

Neelarun Mukherjee

Department of Earth and Planetary Sciences, University of Texas at Austin.

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Curriculum Vitae as of December 2024

EDUCATION

- **The University of Texas at Austin** 2021 – 2026 (expected)
Ph.D. in Hydrology GPA 3.96/4.0
Dissertation Topic: Flow and transport processes in supra-permafrost aquifers in the Arctic
Co-advisors: Dr. M. Bayani Cardenas & Dr. Jingyi Ann Chen
- **Indian Institute of Technology (IIT), Kharagpur** 2016 – 2021
M.S. and B.S. in Geophysics GPA 8.46/10.0
Micro-specialization in Fluid Mechanics and Microfluidics
Masters' 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>.
Thesis Co-advisors: Dr. Abhijit Mukherjee & Dr. Aditya Bandopadhyay

AWARDS AND SCHOLARSHIPS

- **First Place in Geoscience Hackathon on computational reproducibility** Oct, 2024
The University of Texas at Austin Austin, TX
- **Earth System Science (ESS) PI Meeting Travel Grant** Apr, 2024
Department of Energy, U.S. Federal Government Reston, VA
- **Travel Grant for Reactive Transport Workshop using PFLOTTRAN** Nov, 2023
Consortium of Universities for the Advancement of Hydrologic Science, Inc Richland, WA
- **Summer Off-Campus Research Grant** May, 2023
The University of Texas at Austin Austin, TX
- **Dean's List, International Student Affairs** Jul, 2021
Indian Institute of Technology, Kharagpur Kharagpur, India
- **Prof. Supriya Mohan Sengupta Memorial Award for best Masters' Thesis** Dec, 2021
Indian Institute of Technology, Kharagpur Kharagpur, India
- **Best Undergraduate Project Award** Dec, 2021
Indian Institute of Technology, Kharagpur Kharagpur, India
- **University of Alberta Research Experience (UARE)** Jan, 2020
Department of Mechanical Engineering, University of Alberta Edmonton, Canada
- **CNRS Research Scholarship** May, 2019
Geosciences Rennes Rennes, France
- **Inspire Scholarship** Mar, 2019 – May, 2021
Department of Science and Technology (DST), Government of India Kharagpur, India

JOURNAL PUBLICATIONS

- **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>
- 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). <https://doi.org/10.1063/5.0220101> [Editor's Choice]

CONFERENCE PROCEEDINGS (TALKS* & POSTERS†)

- **Mukherjee, N.***, 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.
- Villaruel, S. †, **Mukherjee, N.**, Hill, D., Cardenas, M., Shuai, P., Gao, B., Coon, E., Chen, J., Hill, D., 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.
- Clark, Z. †, 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.
- **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.
- **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*, Chicago, Illinois.
- Keith, D. G. †, **Mukherjee, N.**, deFabry, C. M., Cabraal, S. A., Schmidt, L., Turetcaia, 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.
- **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.
- **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, CA.

RESEARCH PROJECTS

- **UT Department of Earth and Planetary Sciences** Aug, 2021 – present
Graduate Research Assistant Texas, U.S.
 - Developing a process-based understanding of the flow of groundwater and reactive transport of DOC in supra-permafrost aquifers in continuous permafrost regions using a MODEX approach.
 - Developed a stochastic workflow to quantify uncertainty of water and organic carbon fluxes in permafrost watersheds across hydrologic states.
- **Indian Institute of Technology, Kharagpur** Jul, 2018 – Aug, 2021
Undergraduate Research Assistant West Bengal, India
 - **Effect of changes in seawater head on seawater-groundwater interaction [Thesis]**
 - Understanding groundwater flow due to diurnal and seasonal head variation for pre and post-monsoon period, considering matrix compression and rebound with a coupled flow and solute transport model.
 - **Thermal Transport in Connected Aquifers**
 - Determination of mixing rate considering reactive transport of some specific elements responsible as radiogenic heat source using a coupled flow and heat transport numerical model.
- **University of Alberta** Nov, 2020 – Apr, 2021
Research Intern, Advisor: Dr. Peichun Amy Tsai Edmonton, Canada
 - **Three-dimensional Flow Field of Low-Capillary-Number Microfluidic Emulsions**
 - Numerical simulations of mass-transfer and phase change across immiscible interfaces between supercritical CO₂ using VOF in a T-junction microfluidic channel
 - Investigation of different droplet formation pressure regimes in a T-junction microchannel
- **UMR METIS, Sorbonne Université** Apr, 2020 – Jul, 2020
Research Intern, Advisor: Dr. Damien Jougnot Paris, France
 - **Numerical study of Rayleigh Taylor Instabilities in porous media with geoelectrics**
 - Developed a flow and transport code for Rayleigh Taylor Instability in porous media
 - Coupled effective conductivity calculation with flow and transport by current injection through it as the instability evolves
 - Analyzed anisotropy with the change in mixing length using inverse formulation

○ **Geosciences Rennes, Université de Rennes1**

Research Intern, Advisor: Dr. Yves Meheust

May, 2019 – Jul, 2019

Rennes, France

● **Numerical simulations and Experimental study of CO₂ sequestration in deep aquifers**

- Designed and performed a 3D experiment for laser scanning of Rayleigh Taylor instability of miscible fluids in a porous media
- Studied the variation of onset time and mixing length in pore scale for density-driven instability
- Analyzed anisotropy with the change in mixing length using inverse formulation

TECHNICAL SKILLS

- **Languages:** Python, MATLAB, Shell, C++, C, Java, FORTRAN
- **Numerical Models:** Amanzi-ATS, PFLOTRAN, OpenFOAM, HYDRUS, COMSOL, FEniCS, Basilisk, COMSOL
- **Other softwares:** SolidWorks, Fluent, QGIS, ARCGIS, ParaView, Visit, Adobe Illustrator, Affinity Designer, L^AT_EX
- **Lab/Field Equipments:** Levelloggers, Total Stations, Benchtop KSAT and Hyprop, Chemetrics

TEACHING/MENTORING EXPERIENCE

○ **University of Texas at Austin**

Teaching Assistant

- **Summer 2024** Instructed a field class of 21 students (GEO376L: Hydro Field Camp) where we spent three week spanning Texas and Yucatan Peninsula, Mexico.
- **Fall 2023** Assistant instructor of graduate sessions in groundwater hydrology during the absence of lead instructor Dr. M Bayani Cardenas.
- **Spring 2023:** Instructed laboratory sections (60 freshmen across various disciplines) for GEO 401: Introduction to Geology: Over 150 hours of teaching experience
- **Fall 2022:** Instructed laboratory sections and class (90 freshmen across various disciplines) for COE 301: Introduction to Computer Programming: Over 150 hours of teaching experience.

○ **University of Texas at Austin**

Mentorship

- Sydney R Villaruel, Undergraduate student mentee
- Chengwei Zhang, Grad-student mentee

○ **University of Alberta**

Mentorship

- Santhosh Virappane, Masters student mentee

FIELD EXPERIENCES

- **North Slope, Alaska:** Understanding the flow and reactive transport in supra-permafrost aquifers in continuous permafrost aquifers.
- **Austin, Texas:** Understanding tidal response of a river to groundwater flows in Lower Colorado river.
- **Celestun, Mexico:** Groundwater survey to understand seawater-freshwater mixing along a beach.
- **Anillo de Cenotes, Mexico:** Groundwater survey to understand Karst geochemistry and hydrodynamics of seawater groundwater mixing.
- **Purulia, West Bengal:** 2-D electrical Resistivity Tomography using ABEM Terrameter.
- **Kharagpur, West Bengal:** 12 channel seismic data acquisition using sledgehammer as seismic source and McSEIS-SX 48 seismograph system for recording.
- **Kharagpur, West Bengal:** 3D radiometric nuclear prospecting.
- **Balasore and Chandipore beach, Orissa:** Coastal hydrogeology basics.

PROFESSIONAL AFFILIATIONS

- American Geophysical Union (AGU)
- Geological Society of America (GSA)

LEADERSHIP & OUTREACH

- **Kiker Elementary School** May, 2022
Community Service Austin, TX
 - Created engaging and interactive modules to introduce elementary school students to basic geology concepts, fostering active learning and hands-on exploration
- **TeamKART, Formula SAE Team, IIT Kharagpur** 2017 – 2021
Team Head, Suspension and Vehicle Dynamics West Bengal, India
 - Played a key role in developing and designing Vehicle Dynamics for Formula SAE car K4. The car competed in Formula Bharat 2019, showcasing expertise in optimizing performance
 - Led as the Engineer and Mentor for Formula SAE car K5, securing a commendable 10th place in Formula Bharat 2020. Demonstrated effective leadership and mentorship in competitive motorsports.
- **National Service Scheme, Government of India** 2016-2017
Community Service West Bengal, India
 - Participated in teaching students in rural areas, repairing roads in villages and organization of health awareness camps in rural areas.