

NEELARUN MUKHERJEE

Department of Earth and Planetary Sciences, Jackson School of Geosciences, University of Texas at Austin
✉ neelarun@utexas.edu 📞 +1 (737) 733-1803 🌐 neelarunmukherjee.github.io 📱 /neelarunmukherjee

RESEARCH INTERESTS

Flow and Reactive Transport, Computational Fluid Dynamics, Cold-regions Hydrology

EDUCATION

- | | | |
|----------------|-------------------------------|--|
| 2021 – Present | Ph.D. Candidate,
Hydrology | University of Texas at Austin
<i>Dissertation Topic:</i> Flow and transport processes in supra-permafrost aquifers in the Arctic
<i>Committee:</i> Dr. M. Bayani Cardenas, Dr. Jingyi Chen, Dr. Daniel O. Breecker, Dr. George W. Kling, Dr. Ethan T. Coon, Dr. Pin Shuai |
| 2016 – 2021 | M.S. and B.S.,
Geophysics | Indian Institute of Technology (IIT), Kharagpur
Specialization in Fluid Mechanics and Microfluidics
<i>Thesis:</i> Numerical modeling of seawater intrusion considering diurnal head changes of seawater and matrix compression and rebound.
<i>Advisors:</i> Dr. Abhijit Mukherjee, Dr. Aditya Bandopadhyay |

ACADEMIC EXPERIENCES

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|----------------------------|--------------------------------|---|
| Summer, 2026
Aug 2025 | Graduate Intern | Oak Ridge National Laboratory Oak Ridge, TN, USA
Mentor: Dr. Scott L. Painter
<i>Flow and Reactive Transport in Supra-permafrost Aquifers</i>
Integrated a 14-reaction biogeochemical network using PFLOTTRAN into the ATS thermal-hydrologic model across freeze-thaw transitions. |
| Fall 2020 | UARE Fellow | University of Alberta Alberta, Edmonton, Canada
Advisor: Dr. Peichun Amy Tsai
<i>Low-Capillary-Number Microfluidic Emulsions</i>
Investigated low-Capillary-number Taylor flows of CO ₂ emulsions in microchannels using high-resolution pore scale simulations. |
| Summer 2020 | Intern | Sorbonne Université Paris, France
Advisor: Dr. Damien Jougnot
<i>Rayleigh Taylor Instabilities in porous media with geoelectrics</i>
Developed a coupled flow, transport and geoelectric solver in OpenFOAM for Rayleigh-Taylor instabilities. |
| Summer 2019 | Charpak Intern | Université de Rennes Rennes, France
Advisor: Dr. Yves Meheust
<i>Numerical simulations and Experimental study of CO₂ sequestration in deep aquifers</i>
Developed an OpenFOAM solver for Rayleigh Taylor instability of miscible fluids in porous media |
| 2018 – 2019 | Research Assistant | IIT Kharagpur Kharagpur, WB, India
Advisor: Dr. Saibal Gupta
<i>Thermal Transport in Connected Aquifers</i>
Modeling mineral mixing rates from transport of a radiogenic heat source using a coupled groundwater flow and heat transport model. |
| 2019 – 2020
2017 – 2019 | Team Mentor,
Subsystem Lead | TeamKART Motorsports Kharagpur, WB, India
PI: Dr. A.R. Mohanty, Dr. C.S. Kumar, Dr. S.K. Panda
<i>Design of Vehicle Dynamics for Formula SAE</i>
Suspension and aero design for FSAE cars K4 (2019) and K5 (2020), securing P6 and P10, Formula Bharat |

TECHNICAL SKILLS

Languages: Python, MATLAB, Julia, C++, C, Shell, \LaTeX

Open-source Numerical Codes: Amanzi-ATS, PFLOTRAN, OpenFOAM, Basilisk (Gerris)

Other Software: COMSOL, SolidWorks, Fluent, ArcGIS, ParaView, VisIt, FreeCAD, Affinity Designer

Lab/Field Equipment: Levelloggers, Total Stations, Benchtop KSAT, Hyprop, Chemetrics, ABEM Terrameter

PEER-REVIEWED PUBLICATIONS

- [4] Mukherjee, N., Gao, B., Shuai, P., Coon, E. T., Hill, D., Neilson, B. T., Kling, G. W., and Cardenas, M. B. *The effects of extreme weather variability on supra-permafrost hydrology: Flashy hillslopes with more outflow* (Submitted, Under Review). Preprint: <https://doi.org/10.22541/essoar.15004629/v1>
- [3] Mukherjee, N., Gao, B., Shuai, P., Coon, E. T., Hill, D., Chen, J., Neilson, B. T., Kling, G. W., and Cardenas, M. B. *Seasonal to decadal changes in supra-permafrost soil and aquifer thermal hydrology: broader, deeper, and longer activity*. (Submitted, Under Review). Preprint: <https://doi.org/10.48550/arXiv.2512.19860>
- [2] Mukherjee, N., Chen, J., Neilson, B. T., Kling, G. W., and Cardenas, M. B. (2024). *Water and carbon fluxes from a supra-permafrost aquifer to a stream across hydrologic states*. *Journal of Hydrology*, 645, 132285. <https://doi.org/10.1016/j.jhydrol.2024.132285>
- [1] Virappane, S., Azadi, R., Mukherjee, N., and Tsai, P. A. (2024). *Three-dimensional simulations of two-phase plug flow in a microfluidic channel*. *Physics of Fluids*, 36(10). *Editors' Choice*. <https://doi.org/10.1063/5.0220101>

MANUSCRIPTS UNDER PREPARATION

- [1] Mukherjee, N., Gao, B., Painter, S., Shuai, P., Coon, E. T., Painter, S., Neilson, B. T., Cory, R. M., Kling, G. W., and Cardenas, M. B. *Fate of soil carbon in supra-permafrost aquifers after 40 years of warming*.

CONFERENCE PROCEEDINGS

- [17] Mukherjee, N.^{*}, Gao, B., Shuai, P., Coon, E., Hill, D., Neilson, B. T., Cory, R. M., Kling, G. W., Chen, J., and Cardenas, M. B. (2025). *The Effects of Weather Variability on Supra-Permafrost Thermal Hydrology*. AGU Fall Meeting C32B-05, New Orleans.
- [16] Mukherjee, N.[†], Gao, B., Shuai, P., Coon, E., Hill, D., Neilson, B. T., Cory, R. M., Kling, G. W., Chen, J., and Cardenas, M. B. (2025). *Arctic Active Layers are Staying Unfrozen: 40 years of Thermal-Hydrologic Change* AGU Fall Meeting B51M-0759, New Orleans.
- [15] Hill, D.[†], Mukherjee, N., Cardenas, M. B., Gao, B., Shuai, P., Coon, E., Cory, R. M., Kling, G. W., and Neilson, B. T. (2025). *Hydrologic Observations Across the Hillslope-to-River Corridor of an Arctic Tundra Watershed*. AGU Fall Meeting, New Orleans.
- [14] Mukherjee, N.^{*}, Gao, B., Shuai, P., Coon, E., Hill, D., Neilson, B. T., Cory, R. M., Kling, G. W., Chen, J., and Cardenas, M. B. (2025). *Using a fully calibrated and validated model to unravel hidden unfrozen layers inside a frozen ground due to warming winters*. [Invited Talk]. ATS Short Course, Knoxville, Tennessee
- [13] Mukherjee, N.[†], Gao, B., Shuai, P., Coon, E., Hill, D., Neilson, B. T., Cory, R. M., Kling, G. W., Chen, J., and Cardenas, M. B. (2025). *Impacts of changing hydrologic conditions on groundwater flow and reactive solute transport in supra-permafrost aquifers* Department of Energy: Earth System Sciences PI Meeting, Reston, Virginia.
- [12] Hill, D.[†], Mukherjee, N., Neilson, B. T., Shuai, P., Cory, R. M., Kling, G. W., Gao, B., Coon, E., and Cardenas, M. B. (2025). *Hydrologic Observations Across the Hillslope-to-River Corridor of an Arctic Tundra Watershed* Department of Energy: Earth System Sciences PI Meeting, Reston, Virginia.

- [11] Cardenas, M. B., Mukherjee, N.[†], Hill, D.[†], Neilson, B. T.[†], Shuai, P., Cory, R. M., Kling, G. W.[†], Gao, B., Coon, E. (2025). *Advancing Understanding of Flow and Reactive Transport Processes Across the Hillslope-to-River Corridor of Arctic Watersheds* Department of Energy: Earth System Sciences PI Meeting, Reston, Virginia.
- [10] Mukherjee, N.^{*}, Shuai, P., Gao, B., Coon, E., Chen, J., Hill, D., Neilson, B., Kling, G.W., and Cardenas, M. B. (2024). *Investigation of groundwater flow and reactive transport in supra-permafrost aquifers*. AGU Fall Meeting C42C-04, Washington DC.
- [9] Villaruel, S.[†], Mukherjee, N., Hill, D., Cardenas, M., Shuai, P., Gao, B., Coon, E., Chen, J., Neilson, B., Kling, G.W., and Cardenas, M. B. (2024). *Hydro-stratigraphy of the active layer in riparian valley bottoms of an arctic watershed*. AGU Fall Meeting, Washington DC.
- [8] Clark, Z.[†], Chiu, C. Y.[†], Mukherjee, N., deFabry, C. M., Nachimuthu, S., Herrera, R. G., Gonzalez, R. M., Bennett, P. C., Shanahan, T. M., and Cardenas, M. B. (2024). *Characteristics of the Coastal Groundwater of Celestún, Mexico on the West Coast of the Yucatan Peninsula for Extreme Conditions During the Dry Season*. AGU Fall Meeting, Washington DC.
- [7] Mukherjee, N.^{*}, Chen, J., Neilson, B., Kling, G. W., and Cardenas, M. B. (2024). *Groundwater dominates fluxes of water and organic carbon in a permafrost watershed across hydrologic states*. Department of Energy: Earth System Sciences PI Meeting, Reston, Virginia.
- [6] Cardenas, M. B.[†], Neilson, B. T., Shuai, P., Cory, R. M., Kling, G. W., Mukherjee, N., Gao, B., and Coon, E. (2024). *Dynamics of interconnected surface-subsurface flow and reactive transport processes across the hillslope-riparian zone river corridor continuum of cold, high-latitude watersheds*. Department of Energy: Earth System Sciences PI Meeting, Reston, Virginia.
- [5] Mukherjee, N.[†], Shuai, P., Gao, B., Coon, E., Chen, J., Hill, D., Neilson, B., Kling, G.W., and Cardenas, M. B. (2023). *Investigating Groundwater Flow and Thermal Transport in Arctic Supra-Permafrost Aquifers Using Field Observation Driven Integrated Hydrologic Models*. AGU Fall Meeting C53C-1052, San Francisco, California.
- [4] Mukherjee, N.^{*}, Cardenas, M. B., Chen, J., Neilson, B., and Kling, G. W. (2022). *Supra-permafrost groundwater's contribution to stream flow and organic matter chemistry in the Arctic: estimation using combined mechanistic and statistical approaches*. AGU Fall Meeting H16G-07, Chicago, Illinois.
- [3] Keith, D. G.[†], Mukherjee, N., deFabry, C. M., Cabraal, S. A., Schmidt, L., Turetaia, A., Nguyen, W. D., Bennett, P. C., Shanahan, T. M. and Cardenas, M. B. (2022). *Hydrologic, Geophysical, and Geochemical Characterization of an Aquifer along the Beach of a Barrier Island*. AGU Fall Meeting, Chicago, Illinois.
- [2] Mukherjee, N.[†], Dhar, J., Jougnot, D., and Méheust, Y. (2021). *Characterizing Rayleigh Taylor Instability and Convection in a Porous Medium with Geoelectric Monitoring*. AGU Fall Meeting, New Orleans, Louisiana.
- [1] Mukherjee, N., Dhar, J.[†], Nadal, F., Le Borgne, T., Meunier, P., and Meheust, Y. (2019). *Gravitational instability and convection in a granular porous medium: pore scale experimental study and implications for solubility trapping of CO₂*. AGU Fall Meeting, San Francisco, California.

Talks* & Posters[†]

AWARDS AND SCHOLASTIC ACHIEVEMENTS

2025, 2024	Travel Grant, Earth System Science (ESS) PI Meeting, Dept. of Energy
2024	Outstanding Student Presentation Award (OSPA), AGU Fall Meeting
2024	First Place, Geoscience Hackathon on Computational Reproducibility, UT Austin
2023	Travel Grant, Reactive Transport Workshop using PFLOTRAN, CUAHSI
2023	Jackson School Summer Off-Campus Research Grant, UT Austin

2021	Dean's List, IIT Kharagpur
2021	Prof. Supriya Mohan Sengupta Memorial Award, Best Masters' Thesis, IIT Kharagpur
2021	Best Undergraduate Project Award, IIT Kharagpur
2020	University of Alberta Research Experience (UARE) Award
2019	Indo-French Summer Research Charpak Scholarship
2016	Innovation in Science Pursuit for Inspired Research (INSPIRE) Fellowship, Govt. of India
2016	All India Rank 6193 (out of 1.2 million aspirants) in Joint Entrance Examination (JEE)

TEACHING

Summer 2024, 2026	Teaching Assistant	GEO376L: Hydro Field Camp UT Austin Instructed 2 field classes of more than 20 students where we spent three weeks spanning Texas and Yucatan, Mexico
Fall 2023, 2024	Substitute Instructor	GEO 382S: Physical Hydrology UT Austin Led graduate sessions in groundwater hydrology
Spring 2023	Teaching Assistant	GEO 401: Introduction to Geology UT Austin Instructed over 150 hours of lab sessions (100 freshmen across various disciplines)
Fall 2022, 2026	Teaching Assistant	COE 301: Introduction to Computer Programming UT Austin Instructed over 150 hours of lab and in-class sessions (90 freshmen across various disciplines)

FIELD EXPERIENCES

2022-2024 (12 weeks)	Imnavait Creek, North Slope, Alaska, USA Investigations on groundwater flow and reactive transport in supra-permafrost aquifers
2023, 2024	Austin, Texas, USA Understanding tidal response of a river to groundwater flows in Lower Colorado river
June 2024	Celestun, Mexico Groundwater survey to understand seawater-freshwater mixing along a beach
June 2024	Anillo de Cenotes, Mexico Groundwater survey to understand Karst geochemistry and hydrodynamics of seawater groundwater mixing
Dec 2019	Purulia, West Bengal, India 2-D electrical Resistivity tomography to understand confined groundwater aquifer hydrologic stratification
Dec 2018	Kharagpur, West Bengal, India Geophysical interpretation via 12 channel seismic data acquisition

MENTORSHIP

2023 – 2024	Sydney R Villaruel	Undergraduate Student @UT Austin. Currently pursuing MS @ University of South Carolina
2022 – 2024	Chengwei Zhang	PhD Student @ UT Austin
2021 – 2023	Santhosh Virappane	Masters Student @Univ. of Alberta. Currently Scientist-Engineer @ RWDI

PROFESSIONAL SERVICE

Reviewer:

- WRR (2026 @2)
- The Cryosphere (2025 @1, 2026 @2)
- Catena (2025 @1)
- Journal of Hydrology (2025 @2)
- AGU Fall Meeting OSPA Judge (2023, 2024)

Conference:

2025	Convener	Barret Kurylyk, Michelle Walvoord, David Rudolph, Cansu Demir, Neelarun Mukherjee . Hydrology and hydrogeology of thawing cold regions. <i>GSA Connects 2025</i> , San Antonio, Texas. October 2025
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Outreach:

May 2022	Volunteer	Kiker Elementary School, Austin, TX Created engaging and interactive modules to introduce elementary school students to basic hydrogeology
2016 – 2017	Community Service	National Service Scheme, Government of India Elementary maths teacher in primary school, repaired roads and organized health awareness camps in rural areas

Curriculum Vitae as of July 2026