

# Saroj Kumar Dash

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## EDUCATION

**Ph.D., Indian Institute of Technology Kanpur, India** 2023

Earth Science • CPI = 9.17

Thesis: Space-time hydrodynamics and crop water stress using multi-source Earth Observation data from an agriculture-dominated Critical Zone Observatory (CZO) in the Ganga basin, India

**M.Sc., Indian Institute of Technology Bhubaneswar, India** 2015

Geology • CPI = 8.61

**B.Sc., Ravenshaw University, Cuttack, India** 2013

Geology • Marks (%) = 73.30

## RESEARCH INTERESTS

- **Bio-geophysical controls of atmospheric carbon capture:** Investigating bio-geophysical drivers of nature-based carbon sequestration under heterogenous water stress, with emphasis on how single- vs. multi-component thresholds regulate plants carbon-water fluxes in a changing climate.
- **Multi-source Earth observations for catchment and field scale hydrology:** Integrating multi-source (*in-situ*, drone, satellite) Earth observations to characterize hydrological distinctiveness of croplands and identify underlying drivers across catchment to field scales.
- **Remote sensing of soil-plant-atmosphere continuum:** Advancing spaceborne and airborne remote sensing to enhance soil water estimation and quantify atmospheric evaporative demand across spatially heterogeneous canopies.

## RESEARCH EXPERIENCE

**Postdoctoral Scholar** Fall 2024 – ongoing

(University of California, Davis)

- Evapotranspiration and gross primary productivity flux dynamics over woody perennial crops in the central valley of California.

**Research Associate** Winter (2023) – Summer (2024)

(National Centre for Earth Science Studies, India)

- Long-term vegetation resilience in South India and its impact on vegetation carbon pool.
- Operational soil moisture assessment across the climatic zones of Indian mainland.

**Project Scientist****(Summer – Fall) 2023**

(Indian Institute of Technology Kanpur, India)

- Field-scale vegetation stress detection using airborne thermal and multispectral imagery in the Ganga basin critical zone observatory.
- Sensitivity of SAR-derived soil moisture observations to evapotranspiration dynamics.

**Visiting Research Student****Summer and Fall (2019)**

(University of Leicester and King's College London, UK)

- Assessment of clear sky Sentinel-3 Sea and Land Surface Radiometer (SLSTR) and drone-based land surface temperature (LST) observations.
- Atmospheric radiance modelling using MODTRAN-based radiative transfer model for top-of-atmosphere correction.

**Research Scholar****2015 – 2023**

(Indian Institute of Technology Kanpur, India)

- Comprehensive assessment of passive microwave satellite soil moisture (SM) observations.
- Geostatistical approaches for depicting drivers and optimal sampling strategy of SM and groundwater dynamics.
- Land surface temperature and crop water stress estimation using aerial thermal and multispectral imagery during seasonal crop cycles.
- Development of framework for high-quality in-situ hydrometeorological observations and unmanned aerial vehicle (UAV) data capture.

**HONORS AND AWARDS**

- First prize in Flash presentation at the UC Davis Postdoctoral Symposium 2025
- IEEE GRSS Travel Support to attend International Soil Moisture School at IIT Bombay, 2023
- Student travel grant to attend AGU Fall Meeting 2018, held at Washington, USA, 2018
- Graduate Aptitude Test in Engineering (GATE) – 2015 and National Eligibility Test (NET) – 2016
- Paid summer Intern at Wadia Institute of Himalayan Geology (WIHG), Dehradun, India, 2014
- Innovation in Science Pursuit for Inspired Research (INSPIRE) scholarship by Department of Science and Technology, Government of India among the top 1% in 12<sup>th</sup> board examination, 2010–2015.

**PUBLICATIONS****Journals and Magazines**

- **Dash, S.K.**, Sembhi, H., Langsdale, M., Wooster, M., Dodd, E., Ghent, D. and Sinha, R., 2025. Assessing the field-scale crop water condition over an intensive agricultural plain using UAV-based thermal and multispectral imagery. *Journal of Hydrology*, 655, p.132966. DOI: [10.1016/j.jhydrol.2025.132966](https://doi.org/10.1016/j.jhydrol.2025.132966)
- van der Vliet, M., Malbeteau, Y., Ghent, D., de Haas, S., Veal, K., van der Zaan, T., Sinha, R., **Dash, S.K.** & Houborg, R. & de Jeu, R. (2024). Quantifiable impact: monitoring landscape restoration from space. A regreening case study in Tanzania. *Frontiers in Environmental Science*, 12, p.1352058. DOI: [10.3389/fenvs.2024.1352058](https://doi.org/10.3389/fenvs.2024.1352058)

- **Dash, S.K.** & Sinha, R. (2022). Space-time dynamics of soil moisture and groundwater in an agriculture-dominated critical zone observatory (CZO) in the Ganga basin, India. *Science of The Total Environment*, 851, p.158231. DOI: [10.1016/j.scitotenv.2022.158231](https://doi.org/10.1016/j.scitotenv.2022.158231)
- **Dash, S.K.** & Sinha, R. (2022). A Comprehensive Evaluation of Gridded L-, C-, and X-Band Microwave Soil Moisture Product over the CZO in the Central Ganga Plains, India. *Remote Sensing*, 14(7), p.1629. DOI: [10.3390/rs14071629](https://doi.org/10.3390/rs14071629)
- Gupta, S., Karumanchi, S.H., **Dash, S.K.**, Adla, S., Tripathi, S., Sinha, R., Paul, D. & Sen, I.S. (2019). Monitoring ecosystem health in India's food basket, *Eos science news magazine*, 100. DOI: [10.1029/2019EO117683](https://doi.org/10.1029/2019EO117683)

### **Manuscripts in communication**

- Dash, S.K., Sembhi, H., and Sinha, R., “Integrating UAV thermal imagery and *in-situ* data for high-resolution crop water stress–soil moisture dynamics over India’s agricultural hotspot” (*Accepted for publication in International Journal of Remote Sensing*).

### **Conferences and Workshops**

- **S. Dash**, N. E. Bambach, K. Knipper, A. McElrone, W. P. Kustas, A. Gal, M. Levinson, K. Estrada, Spatiotemporal Variability and Impacts of Canopy and Atmospheric Stress in Almond Orchards, 36th Conference on Agricultural and Forest Meteorology, 2025
- K. S. Sreekutty, **S. K. Dash**, S. Krishnan, S. G. Thampi, Inferring the spatiotemporal interdependency of soil moisture–rainfall Coincidences over the Indian region, EGU General Assembly, 2025, DOI: [10.5194/egusphere-egu25-936](https://doi.org/10.5194/egusphere-egu25-936)
- R. Sinha, S. Behera, **S. K. Dash**; Field-Scale Soil Moisture Estimation Integrating SENTINEL-1 SAR Data with Uav-Based Thermal and Multispectral Imagery Over AN Agricultural Czo in the Ganga Basin, India, American Geophysical Union Fall Meeting, 2023, DOI: 2023AGU FM.H11I1375S
- **S. K. Dash**, S. R. Behera, R. Sinha, D. K. Pandey; Multi-source soil moisture retrieval over the agriculture-dominated Critical Zone Observatory (CZO) in the Ganga basin: a potential cal/val site for the NISAR mission, NASA-ISRO Synthetic Aperture Radar (NISAR) Science Workshop, 2023
- **S. K. Dash**, R. Sinha; Comprehensive evaluation of space-based passive microwave gridded data in the central Ganga plain, India, IEEE GRSS Soil Moisture School, 2023
- **S. K. Dash**, H. Sembhi, R. Sinha, M. Langsdale, M. Wooster; Estimating the Crop Water Stress in the agricultural Critical Zone Observatory (CZO) in Central Ganga Plain, India, using Thermal and Multispectral Aerial Imagery, American Geophysical Union Fall Meeting, 2022
- **S. K. Dash**, R. Sinha; Validation of SMAP and AMSR2 satellite soil moisture data over the Critical Zone Observatory in central Ganga plains, North India using ground-based observations, EGU General Assembly, 2021, DOI: [10.5194/egusphere-egu21-4667](https://doi.org/10.5194/egusphere-egu21-4667)
- **S. K. Dash**, R. Sinha; Understanding spatio-temporal dynamics in soil moisture and groundwater in a Critical Zone Observatory (CZO) in Ganga basin, North India, American Geophysical Union Fall Meeting, 2020
- R. Sinha, **S. K. Dash**, H. Sembhi, D. Ghent, M. Wooster, C. Joshi, M. Jain, P. Franses,; Understanding community perspectives for estimation of crop water stress in an agriculture dominated CZO in the Ganga plains, India, American Geophysical Union Fall Meeting, 2019

- **S. K. Dash**, S. Gupta, R. Sinha, S. Tripathi; Downscaling of Soil Moisture Active Passive (SMAP) Satellite Data for the Small Agricultural Critical Zone Observatory of the Ganga Basin, American Geophysical Union Fall Meeting, 2018
- S. Gupta, S. Tripathi, R. Sinha, S. H. Karumanchi, D. Paul, S. N. Tripathi, I. S. Sen, **S. K. Dash**; Setting up a new CZO in the Ganga basin: instrumentation, stakeholder engagement and preliminary observations, American Geophysical Union Fall Meeting, 2017
- D. Paul, S. Tripathi, K. S. Harsha, S. Adla, **S. K. Dash**, Y. Chander, P. Mahajan, S. N. Tripathi, I. S. Sen, and R. Sinha; Challenges and lessons learned in establishing a critical zone observatory in an intensively managed rural landscape of India, American Geophysical Union Fall Meeting, 2016
- **S. K. Dash**, A. K. Rai; Understanding Earthquakes and Tsunami Hazard in Bay of Bengal, National Conference of Ocean Society of India, 2015

## PROGRAMMING AND INSTRUMENTATION SKILLS

**Coding and Software:** Python, MATLAB, Google Earth Engine, R-Studio, GIS Tools (ArcGIS, QGIS, SAGA GIS)

**Data Analysis Skills:** Satellite and Airborne Data, In-situ Hydrometeorological Data, Geostatistical Computations, Machine Learning and Hydrological Modelling, Eddy Covariance Fluxes

**Instrumentation:** In-situ weather station, Infrared Radiometer (IRT), Soil moisture sensors (ML3 Theta Probe, WaterScout SM100, Trime Pico), Eddy Covariance System, Leaf Area Index meter, Groundwater level recorder, Aerial Imaging Thermal and Multispectral Camera

## PROFESSIONAL SERVICES

### Mentoring Graduate Students:

- Anshida Nasrin P, M. Tech. at Government Engineering College Thrissur 2025 (Ongoing)  
Research title: Spatiotemporal Variability and Influence of Soil Moisture on Radar Derived Vegetation Indicators
- Sreekutty K S, M. Tech. at National Institute of Technology (NIT) Calicut 2025  
Research title: Long-term spatiotemporal variability of vegetation resilience and its potential drivers in Indian climatic regime
- Sandra Sanjay Kumar, Government Engineering College Thrissur 2024  
Research title: Validation of Satellite and Model Derived Soil Moisture Products Using In-Situ Observations over Indian Mainland
- Sreekutty K S, Intern at National Institute of Technology (NIT) Calicut 2024  
Research title: Statistical Analysis of Rainfall & Soil Moisture Relationship Over India
- Aparna R R, Intern at College of Engineering Trivandrum 2024  
Research title: Factors Influencing Spatio-temporal Variability of Soil Moisture
- Sambit Ranjan Behera, M. Tech. at Indian Institute of Technology Kanpur (IITK) 2021  
Research title: Understanding Soil moisture – temperature interaction in an agricultural dominated CZO in the Ganga Basin, India

**Journal(s) Peer Reviewer:** Journal of Hydrology, International Journal of Remote Sensing, Climate Change

**Book(s) Reviewer:** A chapter in the book titled as “Blue Sky, Blue Water – Strategies for Protecting Air and Water Quality in the 21st Century” by Springer publisher

## PROJECT CONTRIBUTIONS

- 2024–ongoing: Tree-crop Remote sensing of Evapotranspiration eXperiment (T-REX), USA
- 2017–2021: Thermal infrared technologies for supporting environmental assessment and decision making in the Ganges Basin by Science and Technology Facilities Council (STFC), UK,
- 2015–2019: Establishing a Critical Zone Observatory in the Ganga Basin: Focus on water balance, water quality, and hydro-meteorological information system by Ministry of Earth Sciences (MoES), New Delhi,

## STAKEHOLDER ENGAGEMENTS

- Participated and presented at the stakeholder consultation workshop, organized by The Energy and Resources Institute (TERI), New Delhi
- Organized multiple community engagements at local scale for disseminating research outcomes on sustainable water resource management, jointly with The Flow Partnership (a UK-based NGO).

## CERTIFIED LEARNING MODULES

- 2022: Introduction to Data Science in Python by University of Michigan
- 2022: Overview of Geoprocessing using Python, Hyperspectral and Microwave Remote Sensing Techniques for Geological Studies by Indian Institute of Remote Sensing, ISRO
- 2021: Python applications for Hydrology and Hydrogeology by Australian Water School
- 2020: Maps and the Geospatial Revolution by Pennsylvania State University
- 2020: MATLAB Onramp by MathWorks Training Services
- 2020: Programming for Everybody (Getting Started with Python), Python Data Structures, and Using Python to Access Web Data by University of Michigan

## CULTURAL AND LEADERSHIP ACTIVITIES

- 2015–2020: Organized and performed music, theatres in the Utkal Parishad Odisha community at IIT Kanpur
- 2018: Participated in the Singing competition round of Colors of Youth (Season 7)
- 2015–2017: Cultural Secretary of the Odisha community (Utkal Parishad), IIT Kanpur