g., furans, phenols, monoterpenes) using the SAPRC modeling system and MechGen mechanism generation framework.
- Implemented mechanisms in SAPRC box models and assessed performance against observations of VOC reactivity, NO_x level, ozone formation, and radical concentrations in chamber experiments.

Mechanistic Studies of SOA Production from Wildfire Precursors　　　Nov 2020 - Dec 2021

- Designed chamber experiments to characterize SOA yields and properties from camphene oxidation under varying NO_x conditions, and derived SOA parameterizations using both the two-product model and the volatility basis set (VBS) approach.
- Compared chamber results with simulations from SAPRC and GECKO-A box models to evaluate the chemical pathways contributing to SOA formation.
- Provided the first evidence that low NO concentrations enhance the formation of highly oxygenated organic molecules (HOMs) through peroxy radical H-shift isomerization (auto-oxidation), based on comprehensive analysis of RO_2 reaction fates.

(ii) Air Pollution Exposure Modeling

Assessing Wildfire Smoke Exposure Risks in Wine Vineyards   Jan 2022 - Present

- Led efforts to improve wildfire smoke exposure predictions by addressing key limitations in UCD/CIT chemical transport modeling (CTM) system.
- Developed an expanded wildfire VOC speciation profile (14 to 72 species) to enhance chemical resolution in UCD/CIT simulations.
- Updated chemical mechanisms for biomass burning trace gases to improve the representation of atmospheric chemistry.
- Applied a Random Forest-based data fusion framework integrating EPA regulatory monitors, PurpleAir sensors, satellite-derived aerosol optical depth (AOD), and WRF meteorological fields to reduce model bias in ground-level pollutant estimates.

Long-Term Environmental Impacts Under the Manure Management Program   Jan 2022 - Dec 2023

- Conducted regional air quality simulations using the UCD/CIT model to evaluate the long-term atmospheric impacts of widespread anaerobic digester adoption by 2050 in California's San Joaquin Valley.
- Assessed tradeoffs between reduced methane and VOC emissions and increased NO_x emissions from digester operations under future energy and climate scenarios.
- Quantified public health co-benefits and environmental justice (EJ) outcomes from GHG mitigation strategies, demonstrating that digester adoption does not exacerbate existing disparities in air pollution exposure across regions.
- Contributed findings to support GHG mitigation planning under California's CEQA framework.

(iii) Atmospheric Dynamics and Climate Risk

Assessing Urban Water Infrastructure Risk   Oct 2015 - May 2016

- Collaborated with GIS and computer science teams to develop a risk assessment framework for water system vulnerability by analyzing pipe failure data in relation to extreme weather patterns.

Genesis Study of Tropical Cyclones over the Pacific Ocean   Sep 2011 - Jun 2014

- Analyzed the structural evolution of western North Pacific tropical cyclones undergoing extratropical transition using cyclone phase space diagnostics and reanalysis datasets.
- Conducted a case study of Typhoon Fung-Wong (2008), demonstrating how vertical wind shear reduction, upper-level forcing, and low-level vorticity enhancement contributed to cyclogenesis.
- Identified the critical roles of mid-latitude baroclinic interactions and subtropical ridge evolution in modulating both the formation and transition pathways of tropical cyclones.

Orographic Influences on Mesoscale Convective Systems in Coastal Regions   Sep 2011 - Jun 2014

- Analyzed convective storm patterns across Zhejiang Province, identifying correlations between severe convection and regional topography.
- Conducted WRF simulations to assess the roles of latent heat release and terrain-induced lifting in convective initiation and organization.
- Demonstrated that coastal mountains enhance atmospheric instability and vertical motion, supporting convective development in otherwise marginal synoptic conditions.

LEADERSHIP & SERVICE

Student Mentor   2021 - Present

- Mentor graduate students in atmospheric modeling, chemical mechanisms, and research development.

Peer Reviewer   2021 - Present

- Review manuscripts for Atmospheric Chemistry and Physics and other journals in atmospheric chemistry and model development.

Teaching Assistant   2011 - 2012 & 2017 & 2019

- Led discussion sections and provided MATLAB support for the course "Engineering Modeling and Analysis", and graded assignments and exams (~100 students).
- Delivered lectures twice a week and hands-on WRF model labs for the course "Numerical Weather Forecast" (~20 students).

AWARDS & HONORS

Esther F. Hays Graduate Fellowship, Center for Environmental Research and Technology, UC Riverside	2020
Dean's Distinguished Fellowship Award, Chemical and Environmental Engineering, UC Riverside	2016
Outstanding Student Award, National Weather Forecaster Professional Training Program	2014
Scholarship for Excellence in Special Major, School of Earth Science, Zhejiang University	2010
National Talent Cultivation Scholarship, Department of Chemistry, Zhejiang University	2009

SKILLS

Atmospheric Modeling: WRF, UCD/CIT, F0AM, AERMOD

Chemical Mechanism Development: SAPRC, MechGen, CRACMM, CMAQ

Programming & Data Tools: Fortran, Python, MATLAB, SQLite, Linux, Git, BenMap

Focus Areas: Ozone, PM, Air Toxics, Wildfire Emissions, Exposure Assessment, Public Health, Environmental Justice

Language: English, Chinese/Mandarin

PUBLICATIONS

Jiang, J., Franco L., Helstrom E., Pye H., Skipper T.N., Schwantes R., Kroll J., 2025. Framework of Chemical Assessment for Mechanism Evaluation and Optimization (CAMEO): in preparation.

Jiang, J., Shahid S.B., Zhang Y. Y., Cocker III, D.R. and Barsanti, K.C., 2025. Evaluation of A New Gas-Phase Mechanism of Phenolic Compounds under Atmospheric Relevant Conditions: (in preparation).

Carter, W.P., **Jiang, J.**, Wang, Z. and Barsanti, K.C., 2025. The SAPRC Atmospheric Chemical Mechanism Generation System (MechGen). *Geoscientific Model Development*: doi.org/10.5194/egusphere-2025-1183 (under review).

Carter, W.P., **Jiang, J.**, Orlando, J.J. and Barsanti, K.C., 2025. Derivation of Atmospheric Reaction Mechanisms for Volatile Organic Compounds by the SAPRC Mechanism Generation System (MechGen). *Atmospheric Chemistry and Physics*: doi.org/10.5194/acp-25-199-2025.

Jiang, J., Li, Y., and Kleeman, M.: Air Quality and Public Health Effects of Dairy Digesters in California, *Atmos. Environ*. 2024: doi.org/10.1016/j.atmosenv.2024.120588.

Li, Q., **Jiang, J.**(co-first), Afreh, I.K., Barsanti, K.C. and Cocker III, D.R., 2022. Secondary Organic Aerosol Formation from Camphene Oxidation: Measurements and Modeling. *Atmospheric Chemistry and Physics*: doi.org/10.5194/acp-22-3131-2022.

Meehan-Atrash, J., Luo, W., McWhirter, K.J., Dennis, D.G., Sarlah, D., Jensen, R.P., Afreh, I., **Jiang, J.**, Barsanti, K.C., Ortiz, A. and Strongin, R.M., 2021. The influence of terpenes on the release of volatile organic compounds and active ingredients to cannabis vaping aerosols. RSC advances: doi.org/10.1039/D1RA00934F.

Jiang, J., Carter, W.P., Cocker III, D.R. and Barsanti, K.C., 2020. Development and Evaluation of a Detailed Mechanism for Gas-Phase Atmospheric Reactions of Furans. *ACS Earth and Space Chemistry*: doi.org/10.1021/acsearthspacechem.0c00058.

Wei, G.F., Zhu, P.J., **Jiang, J.**, and Liu, H.J., 2017, Analysis of Structure Evolution and Environmental Conditions of Tropical Cyclones Over the Western North Pacific During Extratropical Transition., *Journal of Tropical Meteorology*.: doi.org/10.16555/j.1006-8775.2017.01.002.

Jiang, J., Zhu, P.J., and Jiang, J., 2016. The Formation and Structure Evolution of Initial Disturbance of Typhoon Fung-Wong, *Journal of Tropical Meteorology*.: doi.org/10.16555/j.1006-8775.2016.01.001.

SELECTED PRESENTATIONS

Jiang, J., et al., Dec 2024, A Systematic Comparison Between Laboratory Measurements and Mechanistic Modeling of VOC Oxidation Reactions, *American Geophysical Union (AGU) 2024 Annual Meeting.*

Jiang, J., et al., Dec 2024, A Framework for Integrating Laboratory Data into Chemical Mechanism Development, *Atmospheric Chemical Mechanisms Conference 2024.*

Jiang, J., et al., Oct 2024, Modeling SOA Formation from Phenols Using an Updated Gas-Phase Mechanism and Revised SOA Parameters, *American Association for Aerosol Research (AAAR) 42nd Annual Conference.*

Jiang, J., et al., Oct 2024, A Systematic Comparison Between Laboratory Chamber Measurements and Mechanistic Predictions of Complex Oxidation Reactions, *American Association for Aerosol Research (AAAR) 42nd Annual Conference.*

Jiang, J., et al., Dec 2023, Long-Term Air Quality and Health Effects of Dairy Digesters in the Future Northern California, *International Aerosol Modeling Algorithms Conference 2023.*