

Saswata Nandi

Postdoctoral Researcher · Hydrology · University of California, Merced · California, USA
withsaswata@gmail.com · saswatanandi.github.io · ORCID 0000-0003-3833-966X · Google Scholar ·
github.com/iamsaswata · LinkedIn

Hydrologist working on wildfire, forest, and hydroclimate extremes — and turning those models into tools agencies actually use. **22 papers** (h-index 11; 567 citations); lead developer of **IMDLIB** (**251,000+ downloads**) and **ARWIN** (decision-support dashboard for El Dorado County Water Agency).

RESEARCH INTERESTS

Forest & Wildfire Hydrology	Effects of wildfire, forest management, and vegetation dynamics on water yield, evapotranspiration, and sediment fluxes
Hydroclimate Extremes & Risk	Drivers and impacts of atmospheric rivers, drought, and floods under a changing climate
Hybrid Physics-ML Hydrology	Coupling process-based hydrology with machine learning for forecasting and process understanding
Operational Hydrology	Hydrologic observatories, real-time decision support tools, and open-source software for water agencies and the research community (ARWIN, IMDLIB)

POSITIONS

2022 – present	Postdoctoral Research Scholar Sierra Nevada Research Institute, UC Merced, CA, USA ◆ ARWIN — real-time hydroclimate decision-support dashboard for El Dorado County Water Agency; two telemetry nodes (10 sites each); used by agency staff and basin stakeholders ◆ American River Hydrologic Observatory (ARHO) — field instrumentation for snowpack, soil-moisture, and meteorological monitoring ◆ 1 km VIC simulations across California (CWIS) with dynamic vegetation assimilation to quantify hydrologic impacts of wildfire and natural disturbance ◆ Post-fire soil-erosion and sediment-yield modelling across California burn scars
Jan – Apr 2015	Senior Research Fellow Indian Institute of Engineering Science and Technology, Shibpur ◆ Radioactive-tracer experiments and hydrodynamic modelling of dredge-material dispersion in a coastal river reach

EDUCATION

2022	Ph.D., Water Resources Engineering Indian Institute of Technology Bombay Advisor: M. Janga Reddy ◆ Process-based integrated modelling framework for hydrological simulation and flood forecasting
2015	M.E., Water Resources Engineering Indian Institute of Engineering Science and Technology, Shibpur ◆ Reservoir operation using dynamic programming and artificial neural network
2013	B.Tech, Civil Engineering Jalpaiguri Government Engineering College ◆ Statistical modelling and analysis of hydrological extremes

PUBLICATIONS

Journal articles

1. Kandhway, A., **Nandi, S.**, Conklin, M. H. & Safeeq, M. (2026). Comparing crop evapotranspiration estimation methods to evaluate water-saving potential of alternative land uses in the San Joaquin Valley, California. *Frontiers in Water*, 8, 1879797.
2. Datta, R., Janga Reddy, M. & **Nandi, S.** (2025). Assessment of climate change impacts on runoff and hydrological drought risk using the VIC-3L model and four-variate D-vine copulas in the Upper Bhima basin, India. *Journal of Water and Climate Change*, 16(11), 3447–3482.
3. Jha, P. K., Jha, P. K., Mehan, S. & **Nandi, S.** (2025). Editorial: Addressing climate change in agriculture and natural resources with a focus on adaptation and extreme events. *Frontiers in Environmental Science*, 13, 1722615.

4. Casirati, S., Conklin, M. H., **Nandi, S.** & Safeeq, M. (2025). Effect of Forest Management Practices on Water Balance Across a Water–Energy Gradient in the Upper Kings River Basin, USA. *Ecohydrology*, 18(1), e2753.
5. **Nandi, S.** & Swain, S. (2024). Role of groundwater systems in fulfilling sustainable development goals: A focus on SDG6 and SDG13. *Current Opinion in Environmental Science & Health*, 42, 100576.
6. **Nandi, S.** & Reddy, M. J. (2024). Investigating the projected changes in water balance components under climate change considering the effect of storage structures. *Journal of Water and Climate Change*, 15(5), 1981–2000.
7. Swain, S., Mishra, P. K., **Nandi, S.**, Pradhan, B., Sahoo, S. & Al-Ansari, N. (2024). A simplistic approach for monitoring meteorological drought over arid regions: a case study of Rajasthan, India. *Applied Water Science*, 14(2), 36.
8. **Nandi, S.**, Patel, P. & Swain, S. (2024). IMDLIB: An open-source library for retrieval, processing and spatiotemporal exploratory assessments of gridded meteorological observation datasets over India. *Environmental Modelling & Software*, 171, 105869.
9. Swain, S., Mishra, S. K., Pandey, A., Srivastava, P. K. & **Nandi, S.** (2024). Characterization and assessment of hydrological droughts using GloFAS streamflow data for the Narmada River Basin, India. *Environmental Science and Pollution Research*, 31(41), 54281–54294.
10. **Nandi, S.** & Janga Reddy, M. (2023). Improving the accuracy of multimodel short-to-medium-range precipitation and streamflow forecasts over the Upper Bhima river basin, India. *Hydrological Sciences Journal*, 68(13), 1864–1880.
11. **Nandi, S.** & Swain, S. (2023). Analysis of heatwave characteristics under climate change over three highly populated cities of South India: a CMIP6-based assessment. *Environmental Science and Pollution Research*, 30(44), 99013–99025.
12. **Nandi, S.** & Janga Reddy, M. (2022). Evaluating the performance of bias-corrected IMERG satellite rainfall estimates for hydrological simulation over the Upper Bhima River basin, India. *Geocarto International*, 37(27), 15505–15529.
13. **Nandi, S.** & Reddy, M. J. (2022). An integrated approach to streamflow estimation and flood inundation mapping using VIC, RAPID and LISFLOOD-FP. *Journal of Hydrology*, 610, 127842.
14. **Nandi, S.** & Manne, J. R. (2020). Spatiotemporal Analysis of Water Balance Components and Their Projected Changes in Near-future Under Climate Change Over Sina Basin, India. *Water Resources Management*, 34(9), 2657–2675.
15. **Nandi, S.** & Janga Reddy, M. (2020). Comparative performance evaluation of self-adaptive differential evolution with GA, SCE and DE algorithms for the automatic calibration of a computationally intensive distributed hydrological model. *H2Open Journal*, 3(1), 306–327.
16. **Nandi, S.** & Reddy, M. J. (2017). Distributed rainfall runoff modeling over Krishna river basin. *European Water*, 57, 71–76.

Book chapters

1. **Nandi, S.** & Reddy, M. J. (2021). Multiobjective Automatic Calibration of a Physically Based Hydrologic Model Using Multiobjective Self-Adaptive Differential Evolution Algorithm. *Climate Change Impacts on Water Resources*, pp. 435–448.
2. **Nandi, S.** & Janga Reddy, M. (2020). Parameter Estimation of a Macroscale Hydrological Model Using an Adaptive Differential Evolution. *Water Management and Water Governance*, pp. 243–255.
3. Swain, S., **Nandi, S.** & Patel, P. (2018). Development of an ARIMA Model for Monthly Rainfall Forecasting over Khordha District, Odisha, India. *Recent Findings in Intelligent Computing Techniques*, pp. 325–331.

Conference papers

1. **Nandi, S.** & Reddy, M. J. (2021). Parameter Estimation of VIC-RAPID Hydrological Model Using Self-adaptive Differential Evolution Algorithm. *Proceedings of International Conference on Scientific and Natural Computing*, pp. 137–146.
2. **Nandi, S.** & Reddy, M. J. (2018). Assessing Suitability of Satellite Rainfall Data for Estimation of Daily Streamflows of a Small Tropical Catchment in India. *IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium*, pp. 5278–5281.
3. Swain, S., Patel, P. & **Nandi, S.** (2017). Application of SPI, EDI and PNPI using MSWEP precipitation data over Marathwada, India. *2017 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 5505–5507.
4. Swain, S., Patel, P. & **Nandi, S.** (2017). A multiple linear regression model for precipitation forecasting over Cuttack district, Odisha, India. *2017 2nd International Conference for Convergence in Technology (I2CT)*, pp. 355–357.

Conference abstracts

1. Chakraborty, A., **Nandi, S.**, Abatzoglou, J. T. & Safeeq, M. (2025). Deciphering the Multiscale Influences of Drought Characteristics on the Water Use Efficiency Across CONUS Ecosystems. *AGU Fall Meeting 2025*, Abstract B41I-1968.
2. **Nandi, S.** & Safeeq, M. (2024). How Wildfires Alter Evapotranspiration Patterns in California: A High Resolution Hydrological Modelling Approach. *AGU Fall Meeting 2024*, Abstract GC51CC-0045.
3. Khan, S., Casirati, S., **Nandi, S.** & Conklin, M. H. (2024). Modeling the effects of forest thinning on the long-term water balance in a Mediterranean mixed-conifer basin. *AGU Fall Meeting 2024*, Abstract H23S-05.
4. **Nandi, S.** & Swain, S. (2023). Towards a reliable streamflow forecasting system: An evaluation of TIGGE multimodel ensemble forecasts in the Upper Bhima River Basin, India. *XXVIII General Assembly of the International Union of Geodesy and Geophysics (IUGG)*, Oral presentation, IUGG23-0380.
5. Datta, R., Reddy, M. J. & **Nandi, S.** (2022). Development of Regional Severity-Duration-Frequency and Severity-Areal extent-Frequency Curves for an Indian Basin Under Warming Climate. *AGU Fall Meeting 2022*, Abstract H41A-02.
6. **Nandi, S.** & Swain, S. (2022). Flood risk assessment and identification of hotspots under CMIP6 scenarios using a coupled physical modeling approach: A case study over the Mahanadi River Basin, India. *AGU Fall Meeting 2022*, Abstract H42B-1253.

GRANTS & FUNDING

- 2024 **A decision-support tool for mapping climate change and wildfire effect on Southern Sierra Nevada streamflow and sediment yield**
California Department of Water Resources (DWR) · USD 275,000
Postdoctoral Researcher (proposal preparation & project lead); UC Merced (SNRI)
- 2022 **SNRI Postdoctoral Grant**
Sierra Nevada Research Institute, UC Merced

HONOURS & FELLOWSHIPS

- MHRD/MoE National Doctoral Fellowship**
Competitive merit fellowship supporting full PhD tenure at Indian Institute of Technology Bombay.
- 2022 **AGU Travel Award**
American Geophysical Union, USA
- 2018 **IEEE Travel Award**
IGARSS Conference, Valencia, Spain
- 2017 **IIT Bombay Institute Travel Grant**
EWRA Conference, Athens, Greece

SOFTWARE & DATA PRODUCTS**IMDLIB**

Open-source Python package for retrieval, processing, and spatiotemporal analysis of gridded India Meteorological Department (IMD) observational datasets. 251,000+ downloads; community-adopted across India-focused hydroclimate research.

prismdata

Python package for programmatic access to PRISM climate data over the continental United States.

ARWIN

Real-time hydroclimate decision-support dashboard for the Upper American River Basin, built and maintained for El Dorado County Water Agency.

TEACHING

- 2016–2020 **Water Resources Engineering**
Teaching Assistant, IIT Bombay
- ◆ Developed lecture notes on rainfall–runoff processes, hydrograph analysis, reservoir planning and operation, and crop water requirements.
 - ◆ Designed and graded problem sets and term examinations.

- 2017–2018 **Advanced Experimental Fluid Mechanics**
 Teaching Assistant, IIT Bombay
 ♦ Mentored and coordinated graduate teaching assistants.
 ♦ Designed and evaluated student assessments.

STUDENT MENTORING

- Summer 2025 **Anthony Pedraza**
 Undergraduate, UC Merced — co-mentored on soil-erosion estimation in the Upper San Joaquin Basin
- Summer 2024 **Deep Singh Mehroke**
 Undergraduate, UC Merced — co-mentored on decision-support system design for the California Water Information System (CWIS)

PROFESSIONAL SERVICE

- Journal reviewer
 Journal of Hydrology · Hydrological Processes · Physics and Chemistry of the Earth · Science of the Total Environment · Environmental Modelling & Software · SoftwareX · npj Climate and Atmospheric Science and others — totaling over 100 reviews across 36 SCI journals.
- Editorial service
Guest Editor, Discover Applied Sciences
Guest Editor, Frontiers in Environmental Science
- Committees & events organised
 25 Feb – 01 Mar 2019 **Organizing Committee Member**
 CEP-QIP short-term training program on Advanced Computing Methods in Civil Engineering, Indian Institute of Technology Bombay, Mumbai
- 24–28 Feb 2019 **Technical Committee Member**
 The Eleventh International Conference on Advanced Geographic Information Systems, Applications, and Services (GEOProcessing 2019), Athens, Greece

PRESS & MEDIA

- Kolkata records hottest April; east and north-east sizzle**
 The Hindu (Data)
- A June with extremes: maximum temperature hits the lowest mark in Chennai, highest in Thiruvananthapuram**
 The Hindu (Data)
- Little correlation between higher temperatures and lower turnout**
 The Hindu (Data)
- Long read: Are heatwaves more deadly for women?**
 Significance Magazine

TECHNICAL SKILLS

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|-------------------------------|---|
| Hydrologic & Hydraulic Models | VIC · SWAT · LISFLOOD-FP · HEC-Suits |
| Statistics & Machine Learning | Copulas · evolutionary single/multi-objective optimization · deep neural networks · bias correction · time-series modelling |
| Programming Languages | Fortran · Python · R · Matlab · JavaScript |
| Geospatial Analysis | Google Earth Engine · QGIS · ArcGIS · GDAL · Python libraries (xarray, rioxarray, rasterio, geopandas, geoplot) |
| Parallel Processing / HPC | MPI · OpenMP · POSIX threads · HPC with various job schedulers |
| Database Management | MySQL · Postgres |
| Software Engineering | Git · Docker · GitHub Actions · CircleCI · Travis CI |

PROFESSIONAL MEMBERSHIPS

- American Geophysical Union (AGU)