

Improving soil moisture estimates in the UK and globally

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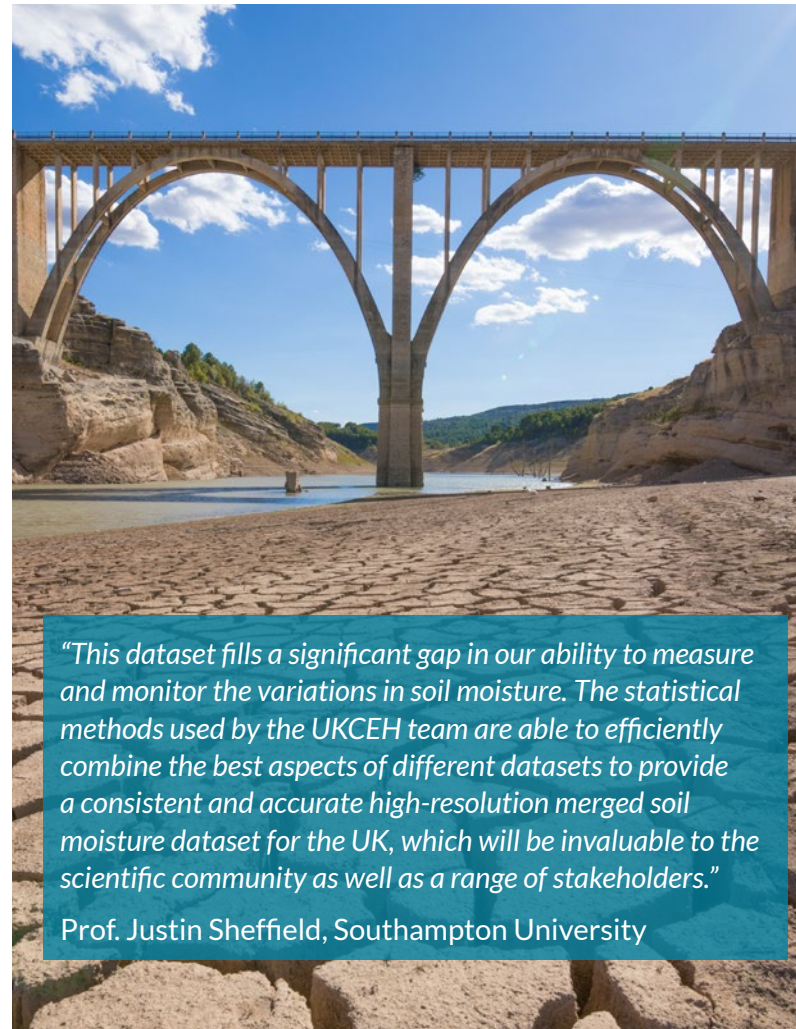


Hydro-JULES

Why it matters

Soil moisture is of fundamental importance to many hydrological, biological, biogeochemical and meteorological processes. Accurate information about soil moisture is therefore valuable to a wide range of decision-makers concerned with weather, flood control, soil erosion and slope failure, water management, geotechnical engineering, water quality, irrigation and agriculture, among others.

Despite this, widespread, continuous and reliable measurements of soil moisture are currently not widely available around the world. Field equipment provides reliable and continuous measurements, but only for a single location. Remote sensing using satellites, in contrast, generates regional maps of soil moisture, but the accuracy of these maps is variable, with missing data and low spatial resolution common problems. Soil moisture models provide information that is continuous and high resolution; however, such models are indirect estimates based on numerical simulations, and are therefore less reliable than observations.



“This dataset fills a significant gap in our ability to measure and monitor the variations in soil moisture. The statistical methods used by the UKCEH team are able to efficiently combine the best aspects of different datasets to provide a consistent and accurate high-resolution merged soil moisture dataset for the UK, which will be invaluable to the scientific community as well as a range of stakeholders.”

Prof. Justin Sheffield, Southampton University

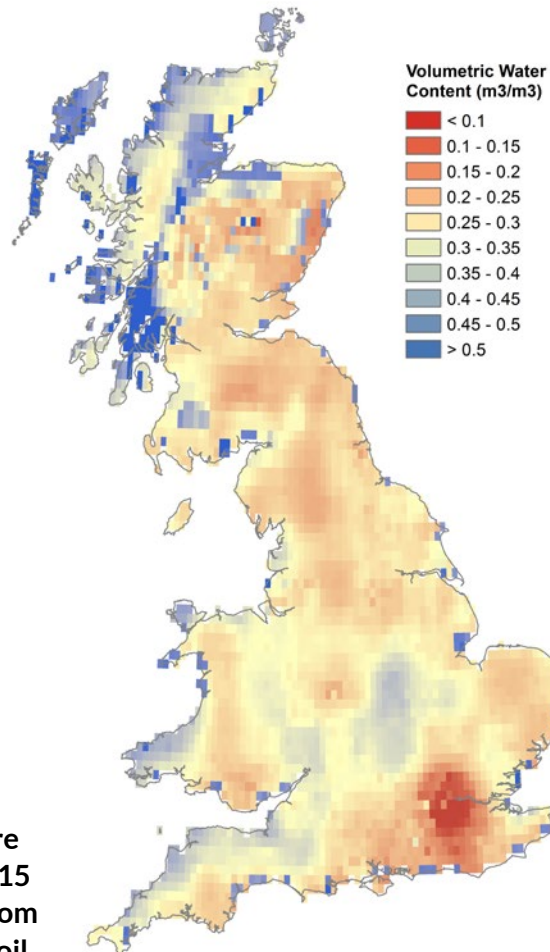
Accurate information about soil moisture is valuable to a wide range of decision-makers

Hydro-JULES, is a research programme funded by the UK’s Natural Environment Research Council (NERC), in order to advance our ability to predict the future availability of water resources and the risk of water related disasters under a changing climate.

The Hydro-JULES programme is building a three-dimensional, open source, community model of the terrestrial water cycle to support and enable collaborative work across the research and academic communities in hydrology and land-surface science. This five-year programme is delivered by the UK Centre for Ecology & Hydrology (UKCEH) in partnership with the British Geological Survey (BGS) and National Centre for Atmospheric Science (NCAS).

w: hydro-jules.org
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Map of soil moisture on the 4th April 2015 for Great Britain from the Hydro-JULES soil moisture product



What we did

In order to develop continuous, high resolution and reliable soil moisture measurements, Hydro-JULES has used a cutting-edge method called Triple Collocation Analysis to combine different types of soil moisture products in a statistically optimal way, creating a single blended product for England, Wales and Scotland. This new product combines data from two satellites (SMAP and ASCAT) and a model (JULES-CHESS), and assesses the results against the COSMOS-UK network, a long-term network of soil moisture monitoring sites managed by UKCEH and supported by Natural Environment Research Council (NERC) national capability funding. This provides users with estimates of soil moisture that are not only more accurate, but high resolution and continuous. This will help scientists from a range of disciplines advance the understanding of many land surface processes.

Impacts and benefits

The future impacts of this new product are considerable. The method of Triple Collection Analysis that underpins the Hydro-JULES product is highly transferable, and can be applied to produce improved soil moisture estimates anywhere on the globe. The method is already being applied in India with international partners from the Indian Institute of Technology Gandhinagar as part of a suite of drought monitoring tools. In addition, the Hydro-JULES team is currently developing the product so that it can produce real-time soil moisture maps. This will be useful for early warning applications, such as drought monitoring and seasonal hydrological forecasting.

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