Yicen Liu

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EDUCATION

Ph.D. | University of Illinois Urbana-Champaign | Environmental Engineering | GPA: 3.94/4 Expected May 2026

- Concentration in Computer Science and Engineering
- Related coursework: Statistics & Probability, Parallel Programming, Numerical Fluid Dynamics, Scientific Visualization, etc.

M.S. | University of Illinois Urbana-Champaign | Environmental Engineering May 2021

B.S. | Tongji University (China) | Environmental Science May 2020

Skills

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

[2] **Tools**: Git/GitHub, Linux, Bash/Shell, HTML/CSS, LaTex

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 (γ_{N2O5}) within the particle-resolved modeling framework (PartMC-MOSAIC); improved the model to allow users to select parameterization method for γ_{N2O5}.
- 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.

Projects

Optimizing the forward-pass of a convolutional layer using CUDA | Course Project 2023

- Analyzed and fine-tunned 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×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.