

YICEN LIU

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EDUCATION

University of Illinois Urbana-Champaign | Ph.D. | Environmental Engineering | GPA: 3.94/4 09/2021-12/2025

- Concentration in Computer Science and Engineering
- Core courses:
 - * **Environmental Engineering:** Water Quality Engineering & Control, Env Eng Principles-Chemical/Physical/Biological, Air Pollution Control, Aerosol Sampling and Analysis, Public Health Engineering, etc.
 - * **Climate & Atmospheric Science:** Physical Meteorology, Numerical Fluid Dynamics, Aerosol Phys. and Chem., Boundary Layer Processes, etc.
 - * **Computer Science & Engineering:** Statistics & Probability, Parallel Programming, Numerical Fluid Dynamics, Scientific Visualization, etc.

University of Illinois Urbana-Champaign | M.S. | Environmental Engineering 09/2020-05/2021

Tongji University (China) | B.S. | Environmental Science 09/2016-05/2020

SKILLS

[1] **Programming:** Python (Numpy, Scipy, Pandas, Matplotlib, Plotly, Seaborn, etc.), Fortran, R, C/C++, C#, MATLAB, Julia

[2] **Modeling:** WRF, PartMC, MOSAIC, CAMP, AERMOD, E-AIM, BioWin, Vminteq

[3] **Tools:** Git/GitHub, Linux, Bash/Shell, HTML/CSS, LaTeX

RESEARCH THEMES

Advancing the understanding of aerosol formation and growth by integrating novel mechanisms into aerosol models.

- Environmental Engineering and Science
- Atmospheric and Climate Science
- Computational Science and Engineering
- Data Science

PUBLICATIONS

<https://yicenl2.github.io/publications/>

RESEARCH EXPERIENCE

Research Assistant 2020-Present

Quantifying the impact of aerosol mixing state on heterogeneous N_2O_5 hydrolysis

- Developed and optimized algorithms to compute the reaction probability of N_2O_5 ($\gamma_{\text{N}_2\text{O}_5}$) within the particle-resolved modeling framework (PartMC-MOSAIC); improved the model to allow users to select parameterization method for $\gamma_{\text{N}_2\text{O}_5}$.
- Designed scenario libraries for systematic assessment of errors introduced by using simplified aerosol representations in climate/air quality models; leveraged parallel simulations with MPI to run over 10,000 scenarios and analyzed the results using Python and scientific computing tools.
- Proposed a new parameter to assist the analysis on the impact of aerosol mixing state on heterogeneous N_2O_5 hydrolysis; performed sensitivity analysis to investigate its impact on the prediction of ambient gas/aerosol species.

Modeling the seed-dependent particle growth with a newly developed multiphase chemistry model

- Compared and identified potential mechanisms for seed-dependent growth of secondary organic aerosols by solving differential equations in Python; integrated the selected mechanism into the PartMC-CAMP modeling framework.

- Optimized model parameters via a data-driven approach; utilized Scipy package in an iterative process involving online simulations and adjustments based on experimental data.

Regional-scale heterogeneous and multiphase chemistry simulations with high-detailed particle compositions

- Configured the WRF domain for the TRACER-AQ campaign in Huston, TX; used field observational data to calibrate and optimize model configurations.
- Integrated WRF-PartMC with CAMP to construct a framework for simulating heterogeneous and multiphase chemistry on a regional scale.

CEE REU Program

Analyzing atmospheric particle composition with instruments

2019-2020

- Tested the chemical composition of aerosol samples; measured the concentrations of inorganic ions (e.g., ammonium) using spectrophotometer and OC/BC content using a thermal/optical transmittance (TOT) analyzer.
- Investigated the spatial-temporal distribution of atmospheric particles in the Midwest US.

Shanghai Undergraduate Innovation Program

2018-2019

The exploration of Hormesis of commercial personal care products on *Vibrio qinghaiensis* sp. -Q67

- Conducted toxicity tests on 23 commercial personal care products to assess their toxic effect on aquatic microorganisms.
- Designed and implemented controlled experiments to study dose-response relationships.

TEACHING EXPERIENCE

Radiative Transfer-Remote Sens (ATMS 304)

01/2022-05/2022

- Spring 2022 List of Teachers Ranked as Excellent by Their Students.

WORKING EXPERIENCE

Urban Planning and Design, Kunshan, Jiangsu

2019

- Conducted a field survey to point out issues in urban water supply and sewage treatment.
- Tested water quality of effluents from industries, communities, and retail stores.
- Collaborated in a technical assistance project to provide suggestions on pipeline network design to ensure water supply safety.

PROJECTS

Optimizing the forward-pass of a convolutional layer using CUDA | Course Project

2023

- Analyzed and fine-tuned CUDA kernels to enhance performance in convolutional layers.
- Utilized profiling tools such as Nsight Systems (nsys) and Nsight-Compute (nv-nsight-cu) to identify bottlenecks and execution efficiency.

Parallel programming to accelerate 2D numerical advection of passive scalar | Course Project

2022

- Computed rotational flow (counter-clockwise) in a 2D $n \times n$ domain using Lax-Wendroff scheme via directional splitting.
- Developed an algorithm using MPI for distributed memory parallelism, and OpenMP for multithreading.
- Evaluate the performance and speedup; optimized the implementation to maximize computational efficiency.

Evaluation and assessment of SO₂ emissions from the Gibson Power Plant | Course Project

2022

- Evaluated the current operational practices of the Gibson Power Plant to identify areas for improvement.
- Modeled SO₂ emissions using AERMOD to predict air quality impacts and assess regulatory compliance.
- Developed code to calculate evaluation statistics and generate visualizations for data analysis.

SELECTED AWARDS & HONORS

[1] **Schlesinger Travel Grant**, UIUC, IL, 2023

[2] **40th Annual Aerosol Conference Student Travel Grant**, Raleigh, NC, 2022

[3] **Fall 2021 Conference Presentation Awards**, UIUC, IL, 2021

[4] **Outstanding Talk in Air Connect 3-min talk (3MT)**, UIUC, IL, 2021