Saubhagya Singh Rathore

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Professional Employment

2024 – present	R&D Staff, Environmental Sciences Division, Oak Ridge National Lab
2021 – 2024	Associate R&D Staff, Environmental Sciences Division, Oak Ridge National Lab
2020 – 2021	Post Doctoral Researcher, Environmental Sciences Division, Oak Ridge National Lab
2019 – 2020	Instructor of Record, College of Engineering, Georgia Institute of Technology

Education

2020	Ph.D., Civil Engineering, Georgia Institute of Technology *Development of seawater-freshwater interface in heterogeneous coastal aquifers* Ph.D. Dissertation advisor: Jian Luo and Aris Georgakakos
2017	M.S., Civil Engineering, Georgia Institute of Technology Concentration: Environmental Fluid Mechanics and Water Resources Engineering
2014	B.Tech., Civil Engineering (Honors), Indian Institute of Technology Bombay B.Tech. Dissertation advisor: T.I. Eldho

Awards and Honors

- Selected for the 2025 Cohort of the Early Career Development Program, ORNL
- Honorable Mention (2nd place), UCOWR Ph.D. Dissertation Award (2021)
- Outstanding Graduate Student Instructor for Civil and Environmental Engineering (2019)
- Best Resident Advisor of the Year, Department of Housing, Georgia Tech (2019)
- NAFSA Advocate - nominated by Georgia Tech, Capitol Hill, Washington D.C. (2018)
- Undergraduate Research Award, IIT Bombay (2013)

Publications

Peer-reviewed Journal Articles

1. Rathore, S.S., Svyatskii, D.S., Coon E. T., Son, K., and Painter, S.L. (2024) "Modeling the effects of artificial drainage on agriculture-dominated watersheds using a fully distributed integrated hydrology model." *Water Resources Research*, 60, e2023WR035993, https://doi.org/10.1029/2023WR035993
2. Rathore, S.S., Coon E. T., and Painter, S.L. (2024) "A Stream-aligned Mixed Polyhedral Meshing Strategy for Integrated Surface- Subsurface Hydrological Models" *Computers & Geosciences,* July 2024, 105617*,* https://doi.org/10.1016/j.cageo.2024.105617
3. Perez, G., Coon, E.T., Rathore, S.S., Le, P.V.V. (2024), "Advancing process-based flood frequ.ncy analysis for assessing flood hazard and population flood exposure". *Journal of Hydrology*, 639: 131620, https://doi.org/10.1016/j.jhydrol.2024.131620
4. Le, P. V. V., Rathore, S. S., Coon, E. T., Ward, A., Haggerty, R., and Painter, S. L. (2024) "Hydrologic connectivity and dynamics of solute transport in a mountain stream: Insights from a long-term tracer test and multiscale transport modeling informed by machine learning". Journal of Hydrology, 639, 131562. https://doi.org/10.1016/j.jhydrol.2024.131562

5. Rathore, S.S., Ward, A.S. and Painter, S.L., (2023) "Numerical evaluation of photosensitive tracers as a strategy for separating surface and subsurface transient storage in streams" *Journal of Hydrology,* 624, p.129931. https://doi.org/10.1016/j.jhydrol.2023.129931
6. Le, P.V., Rathore, S.S. and Painter, S.L., (2023) "A multiscale model for solute transport in stream corridors with unsteady flow" *Journal of Hydrology*, 622, p.129670. https://doi.org/10.1016/j.jhydrol.2023.129670
7. Rathore, S.S., Schwartz, G.E., Brooks, S.C. and Painter, S. L., (2022) "Joint estimation of biogeochemical model parameters from multiple experiments: A Bayesian approach applied to mercury methylation" *Environmental Modelling & Software*, 155, p.105453. https://doi.org/10.1016/j.envsoft.2022.105453
8. Schwartz, G.E., Muller, K.A., Rathore, S.S., Wilpiszeski, R.L., Carrell, A.A., Cregger, M.A., Elias, D.A., Podar, M., Painter, S.L., Brooks, S.C., (2022) "Incorporating Variable Sediment Microbial Activity into Methylmercury Production Kinetics Modeling" *Environmental Science: Processes & Im*pacts. https://doi.org/10.1039/D1EM00287B
9. Rathore, S. S., Jan, A., Coon, E., Painter S. L. (2021), "On the Reliability of Parameter Inferences in a Multiscale Model for Transport in Stream Corridors" *Water Resources Research,* 57, https://doi:10.1029/2020WR028908
10. Rathore, S. S., Lu, C., & Luo, J. (2020). "A semi-analytical method to fast delineate seawater-freshwater interface in two-dimensional heterogeneous coastal aquifers" *Water Resources Research*, 56, e2020WR027197. https://doi.org/10.1029/2020WR027197
11. Rathore, S. S., Tang, Y., Lu, C., & Luo, J. (2020) "A Simplified Equation of Approximate Interface Profile in Stratified Coastal Aquifers" *Journal of Hydrology*, 124249. https://doi.org/10.1016/j.jhydrol.2019.124249
12. Tang, Y., Rathore, S. S., Lu, C., & Luo, J. (2020) "Development of groundwater lens for transient recharge in strip islands" *Journal of Hydrology*, *590*, 125209. https://doi.org/10.1016/j.jhydrol.2020.125209
13. Lu, C., Cao, H., Ma, J., Shi, W., Rathore, S. S., Wu, J., & Luo, J. (2019) "A proof-of-concept study of using a less permeable slice along the shoreline to increase fresh groundwater storage of oceanic islands: Analytical and experimental validation" *Water Resources Research,* 55, 6450– 6463. https://doi.org/10.1029/2018WR024529
14. Rathore, S. S., Zhao, Y., Lu, C., & Luo, J. (2018). "Defining the effect of stratification in coastal aquifers using a new parameter". *Water Resources Research, 54*(9). https://doi.org/doi:10.1029/2018WR023114
15. Rathore, S. S., Zhao, Y., Lu, C., & Luo, J. (2018). "Analytical analysis of the temporal asymmetry between seawater intrusion and retreat". *Advances in Water Resources, 111*, 121-131. https://doi.org/10.1016/j.advwatres.2017.11.001
16. Zhao, Y., Rathore, S. S., Liu, M., & Luo, J. (2018). "Joint Bayesian Inversion for Analyzing Conservative and Reactive Breakthrough Curves" *Journal of Hydrology*, *567*, 446-456. https://doi.org/10.1016/j.jhydrol.2018.10.029
17. Lu, C., Wang, Z., Zhao, Y., Rathore, S. S., Huo, J., Tang, Y., et al. (2018). "A mobile-mobile transport model for simulating reactive transport in connected heterogeneous fields". *Journal of Hydrology, 560*, 97-108. https://doi.org/10.1016/j.jhydrol.2018.02.073
18. Rathore, S.S., Gomez-Velez, J., Herndon E., Painter S. L., (under review), "Scale effects in the dynamics of stream network expansion and contraction", *submitted to Nature Geoscience.*
19. Rathore, S.S., Sloan, B., Painter S.L. (under review), "Hydrologic response of artificially drained agricultural watersheds: Insights from high-resolution integrated surface/subsurface simulations", *submitted to Environmental Research Letters*

20. Gomez-Velez, J. D., Rathore, S.S., Cohen, M.J., Painter S.L. (under review), "Hyporheic-zone processes and stream oxygen dynamics: Insights from a multiscale reactive transport model", *submitted to Water Resources Research.*
21. Liu, Y., He, Y., Kim, M., Rathore, S.S., Luo, J. (under review), "Impact of boundary conditions on modeling seawater intrusion in stratified coastal aquifers under sea level rise", *submitted to Journal of Hydrology.*

Codes and Software Products/Releases

1. Watershed Workflow 1.4.0: Capability of stream-aligned mixed-polyhedral meshing strategy. *GitHub repository:* https://github.com/environmental-modeling-workflows/watershed-workflow/releases/tag/watershed-workflow-1.4.0
2. **Advanced Terrestrial Simulator (exp. ATS v1.6):** Implemented stormwater infrastructure components—gate structures, stage-based pump stations, culverts, canals, and detention basins—within the integrated hydrologic modeling framework.
   GitHub repository: github.com/amanzi/ats/commits/ssr/gates_and_pump/

Research Projects and Fundings

Project fundings

Role of density-driven dynamics in coastal hydro-biogeochemistry (PI), 2025-2027, ORNL LDRD-Early Career Award, Total budget: $300,000

An Integrated, High-Resolution Approach to Modeling the Resilience of Energy Expansion Pathways in the Southeast (Co-I), 2024-2026, ORNL LDRD, Task budget: $150,000

Green infrastructure representations in hydrologic models, Supplemental funding for SETx-UIFL project(Co-I), 2025, Task Budget: $100,000

Ensuring Grid, Infrastructure, Ecosystem, and Community Resilience in Flood-Impacted Regions (Co-I), 2026-2031, DOE-CESER & FEMA, Total budget $7,500,000, Task Budget: TBD

Other active project affiliations

2022-2025	WaDE: Watershed Dynamics And Evolution Science Focus Area https://wade.ornl.gov PI: Eric Pierce (ORNL) Funding Agency: Department of Energy - Environmental System Science Program
2022-2027	Southeast Texas Urban Integrated Field Laboratory https://setx-uifl.org/about/ PI: Paola Passalacqua (UT Austin) Funding Agency: Department of Energy - Environmental System Science Program
2022-2025	IDEAS – Watersheds https://ideas-watersheds.github.io/ PI: David Moulton (LANL) Funding Agency: Department of Energy - Environmental System Science Program

Presentations

Invited Seminars

2025 Alabama Water Institute, University of Alabama, "From Headwaters to Outlet: Capturing Stream-Network Dynamics in Large-scale Watershed Models", part of WaterWorks seminar series (link).
2023 North Carolina A&T State University, "Waterways and Ways of Life: Exploring the Interactions between Human and Hydrological Systems."
2021 Critical Interfaces Network (CInet), "Status and Plans for Modeling Agricultural Watersheds in the COMPASS-GLM Project."
2021 North Carolina A&T State University, "Groundwater-Surface Water Interaction: From Stream Corridors to Coast."
2019 Hohai University (Nanjing, China), "A new approach to understand the effects of heterogeneity in coastal aquifers."
2018 Hohai University (Nanjing, China), "Analytical tools for better understanding of coastal groundwater flow dynamics"

Conference Presentations

2024 Rathore, S.S., Coon, E.T., Svyatsky, D., Perez, G., Le, P., Painter, S.L., "Incorporating Engineered Water Flows in High-Fidelity Integrated Hydrologic Models." *AGU Fall Meeting*, Washington, DC. Invited Oral
Rathore, S.S., Gomez Velez, J., Berens, M., Herndon, E., Painter, S.L., "Stream Network Dynamics: Insights into Expansion, Contraction, and Coonnectivity via Spatially Resolved Hydrology Model." *AGU Fall Meeting*, Washington, DC. Oral
Rathore, S.S., Coon, E.T., Painter, S.L., "Efficient Hydrologic Modeling with Stream-Aligned Mixed-Polyhedral Meshing." *CMWR, Tucson*, AZ. Oral.
Rathore, S.S., Gomez Velez, J., Painter, S.L. "Exploring the water boundaries: Insights into Stream Network Expansion and Contraction from High-resolution Integrated Hydrologic Modeling." *MODFLOW and More,* Princeton University, MD. Oral.
2023 Rathore, S.S., Svaystkii, D., Coon, E., Painter, S.L. "Analyzing event-scale hydrological response of agricultural watersheds with artificial drainage using a fully distributed integrated hydrology model." *AGU Fall Meeting*, San Francisco, CA. eLightning Talk.
Rathore, S.S., Svaystkii, D., Coon, E., Painter, S.L. "Understanding the impacts of artificial surface and subsurface drainage on agricultural watersheds using fully distributed watershed scale hydrology models." *Gordon Research Conference*, Andover, NH. Poster.
Rathore, S.S., Gomez Velez, J., Le, P., Painter, S.L., "Model-data integration strategies for stream metabolism studies." *DOE Environmental System Science PI meeting*, Bethesda, MD. Poster.
2022 Rathore, S.S., Svaystkii, D., Coon, E., Painter, S.L. "Improved Representation of Surface and Subsurface Drainage Networks in Integrated Hydrology Models for Managed Watersheds." *AGU Fall Meeting,* Chicago, IL. Oral.
2021 Rathore, S.S., Painter, S.L. "Improving the Representation of the Hydro-biogeochemical Function of Stream Corridors Using Observation-informed Multiscale Modeling.", *AGU Fall Meeting,* San Francisco, CA. Invited Oral
Rathore, S.S., Lu, C., Luo, J. "A New Framework to Analyze Heterogeneity Effects on Seawater Intrusion." *UCOWR/NIWR Annual Water Resources Conference*, Invited Oral
Rathore, S.S., Coon, E., Painter, S.L. Improving Representation of Surface Drainage Networks in Managed Watersheds. *MODFLOW and More,* Princeton University
2020 Rathore, S.S., Jan, A., Coon, E., Painter, S. "Improving Parameter Inferences in a Multiscale Model for Transport in Stream Corridors." *AGU Fall Meeting*, Virtual. eLightning
2018 Rathore, S.S., Zhao, Y., Lu, C., Luo, J. "Using a new parameter to account for the effect of stratification in coastal aquifers." *AGU Fall Meeting*, Washington, D.C. Poster.

2017 Rathore, S.S., Zhao, Y., Lu, C., Luo, J. "Anaytical analysis of the temporal asymmetry between seawater intrusion and retreat." *AGU Fall Meeting*, New Orleans, LA. Oral.

2016 Rathore, S.S., Zhao, Y., Lu, C., Luo, J. "Timescale analysis of saltwater intrusion and retreat." *AGU Fall Meeting*, San Francisco, CA. Poster

2013 Rathore, S.S., Gupta, M., Eldho, T. I., "Aquifer decontamination studies using MODFLOW and MT3D." *Annual Convention – Indian Water Works Association*, Pune, India. Oral

Teaching and Mentoring

Postdoc Mentor, SETx-UIFL project, 2025

Instructor of Record, College of Engineering, Georgia Institute of Technology

- COE 2001 – Statics: Fall 2019 (54 students), Spring 2019 (19 Students)

Teaching Assistant, Civil and Environmental Engineering, Georgia Institute of Technology

- CEE 2040 – Dynamics: Spring 2018
- CEE 4200 – Hydraulic Engineering: Fall 2016
- CEE 3040 – Fluid Mechanics: Spring 2016

Professional Development

- Tech to Teaching" Certificate, Georgia Tech, 2019
- CIRTL Associate Level Certificate, 2019
- CEE Future Faculty Fellowship ($3,000), Georgia Tech, 2018

Service Activities

Professional Service

Manuscript Reviewer

Nature Scientific Reports, Geophysical Research Letters, Water Resources Research, Journal of Hydrology, Journal of Contaminant Hydrology, Environmental Modeling and Software, Advances in Water Resources

Proposal Reviewer

- DOE-ESS Panel Review (2023 - two separate panels; 2024); DOE-SCGSR Proposal Review

Professional Society Service

- Session convener: Advancing Integrated Modeling for Water Resource Management in Coupled Hydrological and Societal Systems, AGU Fall Meeting, 2024
- Session convener: Groundwater-Surface Water Interactions: Integrating Physical, Biological, and Chemical Patterns and Processes Across Systems and Scales, AGU Fall Meeting, 2022
- Session convener: Advances in Coastal Hydrology: Processes and Impacts, AGU Fall Meeting, 2019

Georgia Institute of Technology

- Student Advisor: Honor Advisory Council, Office of Student Integrity, 2015-2019
- Graduate Teaching Fellow: Center for Teaching and Learning, 2019

Indian Institue of Technology Bombay

- Head: Department Academic Mentorship Program, 2013-2014
- Lead: Hostel and Department Affairs, Student Alumni Relations Cell, 2012-2013

Science Communication and Educational Outreach

- Media Contributor: Featured in a TV report on WBIR Channel 10, discussing Integrated Flood Modeling with a meteorologist, August 2024
- Early Career Highlight at DOE-BER Annual Presentation at ORNL: "Photo-decaying tracers interpreted through a multiscale model for stream corridor transport can distinguish between hyporheic- and surface-zone transient storage", 2023
- Panelist: Break Out Session: Coastal and Terrestrial Aquatic Interfaces, including lightning talk – "Watersheds to Coast: Resolving TAI Processes", ESS-PI Meeting, 2023
- Guest Speaker: "Timescale analysis of saltwater intrusion and retreat in coastal aquifers", Georgia Tech & Geosyntec Open Day, Geosyntec office, 2016

Workshops and Other Activities

- Watershed Workflow Hands-on Training: Stream-aligned meshing, IDEAS Watershed, 2023
- ATS Short Course: Reactive Transport Module, ORNL, 2021
- Groundwater Modeling Workshop: Training for Maharashtra Government Civil Engineers, 2012

Professional affiliations (*current*)

American Geophysical Union