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	Sep 2016 - Dec 2021
M.E. in Geological Engineering, Zhejiang University	Sep 2011 - Jun 2014
B.S. in Atmospheric Science, Zhejiang University	Sep 2007 - Jun 2011

EXPERIENCE

Postdoctoral Associate, Massachusetts Institute of Technology	Feb 2024 - Present
Postdoctoral Associate, University of California-Davis	Jan 2022 - Dec 2023
Research Assistant, 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
Research Assistant, Zhejiang University	Sep 2011 - Jun 2014

PROJECTS

(i) Wildfire Emissions, Mechanisms, and Exposure

Characterizing Wildfire Smoke Exposure Risks in Wine Vineyards (USDA-funded) Jan 2022 - Present

- Enhanced wildfire smoke exposure prediction by leading UCD/CIT chemical transport model (CTM) improvements, addressing critical gaps in biomass burning emission simulations to quantify health risks for agricultural communities and the wine sector.
- Developed an expanded wildfire speciation profile based on results from field measurements, significantly improving chemical resolution and model accuracy for wildfire emission scenarios.
- Designed and implemented a Random Forest-based data fusion framework integrating EPA regulatory monitors, low-cost air sensors, satellite-derived aerosol optical depth (AOD), and Weather Research and Forecasting (WRF) meteorological fields to produce high-resolution ground-level air pollutant exposure fields.

Evaluation and Refinement of CRACMM Mechanism for Wildfire Modeling (EPA-funded) Feb 2024 - Present

- Lead systematic evaluation of isoprene and monoterpene oxidation pathways within the CRACMM mechanism in CMAQ, working closely with EPA scientists and laboratory collaborators to improve mechanism accuracy for wildfire and biogenic emissions.
- Conduct in-depth analysis of gas- and particle-phase product distributions obtained via advanced mass spectrometric techniques to diagnose discrepancies between model predictions and observations under varying atmospheric regimes.
- Propose targeted updates to reaction pathways, kinetic parameters, and product yields, enhancing model's capacity to simulate ozone and secondary organic aerosol (SOA) formation from wildfire smoke plumes.

Mechanistic Studies of Wildfire Smoke and Secondary Pollutant Formation (EPA- & NSF-funded) Jan 2017 - Dec 2021

- Designed and conducted environmental chamber experiments to quantify SOA yields and oxidation products under a range of atmospheric conditions relevant to wildfires, generating datasets to inform mechanism development.
- Led laboratory teams and modeling groups in developing and parameterizing detailed gas-phase oxidation mechanisms for wildfire trace gases (e.g. furans, phenols, and monoterpenes) using the SAPRC framework and MechGen system.
- Implemented and validated the mechanisms in box and plume models, performing quantitative comparisons across approximately 50 chamber datasets to assess ozone formation, radical propagation pathways, and product distributions.
- Demonstrated through comprehensive mechanistic analysis to address how wildfire smoke generates highly oxygenated and toxic compounds, providing evidence that informed updates to air quality models used for wildfire smoke impact assessments.

(ii) Data Systems and Computational Frameworks

Chemical Assessment for Mechanism Evaluation and Optimization (CAMEO) (EPA-funded) Oct 2024 - Present

- Lead the development of CAMEO, a scalable framework integrating and comparing atmospheric chemical mechanisms against laboratory datasets to improve transparency and reproducibility in mechanism evaluation.
- Build Python/SQL workflows to automate experimental data QA/QC, model species mapping across mechanisms, and interactive visualization for model-measurement comparisons.
- Design and maintain a relational database containing experimental data, model outputs, and metadata covering >10,000 oxidation products from diverse wildfire precursors.

(iii) Climate Mitigation and Environmental Equity Modeling

Environmental and Health Impact Assessment of the Manure Management Program (CARB-funded) Jan 2022 - Dec 2023

- Conducted regional-scale air quality simulations using the UCD/CIT model to evaluate the atmospheric impacts of anaerobic digester adoption scenarios across California's San Joaquin Valley.
- Quantified greenhouse gas and air pollutant trade-offs under future climate and energy scenarios.
- Evaluated environmental equity and health co-benefits by calculating population-weighted pollutant concentrations, demonstrating that digester deployment would not exacerbate existing air quality disparities across Northern California.
- Delivered findings supporting GHG mitigation planning, CEQA compliance, and climate policy development.

(iv) Meteorology, Extreme Weather, and Risk Analysis

Assessing Urban Water Infrastructure Risk Oct 2015 - May 2016

- Collaborated with GIS and computer science teams to develop a risk assessment framework evaluating urban water infrastructure vulnerability to extreme weather events.
- Analyzed pipe failure datasets in relation to meteorological trends to identify high-risk zones.

Tropical Cyclone Genesis and Structure Analysis Sep 2011 - Jun 2014

- Analyzed the development of over 50 tropical cyclones in the Pacific Ocean by integrating ERA-Interim reanalysis datasets, geostationary satellite imagery (including infrared and visible channels), and cyclone best-track archives to reconstruct storm structure and intensity evolution.
- Applied cyclone phase space diagnostics to characterize spatial and temporal patterns of cyclone transition, incorporating multi-variable atmospheric fields.
- Conducted a case study of Typhoon Fung-Wong (2008) using high-resolution JRA-55 reanalysis data to derive vorticity and wind shear fields to examine conditions supporting cyclone genesis.

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

- Analyzed severe convective weather events along the east coast of China by integrating dense automatic weather station networks, Doppler radar observations, and geostationary satellite imagery (FengYun Series) to assess mesoscale structures and terrain-triggered convection.
- Applied the WRF model to simulate convective initiation and employed ingredients-based diagnostic methods to quantify the combined effects of latent heat release and complex terrain on storm development.

LEADERSHIP & SERVICE

Mentoring 2021 - Present

- Mentor graduate students in atmospheric modeling, chemical mechanism development, and research project planning.

Peer Reviewer 2021 - Present

- Review manuscripts for Atmospheric Chemistry and Physics and other journals in atmospheric chemistry, air quality modeling, and mechanism evaluation.
- Provide constructive feedback to authors and editors to advance transparent, reproducible science.

Teaching Assistant 2011 - 2012 & 2017 & 2019

- Collaborated with faculty to develop course materials and coordinate instruction.
- Led discussion sections and provided MATLAB instruction for "Engineering Modeling and Analysis," supporting ~100 students and grading assignments and exams.
- Delivered twice-weekly lectures and hands-on WRF model labs for "Numerical Weather Forecast," guiding ~20 students through applied modeling exercises.

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

Languages: English, Mandarin Chinese

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

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.*