

# Working Group on Soil Moisture Variability: “Understanding drivers and feedbacks of soil moisture variability across scales, from local to global”

**Overall aim:** Accelerating our understanding of time-space variability of terrestrial hydrology across scales, with a focus on soil moisture, and the drivers and feedbacks.

## Rationale:

- Soil moisture (SM) is the key state variable of the terrestrial hydrological cycle and controls the evolution of the water, energy and carbon cycles.
- SM varies over a wide range of spatial and temporal scales (from metres to landscape scales, and from hours to inter-annually), driving complex interactions between these cycles.
- However, our knowledge of this variability and its drivers is limited to a small sets of field studies or coarse resolution (> 1km) and uncertain satellite and model estimates.

## Contribution to HELPING Themes and Goals:

- Focus on processes at the local scale, across landscapes and regions to understand differences and similarities.
- Collate large-sample datasets from in-situ observations, complemented by modelled and satellite data.
- Understand how local drivers convolve to produce larger scale (emergent) properties, and how global changes drive changes locally.
- Requires community synthesis of existing data and knowledge.
- Lead to new methods and datasets to bridge across scales, with potential practical applications for monitoring and assessment.

## Methods:

- **Initial workshop, survey, and literature review** to synthesize the state of knowledge and data on process-scale variability in terrestrial hydrology, and identify research questions.
- **Community organization** (e.g., via online collaboration, EGU meetings) to identify sub-WGs or sub-projects to explore ways to develop new datasets and methods to better represent local scale variability and understand drivers and feedbacks.
- The working group will focus on **engaging outside of North America/Europe** and to have dispersed and diverse leadership and membership.
- **Training workshops and online resources** to build research capability and document knowledge and data.

## Proposed outcomes:

- Short-term – Synthesis of current knowledge, methods and datasets. New research questions that can help drive community work on the topic.
- Long-term – New datasets and models to better represent process-scale variability across different landscapes. New approaches to quantify and understand variability across scales.
- Ultimate – New understanding of spatio-temporal variability across scales, its drivers, and feedbacks, and how this can improve applications (e.g., agricultural water management, flood mitigation, biodiversity/habitat maintenance, carbon mitigation), including example applications/case studies.

## Contact:

Justin Sheffield, University of Southampton, UK

[justin.sheffield@soton.ac.uk](mailto:justin.sheffield@soton.ac.uk)