

Dr. Rajasweta Datta



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Summary

I am a seasoned geospatial researcher with expertise spanning over a decade in Remote Sensing, GIS, Hydrology, and Microclimate studies. My academic journey began with a bachelor's degree in Electronics and communication engineering, my passion for earth observation and image processing led me to do a Master's in Remote Sensing from Banasthali University, which ultimately culminated in pursuing a Ph.D. in Geography and later a postdoctoral fellowship at the University of Canterbury, New Zealand.

Throughout my career, I've actively participated in impactful projects with global significance. Notably, leveraging satellite remote sensing, I researched microclimatic zones across Dry Valleys in Antarctica, the largest span of ice-free area in the region within the New Zealand DryVER project. My postdoctoral research at the Geospatial Research Institute, UC, focused on the Rongowai Project a NASA, Air NZ, and University of Auckland initiative, where I employed machine learning to estimate near-surface soil moisture from GNSS-R signals. Earlier, working as a Junior Research fellow at the Indian Institute of Remote Sensing, ISRO, I played a key role in automating land cover classification for a funded project and collaborated with the National Remote Sensing Center to estimate evapotranspiration across the Sundarbans mangroves for my master's thesis.

During my Ph.D., I dedicated four years to teaching at the University of Canterbury and throughout my tenure, I contributed to various smaller projects, including thermal remote sensing studies on Tasman Glacier, and analyzing historical and predicted climate data in New Caledonia to aid farmers in adapting agricultural practices that are in tune to the changing climatic conditions.

Currently, I leverage this diverse experience as a Program Manager for the Mapping and Monitoring team within the Food Land and Water group at WRI India. Here, I lead the Monitoring of Restoration initiatives using satellite remote sensing and ground-based data collection, ensuring the success of critical restoration projects.

Work Experience

09/2023 – current

World Resources Institute India | New Delhi, India

Program Manager Mapping and Monitoring

Food Land and Water Group

Profile link: <https://wri-india.org/profile/rajasweta-datta>

I am heading the Mapping and Monitoring team within the FLW group, overseeing the monitoring of various restoration initiatives conducted by WRI India across different regions of India.

Responsibilities:

- Lead the development of a hydrological monitoring framework.
- Collaborate with the team and external experts to identify key performance indicators (KPIs) reflecting the impact of hydrological interventions on the broader landscape.
- Develop comprehensive methodologies for each KPI within the hydrological monitoring framework.
- Pilot the monitoring framework on ongoing projects to evaluate and test its effectiveness and refine it for broader implementation.
- Data collection: ground and satellite remote sensing data
- Partner with the WRI's global team working to establish a biophysical monitoring framework for tree-based interventions.
- Participate in ground-based data collection, processing, and reporting, following the established methodology for tree-based interventions.

07/2021 – 12/2022

Geospatial Research Institute | Christchurch, New Zealand

Post Doctoral Research Fellow

Led the collaborative effort between NASA and the University of Auckland to create a machine-learning framework for automatic soil moisture estimation. This project leveraged a next-generation GNSS-R sensor installed on Air New Zealand flight Q300. Link: <https://spoc.auckland.ac.nz/>

Responsibilities:

- Data acquisition and processing: This involved collecting and preparing the necessary data for the machine learning model.
- Model development: I designed and implemented a machine learning framework for soil moisture estimation using a Random Forest algorithm in R. This framework incorporated various data from different sources, including Satellite data, Soil data, Terrain data, and In-situ soil moisture measurements.

09/2016 - 02/2021

University of Canterbury | Christchurch, New Zealand

Senior Teaching Assistant

For four years during my PhD studies, I actively contributed as a teaching assistant for GIS, Remote Sensing, and R programming courses.

Responsibilities:

- Facilitating laboratory sessions: I guided students through practical exercises, ensuring comprehension of course concepts.
- Supporting student learning: Provided individual and group assistance with assignments and submissions, fostering their technical skills and problem-solving abilities.
- Contributing to the assessment process: I participated in grading and providing constructive feedback on student work, contributing to their learning journey.

10/2014 - 08/2015

Indian Space Research Organization | Dehradun, India

Junior Research Fellow

Developed an automated system for identifying and monitoring water, vegetation, and built-up areas in a funded project under the Photogrammetry and Remote Sensing Department: "Automatic Retrieval System and Monitoring of Water, Vegetation, and Built-Up Area at Variable Scale using Remotely Sensed Images." Utilized ENVI for image processing and ERDAS Imagine for index development, including calculating thresholds for extracting features like water bodies, vegetation, and built-up areas from multi-spectral and hyper-spectral satellite data using indices like NDVI, NDWI, and NDBI.

Skills

- Research Strategy.
- Qualitative and quantitative research.
- Remote Sensing, GIS-based analysis
- Data Mining
- Programming R, MATLAB, Python.
- Machine Learning.
- Software: ERDAS imagine, ARC GIS Pro, Arc Map, SNAP, ENVI, QGIS
- Satellite data: Sentinel 1-2, Landsat series, MODIS (all Product), Hyperion, quick bird data, world view data.

Education

2016-2021

University of Canterbury | Christchurch, New Zealand

Doctor of Philosophy: Geography

Dissertation title: A foehn climatology of the McMurdo Dry Valleys (MDV) of Antarctica using satellite remote sensing data.

Link: <https://ir.canterbury.ac.nz/items/831e04f3-aed6-4cd2-a969-9764dfc4c13f>

My field expedition to the McMurdo Dry Valleys in Antarctica provided invaluable experience in deploying and operating meteorological equipment in harsh environments. This trip included the crucial task of identifying foehn winds, analyzing their thermal signatures, and determining their footprint across the valley floor. Beyond the fieldwork, I utilized my programming skills in MATLAB and R to analyze both ground-based meteorological data and satellite-derived information (LST and DEM) to understand the thermal signature of foehn winds across the valley floor. Additionally, I leveraged ArcGIS tools for efficient management of remote sensing and GIS data. This allowed me to extract valuable terrain information from DEM data and even develop an algorithm for automatic foehn detection based on winter temperature fluctuations in the Land Surface Temperature data. Finally, I conducted an extensive analysis of data from stream gauges, in-situ measurements, and meteorological sources, revealing a correlation between glacial melt, summer temperatures, and foehn-induced warming.

2012-2014

Banasthali Vidyapeeth | Rajasthan, India

Master of Technology: Remote Sensing

Dissertation title: Conjunctive Use of Eddy Covariance Method and Remote Sensing Data for The Establishment & Temporal Integration of Evapotranspiration.

My dissertation focused on estimating evapotranspiration (ET) across the Sundarbans Mangroves. This involved utilizing Landsat 7 & 8 data: I employed ENVI for atmospheric correction and spectral analysis of both Landsat imageries. Used SEBAL algorithm and implemented the model using the ERDAS Model Maker to calculate various components of the energy balance equation, ultimately leading to the estimation of Latent Heat Flux. This flux was then converted to ET.

2007-2011

Uttaranchal Institute of Technology | Dehradun, India

Bachelor of Technology: Electronics and Communication Engineering

Publications

- “Meteorological Connectivity from Regions of High Biodiversity within the McMurdo Dry Valleys of Antarctica” September 2019 Journal of Applied Meteorology and Climatology. 58(11)
DOI:10.1175/JAMC-D-18-0336.1
- Submitted and under review at Journal of Geophysical Research “The winter Foehn footprint across McMurdo Dry Valleys of Antarctica using a satellite-derived dataset – AntAir v1.0”.

Recent Conference publications:

IEEE IGARSS 2024

PREDICTION OF SOIL MOISTURE FROM NEAR-GLOBAL CYGNUS GNSS-REFLECTOMETRY USING A RANDOM FOREST MACHINE LEARNING MODEL

- M.D. Wilson, R. Datta, S. Savarimuthu, Geospatial Research Institute, Toi Hangarau, University of Canterbury, New Zealand
- D. Moller, Dept. Electrical, Computer, and Software Engineering, University of Auckland, New Zealand
- C. Ruf, Dept. Climate and Space Sciences and Engineering, University of Michigan, United States

IEEE IGRASS 2022

RONGOWAI: A PATHFINDER NASA/NZ GNSS-R INITIATIVE SUPPORTING SDG-15 - LIFE ON LAND

- Delwyn Moller, University of Auckland, New Zealand.
- Matthew Wilson, Rajasweta Datta, University of Canterbury, New Zealand.
- Andrew O'Brien, Ohio State University, United States.
- Ryan Linnabary, University Corporation for Atmospheric Research, United States.
- Chris Ruf, University of Michigan, United States

AGU Fall Meet 2022

NS42A-07 Soil Moisture Estimation from CYGNSS using Machine Learning

- Rajasweta Datta, University of Canterbury, Geospatial Research Institute, Christchurch, New Zealand,
- Matthew Wilson, University of Canterbury, School of Earth and Environment - Geospatial Research Institute, Christchurch, New Zealand,
- Delwyn Moller, Department of Electrical Computer & Software Engineering, The University of Auckland, Auckland, New Zealand
- Christopher S Ruf, University of Michigan Ann Arbor, Climate and Space, Ann Arbor, United States

NS42A-06 First Results From the Rongowai Airborne GNSS-R mission

- Delwyn Moller¹, Christopher S Ruf², Rajasweta Datta³, Scott Gleason⁴, Mike Laverick¹, Xiaoyou Lin⁵, Stephen Musko⁶, Andrew O'Brien⁷, Chris Seal¹ and Matthew Wilson⁸, (1)University of Auckland, Auckland, New Zealand, (2)University of Michigan Ann Arbor, Climate and Space, Ann Arbor, United States, (3)University of Canterbury, Christchurch, New Zealand, (4)Southwest Research Institute Boulder, Boulder, CO, United States, (5)Department of Electrical Computer & Software Engineering, The University of Auckland, Auckland, New Zealand, (6)University of Michigan Ann Arbor, Ann Arbor, United States, (7)Ohio State University-Main Campus, Electrical & Computer Engineering, Columbus, OH, United States, (8)University of Canterbury, School of Earth and Environment - Geospatial Research Institute, Christchurch, New Zealand