

# NEELARUN MUKHERJEE

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Curriculum Vitae as of July 2025

## RESEARCH INTERESTS

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My research focuses on flow and reactive transport in subsurface hydrological and biogeochemical systems. I use field data, lab experiments, remote sensing, and numerical models to study flow, heat, and solute transport in porous media.

## EDUCATION

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**The University of Texas at Austin** 2021 – 2026 (expected)  
*Ph.D. Candidate in Hydrology* GPA 3.96/4.0  
*Dissertation Topic:* Flow and transport processes in supra-permafrost aquifers in the Arctic  
*Committee:* Dr. M. Bayani Cardenas (Advisor), Dr. Jingyi Chen (Co-Advisor), Dr. Dan Breecker, Dr. Pin Shuai, Dr. Ethan Coon, Dr. George W. Kling

**Indian Institute of Technology (IIT), Kharagpur** 2016 – 2021  
*Integrated M.S. and B.S. in Exploration Geophysics* GPA 8.46/10.0  
*Micro-specialization in Fluid Mechanics and Microfluidics*  
*Thesis:* Numerical modeling of seawater intrusion considering diurnal head changes of seawater and matrix compression and rebound. <http://dx.doi.org/10.13140/rg.2.2.15345.25443>.  
*Advisors:* Dr. Abhijit Mukherjee & Dr. Aditya Bandopadhyay

## GRANTS

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**Cold-regions Hydro-biogeochemical Processes** Amount: \$1M (3y)  
Environmental System Science Program (ESS), Department of Energy (DOE)  
*Team:* M. B. Cardenas (PI, UT Austin), B. T. Neilson (Col, Utah State Univ.), P. Shuai (Col, Utah State Univ.), R. M. Cory (Col, Univ. of Michigan), G. W. Kling (Col, Univ. of Michigan), E. T. Coon (Col, Oak Ridge Nat. Lab.), N. Mukherjee (Grad, UT Austin), D. Hill (Grad, Utah State Univ.)

**Future Investigators in NASA Earth and Space Science and Technology** Amount: \$135,000 (3y)  
National Aeronautics and Space Administration (NASA)  
*Team:* J. Chen (PI), M. B. Cardenas (Col), Y. Wu (FI), N. Mukherjee (FI)

## AWARDS AND SCHOLASTIC ACHIEVEMENTS

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Outstanding Student Paper Award (OSPA), AGU Fall Meeting	2024
Travel Grant, Earth System Science (ESS) PI Meeting, Dept. of Energy	2024, 2025
First Place, Geoscience Hackathon on computational reproducibility, UT Austin	2024
Travel Grant, Reactive Transport Workshop using PFLOTRAN, CUAHSI	2023
Jackson School Off-Campus Research Grant, UT Austin	2023
Dean's List, IIT Kharagpur	2021
Prof. Supriya Mohan Sengupta Memorial Award for Best Masters' Thesis, IIT Kharagpur	2021
Best Undergraduate Project Award, IIT Kharagpur	2021
University of Alberta Research Experience (UARE) Award	2020
Indo-French Summer Research Scholarship, CNRS	2019
Innovation in Science Pursuit for Inspired Research (INSPIRE) Fellowship, Govt. of India	2016

## PEER-REVIEWED PUBLICATIONS

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4. Mukherjee, N., Gao, B., Shuai, P., Coon, E. T., Hill, D., Chen, J., Neilson, B. T., Cory, R., Kling, G. W., and Cardenas, M. B. *The effects of extreme weather variability on supra-permafrost hydrology*. (manuscript under preparation)
3. Mukherjee, N., Gao, B., Shuai, P., Coon, E. T., Hill, D., Chen, J., Neilson, B. T., Cory, R., Kling, G. W., and Cardenas, M. B. *The effects of 40 years of recent warming on supra-permafrost hydrology*. (manuscript under preparation)
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>

## CONFERENCE PROCEEDINGS

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13. Mukherjee, N.<sup>†</sup>, Hill, D., Neilson, B. T., Shuai, P., Cory, R. M., Kling, G. W., Gao, B., Coon, E., 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.<sup>†</sup>, Mukherjee, N., Neilson, B. T., Shuai, P., Cory, R. M., Kling, G. W., Gao, B., Coon, E., 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., Neilson, B. T.<sup>†</sup>, Shuai, P., Cory, R. M., Kling, G. W.<sup>†</sup>, Gao, B., Coon, E., Mukherjee, N.<sup>†</sup>, Hill, D.<sup>†</sup> (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.<sup>\*</sup>, Shuai, P., Gao, B., Coon, E., Chen, J., Hill, D., Neilson, B., Kling, G.W., and Cardenas, M. B. (2024). *Impacts of climate conditions on groundwater flow and reactive solute transport in supra-permafrost aquifers*. AGU Fall Meeting, Washington DC.
9. Villaruel, S.<sup>†</sup>, 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.<sup>†</sup>, Chiu, C. Y., deFabry, C. M., Mukherjee, N., 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.<sup>\*</sup>, 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.<sup>†</sup>, 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.<sup>†</sup>, 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, San Francisco, California.
4. Mukherjee, N.<sup>\*</sup>, 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, Chicago, Illinois.

3. Keith, D. G.<sup>†</sup>, 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.<sup>†</sup>, 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.<sup>†</sup>, 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 CO<sub>2</sub>*. AGU Fall Meeting, San Francisco, California.

Talks\* & Posters<sup>†</sup>

## RESEARCH EXPERIENCE

<b>Indian Institute of Technology, Kharagpur</b> <i>Thermal Transport in Connected Aquifers</i> Modeling mixing rates from transport of a radiogenic heat source using coupled flow and transport	PI: Dr. Saibal Gupta   Jul, 2018 – Aug, 2019 Undergraduate Research Assistant
<b>University of Alberta</b> <i>3D Flow Fields for Low-Capillary-Number Microfluidic Emulsions</i> Designed a mass transfer and phase change model for supercritical CO <sub>2</sub> in a T-Junction microchannel	PI: Dr. Peichun Amy Tsai   Nov, 2020 – Apr, 2021 Intern
<b>CNRS, UMR7619 METIS, Sorbonne Université</b> <i>Rayleigh Taylor Instabilities in porous media with geoelectrics</i> Developed a coupled flow and geoelectric - transport solver for Rayleigh-Taylor instability in porous media	PI: Dr. Damien Jougnot   Apr, 2020 – Jul, 2020 Intern
<b>CNRS, UMR6118, Université de Rennes1</b> <i>Numerical simulations and Experimental study of CO<sub>2</sub> sequestration in deep aquifers</i> Developed a 3D solver for designing Rayleigh Taylor instability of miscible fluids in a porous media	PI: Dr. Yves Meheust   May, 2019 – Jul, 2019 Intern
<b>TeamKART Motorsports, Formula SAE Team, IIT Kharagpur</b> <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	PI: Dr. Surjya Kanta Pal   2016 – 2020 Suspension and Brakes Team Lead

## TECHNICAL SKILLS

**Languages** (Skill level: 1–5): Python (5), MATLAB (5), Julia (4), C++ (4), C (4), Shell (3), L<sup>A</sup>T<sub>E</sub>X (5)  
**Open-source Numerical Codes:** Amanzi-ATS, PFLOTRAN, OpenFOAM, Basilisk (Gerris), FEniCS  
**Other Softwares:** COMSOL, SolidWorks, Fluent, ArcGIS, ParaView, VisIt, FreeCAD, Affinity Designer  
**Lab/Field Equipment:** Levelloggers, Total Stations, Benchtop KSAT, Hyprop, Chemetrics, ABEM Terrameter

## FIELD EXPERIENCES

<b>Imnavait Creek, North Slope, Alaska:</b> Investigated groundwater flow and reactive transport in supra-permafrost aquifers	(10 weeks), 2022-2024
<b>Austin, Texas:</b> Understanding tidal response of a river to groundwater flows in Lower Colorado river	May, 2023, 2024
<b>Celestun, Mexico:</b> Groundwater survey to understand seawater-freshwater mixing along a beach	June, 2024
<b>Anillo de Cenotes, Mexico:</b> Groundwater survey to understand Karst geochemistry and hydrodynamics of seawater groundwater mixing	June, 2024
<b>Purulia, West Bengal:</b> 2-D electrical Resistivity tomography to understand confined groundwater aquifer hydrologic stratification	Dec, 2019
<b>Kharagpur, West Bengal:</b> Geophysical interpretation via 12 channel seismic data acquisition	Dec, 2018
<b>Balasore and Chandipore beach, Orissa:</b> Coastal hydrogeology basics	Oct, 2017

## TEACHING

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**GEO376L: Hydro Field Camp** | Teaching Assistant | UT Austin Summer 2024  
Instructed a field class of 21 students where we spent three weeks spanning Texas and Yucatan, Mexico

**GEO 382S: Physical Hydrology** | Substitute Instructor | UT Austin Fall 2023, 2024  
Led graduate sessions in groundwater hydrology

**GEO 401: Introduction to Geology** | Teaching Assistant | UT Austin Spring 2023  
Instructed over 150 hours of lab sessions (100 freshmen across various disciplines)

**COE 301: Introduction to Computer Programming** | Teaching Assistant | UT Austin Fall 2022  
Instructed over 150 hours of lab and in-class sessions (90 freshmen across various disciplines)

## SERVICE AND LEADERSHIP

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**Mentoring Students:** *Sydney R Villaruel* (now MS @ Univ. of South Carolina), *Chengwei Zhang* (PhD Student @ UT Austin), *Santhosh Virappane* (PhD Student @ UAlberta)

**Peer-Reviewer:** Geological Society of America (GSA) Connects 2025, American Geophysical Union (AGU) Fall Meeting 2025, Journal of Hydrology, Catena.

## OUTREACH

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**Kiker Elementary School, Austin, TX** May, 2022  
Created engaging and interactive modules to introduce elementary school students to basic hydrogeology

**National Service Scheme, Government of India** 2016-2017  
Taught maths to youth in rural areas, repaired roads and organized health awareness camps in 5 villages