

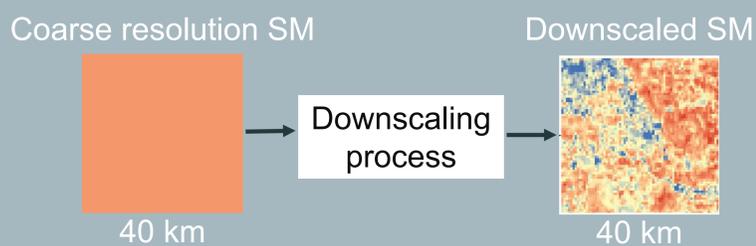
Impact of Vegetated Land Cover on Satellite Soil Moisture Downscaling

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Research Problem

- Accurate **soil moisture (SM)** data are critical to ensure appropriate irrigation levels, support plant growth, and encourage soil health in farming.
- **In-situ SM probes** provide sufficiently accurate measurements. But they are costly, labour intensive, and limited to small areas.
- **Satellite imagery** can provide SM data in a timely and cost-effective manner with broad coverage. But they are limited by coarse spatial resolution and can only measure the top 5cm of soil surface.
- A technique of '**downscaling**' is therefore used to enhance the coarse spatial resolution of satellite SM outputs.



Approach

1. Downscale Soil Moisture Active Passive (SMAP) **satellite SM of top 5cm** into **daily sub kilometre** resolution using machine learning techniques.

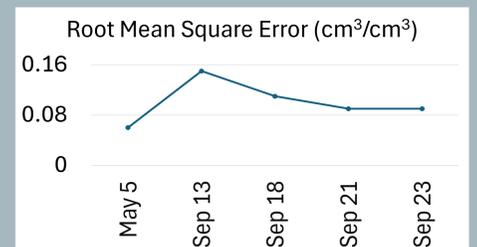
2. Leveraging machine learning techniques to derive SM of **top 30cm** at **daily sub kilometre** resolution from satellite imagery and soil profile characteristics extracted from national soil grid.



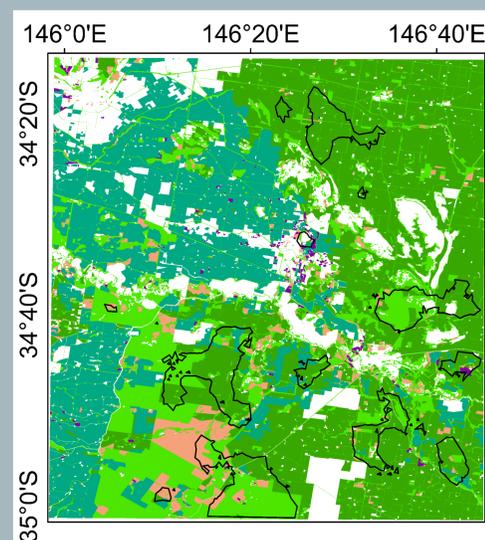
3. The **robustness** of these two approaches will be **tested** in different geographic regions.

Findings

The random forest machine learning model showed high root mean square error for September 13 during validation.

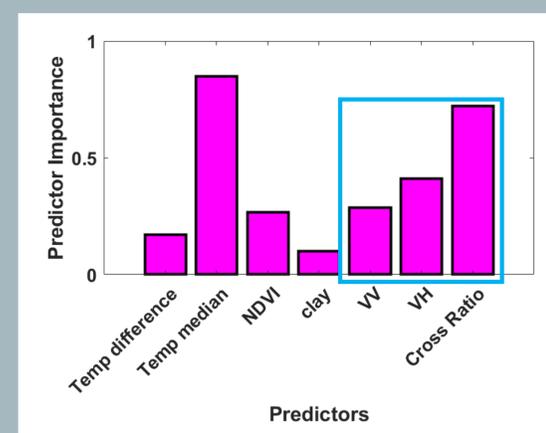


The high error on September 13 was further analysed against vegetated land cover variability using the bias (>20%) between downscaled and airborne SM.



Cropping and grazing native vegetation contained **90%** of bias areas indicating the influence of vegetation on **SM downscaling**.

Key finding: The Sentinel-1 parameters of **VV** backscatter, **VH** backscatter and **cross ratio** (VH – VV) were important for capturing variability in vegetated land cover.



→ Indicates capacity for using these parameters to improve SM downscaling and address a key limitation of satellite SM data