

An Indian-Australian research partnership

Project Title: **Algorithm for Improving Satellite Rainfall Estimates using Surface Soil Moisture**

Project Number **IMURA0894**

Monash Main Supervisor
(Name, Email, Phone)

Prof. Jeffrey Walker
Email: jeff.walker@monash.edu

Full name, Email

Monash Co-supervisor(s)
(Name, Email, Phone)

Monash Head of Dept/Centre (Name, Email)

Prof. Jeffrey Walker
Email: jeff.walker@monash.edu

Full name, email

Monash Department:

Department of Civil Engineering

Monash ADGR
(Name, Email)

Full name, email

IITB Main Supervisor
(Name, Email, Phone)

Prof. RAAJ Ramsankaran
Email: ramsankaran@civil.iitb.ac.in

Full name, Email

IITB Co-supervisor(s)
(Name, Email, Phone)

Full name, Email

IITB Head of Dept
(Name, Email, Phone)

Prof. T.I. Eldho
Email: edlho@civil.iitb.ac.in

Full name, email

IITB Department:

Department of Civil Engineering

Research Clusters:

Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? <i>(Please nominate JUST one. For more information, see www.iitbmonash.org)</i>		Highlight which of the Academy's Theme(s) this project will address? <i>(Feel free to nominate more than one. For more information, see www.iitbmonash.org)</i>	
1	Material Science/Engineering (including Nano, Metallurgy)	1	Advanced computational engineering, simulation and manufacture
2	Energy, Green Chem, Chemistry, Catalysis, Reaction Eng	2	Infrastructure Engineering
3	Math, CFD, Modelling, Manufacturing	3	Clean Energy
4	CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control	4	Water
5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
6	Bio, Stem Cells, Bio Chem, Pharma, Food	6	Biotechnology and Stem Cell Research
7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management	8	Design

The research problem

Define the problem

Rainfall is a crucial source of water in most part of the world. Countries like India, Australia are known for its vulnerability to rainfall variability that impacts the natural resources (water, vegetation), and subsequently the wellness of populations. Knowledge of rainfall spatio-temporal distribution is essential to various applications such as agricultural crop yield estimates, flood nowcasting, dam management, etc. Rain-gauges provide the most common and most direct measurement of point rainfall at the surface; therefore, they are generally assumed as the most accurate method to measure rainfall. Unfortunately, the gauge networks are scarce and have been degrading over the last few decades.

Against this context, satellite-based rainfall products represent an alternative for providing rainfall knowledge in such areas. In recent decades, significant progress has been made in satellite rainfall estimation. However, still many drawbacks exist, especially in near real time products. For example, most real-time products exhibit moderate to high (positive or negative) biases.

One potential strategy for improving satellite rainfall products is to use soil moisture measurements from satellite microwave sensors. The soil moisture signature from rainfall can persist from a few hours to several days after a rain event, and hence a knowledge of the temporal and spatial variability of soil moisture could benefit rainfall retrievals from space.

Project aims

Define the aims of the project

The project aims to develop a new approach to improve near-real-time satellite-based rainfall estimates through satellite-based surface soil moisture retrievals with demonstration in Australia and India.

Expected outcomes

Highlight the expected outcomes of the project including likelihood of patents

- A new algorithm for improving near real-time satellite rainfall products.
- 2-3 high impact publications

How will the project address the Goals of the above Themes?

Describe how the project will address the goals of one or more of the 6 Themes listed above.

The project fits well in the following themes “(i) Water and (ii) Advanced computing”. The project deals with satellite remote sensing of rainfall and how to improve the satellite rainfall products accuracy. This is all about water. Likewise, the project involves advanced computing, to deal with big data, machine learning, deep learning etc.

Capabilities and Degrees Required

List the ideal set of capabilities that a student should have for this project. Be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.

Academic Qualification:

M.E./ M. Tech/MS/M.Sc. (Post graduate) in Geoinformatics/Remote Sensing/Earth Sciences/Hydrology or Water Resources with exposure to remote sensing data products.

Candidates should have strong background in mathematics.

Skills required:

Applicants will need to have some experience in machine learning/deep learning. Experience of computer programming (eg. Fortran, Matlab, Python, R) is of advantage. Expertise in remote sensing data

processing for rainfall estimations and/or soil moisture is preferred.

Apart from this, the candidate should have very good English skills for oral as well as written communications.

Select up to **(4)** keywords from the Academy's approved keyword list (**available at <http://www.iitbmonash.org/becoming-a-research-supervisor/>**) relating to this project to make it easier for the students to apply.

Data Science Optimisation, Algorithm; Modelling and Simulations; Water and Climate change