Sidian Chen

Postdoctoral Associate
Energy Science & Engineering
Stanford University

sidianc@stanford.edu
+1 (520) 369-9240
Google Scholar
Research Website

PROFESSIONAL POSITIONS

2024/1 – present **Postdoc, Stanford University** Advisor: Prof. Hamdi Tchelepi
2023/8 – 2024/1 **Postdoc, University of Arizona** Advisor: Dr. Bo Guo
2022/1 – 2022/6 **Visiting Graduate Student, University of Stuttgart** Host: Prof. Rainer Helmig

EDUCATION

2018/8 – 2023/8 **Ph.D., University of Arizona** Hydrology (major), Applied Math (minor)
Dissertation: *Nonequilibrium Phenomena in Multiphase Flow, Transport, and Phase Change in Porous Media: Pore-Level Physics, Network Modeling, and Upscaling.*

2015/8 – 2018/8 **M.S., Peking University** Environmental Science

2011/9 – 2015/7 **B.S., Tsinghua University** Hydraulic and Hydropower Engineering

HONORS AND AWARDS

2023 Outstanding Oral Presentation Award (1st place), Department of Hydrology & Atmospheric Sciences, University of Arizona.

2021, 2022 Outstanding Oral Presentation Award, Department of Hydrology & Atmospheric Sciences, University of Arizona.

2020, 2021, 2022 John W. Harshbarger Memorial Scholarship, Department of Hydrology & Atmospheric Sciences, University of Arizona.

2022 Outstanding Graduate Student in Research, College of Science, University of Arizona.

2021 Galileo Circle Scholarship, College of Science, University of Arizona.

Outstanding Oral Award at EarthWeek Talk, Earth & Environmental Sciences School, University of Arizona.

2020 Outstanding Student Presentation Award, American Geophysical Union (AGU).

Best Virtual Poster Award, Department of Hydrology & Atmospheric Sciences, University of Arizona.

2019 Travel Grant for AGU Annual Meeting, Graduate and Professional Student Council, University of Arizona.

Shlomo and Yael Neuman Scholarship (Premier departmental award), Department of Hydrology & Atmospheric Sciences, University of Arizona.

RESEARCH INTERESTS

My research focuses on developing innovative conceptual and computational models across length and time scales to understand and quantify fluid flow and reactive solute transport through porous media. The goal is to address challenges in the following environmental and energy applications:

1. Fate, transport, and remediation of per- and polyfluoroalkyl substances (PFAS) in soils and groundwater;
2. Mass and heat exchange between soils and atmosphere near the land surface;
3. Energy storage in natural and engineered porous media (e.g., shale rocks and carbonaceous materials).

PUBLICATIONS

Published

1. **S. Chen**, S. Catalina, W. Chueh*, H. Tchelepi*, "Mathematical modeling and experimental investigations of reactive and charge–discharge mechanisms in aqueous batteries," *Journal of The Electrochemical Society*, 2026.
2. **S. Chen***, B. Guo, T. Zheng, "Coupled two-phase flow and surfactant/PFAS transport in porous media with angular pores: From pore-scale physics to Darcy-scale modeling," *Advances in Water Resources*, p. 105 222, 2026.
3. **S. Chen**, B. Guo*, "Semi-analytical solutions for nonequilibrium transport and transformation of PFAS and other solutes in heterogeneous vadose zones with structured porous media," *Advances in Water Resources*, p. 105 099, 2025.
4. **S. Chen**, B. Guo*, "Pore-scale modeling of PFAS transport in water-unsaturated porous media: Air–water interfacial adsorption and mass-transfer processes in thin water films," *Water Resources Research*, 2023, e2023WR034664.
5. C. Qin*, X. Wang, M. Hefny, J. Zhao, **S. Chen**, B. Guo, "Wetting dynamics of spontaneous imbibition in porous media: From pore scale to Darcy scale," *Geophysical Research Letters*, 2022, e2021GL097269.
6. **S. Chen**, J. Jiang, B. Guo*, "A pore-network-based upscaling framework for the nanoconfined phase behavior in shale rocks," *Chemical Engineering Journal*, vol. 417, p. 129 210, 2021.
7. **S. Chen**, C. Qin, B. Guo*, "Fully implicit dynamic pore-network modeling of two-phase flow and phase change in porous media," *Water Resources Research*, vol. 56, no. 11, e2020WR028510, 2020.
8. **S. Chen**, H. Qin*, Y. Zheng, G. Fu, "Modeling the overflow from sewage interception systems in a rapidly urbanizing catchment," *Journal of Environmental Management*, vol. 233, pp. 748–756, 2019.

In Review

1. S. Murphy, N. Leuenberger, **S. Chen**, E. Crooks, M. S. Jung, H. Tchelepi*, X. Ji*, "Nanoporous carbon coating of separator boosts rate capability of cathodes in lithium-ion batteries," *Advanced Materials*.

OPEN SOURCE SOFTWARE

1. **S. Chen**, B. Guo*, *Source code for "Semi-analytical solutions for nonequilibrium transport and transformation of PFAS and other solutes in heterogeneous vadose zones with structured porous media"*, version v0.0-beta, 2025. URL: https://github.com/GuoSFPLab/SemiAnalyticalSoln-PFAS-HeteroVZ.

TALKS AND PRESENTATIONS

Invited Talks

2026 *Department of Civil and Environmental Engineering*, Texas A&M University.

2025 *MS06-A: Physics of multiphase flow in diverse porous media*, International Society for Porous Media (InterPore) Annual Meeting.

2024 *Department of Land, Air, and Water Resources*, University of California, Davis.

Institute of Hydromechanics and Water Resources Modeling, University of Stuttgart.

Department of Civil, Construction, and Environmental Engineering, Iowa State University.

2020 *Institute of Hydromechanics and Water Resources Modeling*, University of Stuttgart.

Conference Presentations

2025
- **[ECS]** *A mathematical model for simulating the charge-discharge performance of aqueous batteries,* Electrochemical Society (ECS) Biannual Meeting.
- **[InterPore]** *Semi-analytical solutions for nonequilibrium PFAS transport in heterogeneous vadose zones,* International Society for Porous Media (InterPore) Annual Meeting.
- **[InterPore]** *Nonequilibrium multiphase flow and thermodynamic phase change in nanoporous shale rocks: Pore-level physics, network modeling, upscaling* (**Invited**), International Society for Porous Media (InterPore) Annual Meeting.

2024
- **[AGU]** *Semi-analytical solutions for nonequilibrium transport of PFAS (PFAAs and precursors) in heterogeneous vadose zones,* American Geophysical Union (AGU) Annual Meeting.
- **[CMWR]** *Impact of thin water films on mass and heat transfer in porous media and at free flow–porous media interface,* International Conference on Computational Methods in Water Resources (CMWR).

2023
- **[AGU]** *Pore-scale modeling of PFAS transport in water-unsaturated soils: Impact of mass-transfer processes in thin water films,* American Geophysical Union (AGU) Annual Meeting.
- **[InterPore]** *Pore-scale modeling of PFAS transport in water-unsaturated soils: Impact of nonequilibrium mass-transfer processes in thin water films,* International Society for Porous Media (InterPore) Annual Meeting.

2022
- **[AGU]** *Coupled free-flow/pore-network modeling of nonequilibrium nonisothermal evaporation in soils at the land surface: Impact of water film flow and mass and heat transfer across air–water interfaces,* American Geophysical Union (AGU) Annual Meeting.
- **[CMWR]** *A fully-implicit dynamic pore-network modeling framework for two-phase flow and phase change in porous media,* International Conference on Computational Methods in Water Resources (CMWR).
- **[InterPore]** *Dynamic pore-network modeling of compositional flow and nanoconfined phase behavior in shale rocks,* International Society for Porous Media (InterPore) Annual Meeting.
- **[PFAS-Σ-IT]** *Long-term retention and leaching of PFAS in the vadose zone: Controlling processes, mathematical formulation, and practical modeling approaches,* PFAS-Σ-IT International PFAS Summit, University of Tübingen.

2021
- **[AGU]** *Dynamic pore-network modeling of compositional flow and nanoconfined phase behavior in shale rocks,* American Geophysical Union (AGU) Annual Meeting.
- **[AGU]** *Modeling multiphase flow, multispecies transport, and phase change in nanoporous media,* American Geophysical Union (AGU) Annual Meeting.
- **[InterPore]** *Dynamic pore-network modeling of coupled compositional flow and phase change dynamics in porous media,* International Society for Porous Media (InterPore) Annual Meeting.
- **[URTec]** *Effect of pore geometry and heterogeneous surface wettability on the nanoconfined phase behavior in nanopore networks of shale rocks,* Unconventional Resources Technology (URTec) Conference.

2020
- **[AGU]** *Modeling the thermodynamic phase behavior of hydrocarbon mixtures in nanopores,* American Geophysical Union (AGU) Annual Meeting.
- **[GSA]** *Modeling the thermodynamic phase behavior of hydrocarbon mixtures in nanopores,* Geological Society of America (GSA) Annual Meeting.
- **[InterPore]** *Fully-implicit dynamic pore-network modeling of two-phase flow in porous media,* International Society for Porous Media (InterPore) Annual Meeting.

2019
- **[AGU]** *Dynamic pore-network modeling of gas-condensate flow and nanoconfined phase behavior in liquid-rich shale formations,* American Geophysical Union (AGU) Annual Meeting.
- **[GSA]** *Pore-network modeling of the compositional flow and phase behavior of hydrocarbons in liquid-rich shale formations,* Geological Society of America (GSA) Annual Meeting.

TEACHING AND MENTORING

Teaching (University of Arizona)

2023
- *Co-instructor*, HWRS 405/505: Vadose Zone Hydrology
- *Teaching assistant*, HWRS 404/504: Numerical Methods for Environmental Transport Problems
- *Invited lecture*, HWRS 404/504: Numerical Methods for Environmental Transport Problems.

2022
- *Teaching assistant*, HWRS 405/505: Vadose Zone Hydrology
- *Invited lecture*, HWRS 405/505: Vadose Zone Hydrology

2020
- *Teaching assistant*, HWRS 170a: Earth: Our Watery Home

2019
- *Teaching assistant*, HWRS 428/528: Systems Approach to Hydrological Modeling

Mentees

- *Shujie Guo*, PhD student, University of Arizona
- *Niklaus Leuenberger*, PhD student, Stanford University

REVIEW SERVICE

Journal Reviewer

- ACS Environmental Science & Technology Water
- ACS Omega
- Advances in Water Resources
- Chemical Engineering Science
- Computational Geosciences
- Earth Energy Science
- Earth-Science Reviews
- Geoenergy Science and Engineering
- Geophysical Research Letters
- Hydrology and Earth System Sciences
- International Journal of Heat and Mass Transfer
- Journal of Computational Physics
- Journal of Fluid Mechanics
- Journal of Hydrology
- Journal of Petroleum Science and Engineering
- Lab on a Chip
- Transport in Porous Media
- Vadose Zone Journal
- Water Resources Research

Conference Presentation Reviewer

- *Outstanding Student Presentation Awards*, American Geophysical Union (AGU).

Grant Reviewer

- *Student Travel & Research Grants*, Graduate & Professional Student Council, University of Arizona.

PROFESSIONAL SERVICE

Committee member

2023 – present
- *Groundwater Technical Committee*, American Geophysical Union (AGU)

2021 – present — *Membership Committee*, International Society for Porous Media (InterPore)

2024 — *Management Committee*, International Conference on Computational Methods in Water Resources (CMWR)

2022–2023 — *Hydrology Section Student Subcommittee*, American Geophysical Union (AGU)

2021–2022 — *Organizing Committee*, El Día del Agua y la Atmósfera (The Day of Water and the Atmosphere) Student Research Symposium, University of Arizona

Conference Session Organizer

2024–2026 — *Interfacial Phenomena Across Scales*, International Society for Porous Media (InterPore) Annual Meeting

Advances in Imaging and Characterization of Porous Media, International Society for Porous Media (InterPore) Annual Meeting

2024, 2026 — *Pore-scale Flow, Transport, & Geomechanics*, Biennial International Conference on Computational Methods in Water Resources (CMWR)

Conference Session Chair

2025 — *Advances in Imaging Porous Media*, International Society for Porous Media (InterPore) Annual Meeting

Interfacial Phenomena Across Scales, International Society for Porous Media (InterPore) Annual Meeting

Physics of Multiphase Flow in Diverse Porous Media, International Society for Porous Media (InterPore) Annual Meeting

2023 — *Coastal Hydrology & Submarine Groundwater Discharge*, American Geophysical Union (AGU) Annual Meeting

2021, 2023 — *Pore-Scale Physics*, American Geophysical Union (AGU) Annual Meeting

PROFESSIONAL SOCIETIES

- American Geophysical Union (AGU)
- European Geosciences Union (EGU)
- Geological Society of America (GSA)
- International Society for Porous Media (InterPore)