

Xiaohan (Sally) Li, Ph.D.

Atmospheric and Oceanic Sciences Program, Princeton University/
Geophysical Fluid Dynamics Laboratory (GFDL), NOAA

Email: xiaohanl@princeton.edu

[Personal Webpage](#) | [Google Scholar](#) | [ResearchGate](#)

Education

- Ph.D. in Civil and Environmental Engineering, Princeton University 2018-2023
– **Advisor:** [Ian C. Bourg](#)
- B.S. in Energy and Resources Engineering, Peking University, China 2014-2018
– **Research Advisor:** [Dongxiao Zhang](#); [Wei Kang](#)
- B.S. in Economics, Peking University, China 2015-2018

Academic Appointment & Experience

- CIMES Postdoc Research Associate, Princeton University/NOAA GFDL 2023-present
– **Host:** [Paul Ginoux](#)
- Visiting Scholar, Texas A&M University 2023
– **Host:** [Yue Zhang](#)

Honors & Awards

- C. Ellen Gonter Award, American Chemical Society 2023
- CEE Departmental Travel Award, Princeton University 2022
- SEAS Travel Grants, Princeton University 2022
- Walbridge Fund Graduate Award for Environmental Research 2021
- Merit Student, Peking University 2014-2018 (4 times)
- National Encouragement Scholarship, China 2014-2018 (4 times)
- Cyrus Tang Scholarship, China 2014-2018 (4 times)
- Meritorious Winner, International Mathematical Contest in Modeling, COMAP 2016
- 2nd Prize in National College Students Physics Competition, China 2015

Publications

Published

1. **Li, X.**, Bourg I.C. Hygroscopic growth of adsorbed water films on smectite clay particles. *Environmental Science & Technology*, **58**, 2, 1109–1118 (2024).
2. **Li, X.** Water, salt, organics, and minerals: improved understanding of aerosol microphysics from a nanoscale basis. *Princeton University* (2023).
3. **Li, X.**, Bourg I.C. Phase State, surface tension, water activity, and accommodation coefficient of water–organic clusters near the critical size for atmospheric new particle formation. *Environmental Science & Technology*, **57**, 13092–13103 (2023).
4. **Li, X.**, Bourg I.C. Microphysics of liquid water in sub-10 nm ultrafine aerosol particles. *Atmospheric Chemistry and Physics*, **23**, 2525–2556 (2023).
5. Wu Y., Li P., Yan B., **Li, X.**, Huang Y., Yuan J., Feng X., Dai C. A Salt-Induced Tackifying Polymer for Enhancing Oil Recovery in High-Salt Reservoirs: Synthesis, Evaluation, and Mechanism. *Green Energy & Environment*, *in press* (2023).
6. Zhou S., Zhang D., Wang H., **Li, X.** A modified BET equation to investigate supercritical methane adsorption mechanisms in shale. *Marine and Petroleum Geology*, **105**, 284–292 (2019).

Teaching/Mentoring Experience

Teaching Assistant

- CEE207: “Intro to Environmental Engineering”, Princeton University 2020

Undergraduate Research Advising

- Yuno Iwasaki, Physics, Class of 2023
- George Dickinson, Civil and Environmental Engineering, Class 2023
- Benjamin Henry, Civil and Environmental Engineering, Class 2022

Service and Outreach

- **Journal Reviewer:** Journal of the American Chemical Society (JACS), ACS Omega
- **Committee:** AOS Diversity, Equity, and Inclusion (DEI) Committee, Princeton University. 2024
- **Organizer:** Environmental Certificate Colloquium, High Meadow Environmental Institute, Princeton University. 2021–2022
- **Co-Chair:** AGU Fall Meeting, Session A35N: Molecular-Scale Characterization of Atmospheric Aerosol Using Simulations and Experiments. 2021
- **Organizer:** EEWR Brown Bag Seminar, Civil and Environmental Engineering, Princeton University. 2020–2021

Skills

Computational Skills

- Climate modeling
- MD simulations and DFT: LAMMPS, Gromacs, Quantum Espresso
- Computational fluid dynamics: OpenFOAM
- Machine learning and finite element analysis programming: Python, Matlab, C++/C

Experimental Skills

- Pore structure characterization of minerals: mercury intrusion porosimeters, advanced micropore size and chemisorption analyzer
- High pressure gas and sub-critical fluid sorption measurement: rubotherm gravimetric adsorption instruments

Presentations

1. **Li, X.**, Bourg I.C. Hygroscopic growth of adsorbed water films on smectite clay particles. ACS Spring Meeting, New Orleans, March, 2024 (Oral).
2. **Li, X.** Water, salt, and organics in nano-aerosol particles: improved understanding of aerosol microphysics from molecular basis. University of Washington in St. Louis, Missouri, April 2023 (Oral).
3. **Li, X.**, Bourg I.C. How does water contribute to new particle formation? ACS Spring Meeting, Indianapolis, March 2023 (Oral).
4. **Li, X.** Aerosol microphysics from molecular understanding to improved representation in climate models. Geophysical Fluid Dynamics Laboratory, NOAA, Princeton, February 2023 (Oral).
5. **Li, X.**, Bourg I.C. Molecular dynamics simulations of the microphysics of liquid water in nano-aerosol droplets. AAAR 40th Annual Conference, Raleigh, October 2022 (Oral).
6. **Li, X.**, Bourg I.C. Molecular dynamics simulations of the effect of surface charge density and oxidation degree on the colloidal stability of graphene oxide. Goldschmidt, Honolulu, July 2022 (Poster).
7. **Li, X.**, Bourg I.C. Molecular dynamics simulations of water, salt, and organics in nano-aerosol particles. ACS Spring Meeting, San Diego, March 2022 (Oral).
8. **Li, X.**, Bourg I.C. Molecular dynamics simulations of liquid water microphysics in nano-aerosol droplets. AGU Fall Meeting, New Orleans, December 2021 (Poster).
9. **Li, X.**, Bourg I.C. Molecular dynamics (MD) simulation of the microphysics of liquid water in aerosol particles. SMatCh Seminar, Princeton University, November 2021 (Oral).

10. **Li, X.**, Bourg I.C. Phase-mixing states in secondary organic aerosol: key to water cloud condensation and optical insights. EEWR Brown Bag Seminar, Princeton University, December 2019 (Oral).
11. **Li, X.**, Bourg I.C. How secondary organic aerosol affects precipitation and radiative forcing. AGU Fall Meeting, San Francisco, December 2019 (Poster).

Research Experience

Sahel Drought and Climate Internal Variability

Advisor: Paul Ginoux, NOAA GFDL 2023/09-Present

- Characterizing the impact of multidecadal climatic variability on the dust emission activity and drought index in Sahel region using GFDL earth system model ESM4.1.

Aerosol Microphysics in Climate Models

Advisor: Paul Ginoux and Fabien Paulot, NOAA GFDL 2023/09-Present

- Implementing a two-moment aerosol microphysics scheme in GFDL climate model.

Ice Nucleation of Organic Aerosols

Collaborator: Prof. Yue Zhang, Texas A&M Univeristy 2023/01-2023/08

- Developed parameterization of the ice nucleation ability of organic aerosols as a function of their phase state.

Water Films on Smectite Clay

Advisor: Prof. Ian Bourg, Princeton University 2022/09-2023/05

- Investigated water film disjoining pressure on smectite clay across varying salinities and counterions.
- Analyzed hygroscopic growth patterns of diverse dust particles.

Atmospheric New Particle Formation

Advisor: Prof. Ian Bourg, Princeton University 2022/03-2022/08

- Conducted MD simulations on water-organic clusters (1-4 nm) to study phase-mixing states and water uptake dynamics.
- Reconciled discrepancies between experimental measurements and MD simulations using modified classical theories.

Black Carbon Aggregation in Aerosol Droplets

Advisor: Prof. Ian Bourg, Princeton University 2021/10-2022/06

- Examined black carbon particle phase-mixing in aerosol droplets using MD simulations.
- Developed a morphology phase diagram for black carbon particles using the SVM method.

Microphysics of Liquid Water in Ultrafine Aerosol Particles

Advisor: Prof. Ian Bourg, Princeton University

2018/09-2021/10

- Investigated thermodynamic and kinetic properties of sub-10 nm droplets with varying NaCl concentrations and sizes.
- Explored deviations of Kelvin and Köhler theory predictions at nanoscale due to salinity and organic coatings.

Methane Adsorption Mechanisms in Shale

Advisor: Prof. Dongxiao Zhang, Peking University

2017/03-2018/06

- Proposed a modified BET equation for high-pressure multi-layer methane adsorption.
- Characterized shale storage capacity for CH₄ through high-pressure adsorption experiments.

Water Sensitivity and Mechanical Properties of Sedimentary Rocks

Advisor: Prof. Dongxiao Zhang, Peking University

2016/12-2017/06

- Developed an anisotropy-inclusive multi-scale effective stress formulation.
- Conducted microcantilever beam loading tests under ESEM conditions.

Pore Structure Characterization of Sedimentary Rocks

Advisor: Prof. Dongxiao Zhang, Peking University

2015/05-2017/10

- Introduced a complex-pore-characterization model for shale to mitigate tension strength effects.
- Performed mercury intrusion and low-pressure N₂ and CO₂-adsorption experiments on terrestrial and oil shale samples.