PALLAV RANJAN

Assistant Professor, Department of Civil Engineering (Ocean Engineering)
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RESEARCH INTERESTS

Coastal hydrodynamics and environmental fluid mechanics: flow–biota–sediment interaction (coral reefs, seagrass, mangroves); coastal sediment transport, including the transitional regime under waves; air–sea gas exchange; hydrodynamics of seaweed aquaculture and marine carbon sequestration; environmental impact of desalination discharges. Approach: high-fidelity numerical modeling (LES/DNS), laboratory experiments and field observations.

ACADEMIC APPOINTMENTS

Indian Institute of Technology Bombay Oct 2026 – Present
Assistant Professor, Department of Civil Engineering (Ocean Engineering) Mumbai, India
Principal Investigator, Coastal Processes Group

University of California San Diego Oct 2023 – Sep 2025
Postdoctoral Researcher San Diego, CA
Mechanical & Aerospace Engineering and Scripps Institution of Oceanography.
Field observations of air–sea gas exchange and oxygen dynamics on the Kāneʻohe Bay coral reef, Hawaii; hydrodynamics of an offshore kelp farm in Southern California (multi-institution collaboration with Stanford, UC Irvine, UCLA and Ocean Rainforest).

Indian Institute of Technology Bombay Aug 2015 – Jun 2016
Research Assistant, Civil Engineering and Centre for Environmental Science & Engineering Mumbai, India
Storm-surge modeling of Paradip port during Cyclone Phailin (ADCIRC; ISRO-sponsored) and a near-real-time urban flood forecasting model for Mumbai (MIKE FLOOD).

INDUSTRY EXPERIENCE

Geosyntec Consultants Sep 2025 – Sep 2026
Senior Staff Professional Los Angeles, CA
Computational fluid dynamics of river sediment transport, desalination brine plumes in the ocean, and mud flows.

EDUCATION

University of Illinois Urbana-Champaign 2023
Ph.D., Civil Engineering Urbana, IL
Thesis: *Bridging gaps between numerical and physical modeling of aquatic vegetation: experimental bias, near-bed hydrodynamics, and sediment-induced turbulence modulation*. Advisor: Prof. Rafael O. Tinoco.
Graduate concentration in Computational Science and Engineering; graduate minor in Global Studies.

University of Illinois Urbana-Champaign 2023
M.S., Theoretical and Applied Mechanics (Fluid Mechanics) Urbana, IL

University of Illinois Urbana-Champaign 2018
M.S., Civil Engineering (Environmental Hydrology and Hydraulic Engineering) Urbana, IL
Thesis: *High-resolution numerical investigation of hydrodynamics and sediment transport within emergent vegetation canopy*.

Indian Institute of Technology Roorkee 2015
B.Tech., Civil Engineering Roorkee, India

PUBLICATIONS

Google Scholar (November 2026): 260 citations, h-index 6, i10-index 5. Own name in bold.

Peer-reviewed journal articles

[J6] **Ranjan, P.**, & Tinoco, R. O. (2024). On the effects of turbulence modulation driven by suspended sediment stratification in emergent rigid canopies. *Journal of Geophysical Research: Earth Surface*, 129(1), e2023JF007197. doi:10.1029/2023JF007197

[J5] **Ranjan, P.**, Mittal, K., Chamorro, L. P., & Tinoco, R. O. (2022). Impact of gaps on the flow statistics in an emergent rigid canopy. *Physics of Fluids*, 34(6), 066601. doi:10.1063/5.0088527

[J4] Yadav, V., Sherly, M. A., **Ranjan, P.**, Prasad, V., Tinoco, R. O., & Laurent, A. (2022). Risk of plastics losses to the environment from Indian landfills. *Resources, Conservation and Recycling*, 187, 106610. doi:10.1016/j.resconrec.2022.106610

[J3] Jin, C., Coco, G., Tinoco, R. O., **Ranjan, P.**, Gong, Z., Dutta, S., … & Friedrich, H. (2022). High-resolution Large Eddy Simulations of vortex dynamics over ripple defects under oscillatory flow. *Journal of Geophysical Research: Earth Surface*, 127(3), e2021JF006328. doi:10.1029/2021JF006328

[J2] Jin, C., Coco, G., Tinoco, R. O., **Ranjan, P.**, San Juan, J., Dutta, S., Friedrich, H., & Gong, Z. (2021). Large Eddy Simulation of three-dimensional flow structures over wave-generated ripples. *Earth Surface Processes and Landforms*, 46(8), 1536–1548. doi:10.1002/esp.5120

[J1] Yadav, V., Sherly, M. A., **Ranjan, P.**, Tinoco, R. O., Boldrin, A., Damgaard, A., & Laurent, A. (2020). Framework for quantifying environmental losses of plastics from landfills. *Resources, Conservation and Recycling*, 161, 104914. doi:10.1016/j.resconrec.2020.104914

Under review

[R3] **Ranjan, P.**, Veron, F., Ho, D., Davis, K., & Pawlak, G. Dependence of air–sea gas exchange on bottom turbulence over shallow coral reefs. *Limnology and Oceanography*.

[R2] **Ranjan, P.**, Yadav, V., & Tinoco, R. O. Wind-driven transport of plastics from landfills. *Environmental Science & Technology*.

[R1] Dennis, C. E., **Ranjan, P.**, Suski, C., & Tinoco, R. O. Sea lamprey display context-dependent attraction to specific types of turbulence within a laboratory flume. *Biological Invasions*. Preprint: Research Square (2025).

In preparation

[P2] **Ranjan, P.**, Fytanidis, D., & Tinoco, R. O. Near-bed hydrodynamics in aquatic vegetation canopies. *Journal of Geophysical Research: Earth Surface*.

[P1] **Ranjan, P.**, Fytanidis, D., & Tinoco, R. O. Reynolds stresses in aquatic vegetation canopies: quadrant analysis and eddy viscosity. *Water Resources Research*.

Conference papers

[CP2] Deshpande, N. V., & **Ranjan, P.** (2026). Current-aware one-way synchronization and opportunistic current sensing for underwater acoustic sensor links. *CAISc 2026 Conference*.

[CP1] **Ranjan, P.**, Fischer, P., & Tinoco, R. O. (2020). Investigation of hydrodynamics and sediment transport within emergent vegetation canopy. In *River Flow 2020: Proceedings of the 10th Conference on Fluvial Hydraulics* (pp. 1595–1600). CRC Press. doi:10.1201/b22619-222

Conference abstracts and presentations

[C16] **Ranjan, P.**, Pawlak, G. R., Davis, K., Kelm, M., Saunders, S., Monismith, S. G., et al. (2024). Observations of flow around an offshore macroalgal farm. *AGU Fall Meeting*, EP33B-1349. Poster.

[C15] Pawlak, G. R., Davis, K. A., Kelm, M., **Ranjan, P.**, Harrison, E., Infante, J., et al. (2024). Observations of flow around an offshore macroalgae farm. *Ocean Sciences Meeting*, CP44D-1961. Poster.

[C14] **Ranjan, P.**, & Tinoco, R. O. (2023). A two-layer eddy viscosity model to predict the near-bed hydrodynamics in vegetated flows. *76th Annual Meeting of the APS Division of Fluid Dynamics*. Talk.

[C13] **Ranjan, P.**, Molloy, M., Thompson, C., Chen, W., Tseng, C. Y., & Tinoco, R. O. (2022). Interfacial gas exchange in vegetated channels under free-surface waves. *75th Annual Meeting of the APS Division of Fluid Dynamics*. Talk.

[C12] Tinoco, R. O., Tseng, C. Y., San Juan, J., Prada Sepulveda, A., **Ranjan, P.**, You, H., et al. (2021). Turbulence: the cause of and a possible solution to open questions about biophysical interactions in rivers. *AGU Fall Meeting*, EP21A-03. Talk.

[C11] **Ranjan, P.**, & Tinoco, R. O. (2021). Measurement bias within aquatic vegetation canopy: effect of gap length. *5th International Symposium on Shallow Flows (IAHR)*. Talk.

[C10] **Ranjan, P.**, & Tinoco, R. O. (2020). Assessment of experimental bias on laboratory studies of vegetated flows. *AGU Fall Meeting*, EP052-0007. Poster.

[C9] **Ranjan, P.**, & Tinoco, R. O. (2020). Initiation of motion and form drag of plastic waste in landfills. *AGU Fall Meeting*, SY055-01. eLightning talk.

[C8] Jin, C., Coco, G., Tinoco, R. O., Dutta, S., **Ranjan, P.**, San Juan, J. E., et al. (2020). A numerical study on vortex dynamics over ripple geometry with defects. *AGU Fall Meeting*, EP066-07. Talk.

[C7] Tinoco, R. O., **Ranjan, P.**, & Prada Sepulveda, A. F. (2019). Particle capture by aquatic vegetation patches: application to eggs and larvae traveling in streams. *AGU Fall Meeting*, EP41C-2343. Poster.

[C6] **Ranjan, P.**, Dutta, S., Fischer, P., & Tinoco, R. O. (2019). Stratification effects in a sediment-laden vegetated open channel flow. *Finite Elements in Flow Problems (FEF 2019)*, Chicago. Talk.

[C5] **Ranjan, P.**, Dutta, S., Fischer, P., & Tinoco, R. O. (2018). Effect of emergent vegetation on suspended sediment transport. *AGU Fall Meeting*, EP41D-2703. Poster.

[C4] **Ranjan, P.**, Dutta, S., Mittal, K., Fischer, P., & Tinoco, R. O. (2018). Investigation of oscillatory flow through emergent aquatic vegetation patches using high-resolution numerical simulations. *8th International Symposium on Environmental Hydraulics*. Talk.

[C3] Chowdhury, P., Behera, M. R., & **Ranjan, P.** (2016). Investigating sea bed morphology of an estuary located in the western coast of India. *Ocean Sciences Meeting*, MG44B-1982. Poster.

[C2] Mohanty, M. P., Gusain, A., **Ranjan, P.**, Karmakar, S., & Ghosh, S. (2016). A comparative flood hazard assessment with climate projections for India. *3rd International Conference on Regional Climate (ICRC-CORDEX)*, Stockholm. Poster.

[C1] Beniwal, D., **Ranjan, P.**, Desai, R., & Sohoni, M. (2014). Drinking water security in rural Maharashtra. *14th Delhi Sustainable Development Summit*, New Delhi. Poster.

TEACHING

University of Illinois Urbana-Champaign Fall 2021

Co-Instructor and Teaching Assistant, CEE 350: Water Resources Engineering (undergraduate, ~40 students)
Taught the open-channel hydraulics module; ran introductory workshops on R and QGIS. Named on the university *List of Teachers Ranked as Excellent by Their Students*.

Certificate in Foundations of Teaching, University of Illinois Urbana-Champaign

Teaching interests at IIT Bombay

- Undergraduate: Fluid Mechanics (theory and laboratory), Applied Hydraulic Engineering, Numerical Methods in Civil Engineering
- Postgraduate: Mechanics of Water Waves, Coastal and Ocean Environment, Ocean Engineering Laboratory
- New courses: Coastal Ecohydraulic and Biophysical Processes; Entrepreneurship in Ocean and Water Resources Engineering

RESEARCH MENTORING

JTSURF Mentor, Scripps Institution of Oceanography, UC San Diego Summer 2024
One undergraduate; used kelp-farm position data to infer current direction and biomass.

REU and Undergraduate Summer Research Mentor, UIUC 2021
Three undergraduates; flow (ADV, PIV, wave gauges) and dissolved-oxygen measurements of vegetation effects on interfacial gas exchange under waves.

PROFESSIONAL SERVICE

- Convenor and Chair, AGU Fall Meeting 2024 session: *Biophysical and Physical Processes in Coastal Environments: Linking Nearshore to Onshore Processes Through Hydrodynamics, Sedimentary Processes, and Morphodynamics*
- Convenor, AGU Fall Meeting 2025 session: *Landscape Biophysical Interactions: Hydrodynamics, Sedimentary Processes, and Morphodynamics*
- Co-organizer, Grow-N networking meeting (Remote Sensing, Ocean and Water Resources researchers), AGU 2025
- Member, Isometric Science Network (carbon dioxide removal standard and registry), 2024 – present
- Graduate Student Advisory Committee, Civil and Environmental Engineering, UIUC, 2021–2022
- Treasurer, IAHR Student Chapter, UIUC, 2019–2020

HONORS AND FELLOWSHIPS

Mavis Future Faculty Fellowship, UIUC	2021–2022
List of Teachers Ranked as Excellent by Their Students, UIUC	2021
First Place, "Most Engaging Exhibit", Engineering Open House, UIUC	2021
Computational Science and Engineering Fellowship, UIUC (one of five institute-wide)	2018–2019
Ravindra K. and Kavita Kinra Fellowship, Civil and Environmental Engineering, UIUC	2016–2017
Merit-cum-Means Scholarship, Ministry of Human Resource Development, India	2011–2015

OUTREACH

- Engineering Open House, UIUC (2017–2023): led exhibits on Schlieren imaging and on the effectiveness of masks against droplet spread; mangrove replantation awareness for school audiences.
- DREAAM volunteer, Champaign-Urbana (2017–2023): hosted lab visits and science demonstrations for young students.
- SOPAN, IIT Roorkee (2011–2015): weekly teaching of middle-school students in Bhangeri village; annual talent-search examinations.

METHODS AND TOOLS

Numerical	LES/DNS (Nek5000), ADCIRC, FLOW-3D, MIKE FLOOD
Experimental	PIV, LIF, ADV, load cells, optical dissolved-oxygen sensors
Field	ADCP, CTD, Wirewalker
Programming	Python, MATLAB, Fortran, R

Early research experience: B.Tech. thesis on the planform morphology of the River Ganga (IIT Roorkee, 2014); internships at IIRS-ISRO (2014), Transerve Technologies (2013) and CTARA, IIT Bombay (2013).