



## Evaluation and application of medium resolution soil moisture data over Sub-Saharan Africa

Christopher Taylor<sup>1,2</sup>, Jawairia Ahmad<sup>1</sup>, Bethan Harris<sup>1,2</sup>, Dávid Kovács<sup>3</sup>, Colin Moldenhauer<sup>3</sup>, Wouter Dorigo<sup>3</sup>, and Adrià Amell<sup>4</sup>

<sup>1</sup>UKCEH, Wallingford, Oxon, United Kingdom of Great Britain – England, Scotland, Wales (cmt@ceh.ac.uk)

<sup>2</sup>National Centre for Earth Observation, Wallingford, Oxon, UK

<sup>3</sup>Technische Universität Wien, Department of Geodesy and Geoinformation, Vienna, Austria

<sup>4</sup>Chalmers University of Technology, Gothenburg, Sweden

Surface soil moisture exhibits strong day-to-day variability in response to antecedent rainfall. On scales beyond a few kilometres, soil moisture can generate daytime mesoscale circulations via sensible heat flux gradients which may influence the development of new convective rain events, creating a feedback loop. Numerical model simulations struggle to capture such feedbacks, due to shortcomings in the representations of convection, the water stress control on evapotranspiration, and uncertainties in the soil moisture itself. On the other hand, recent analysis of satellite observations has illustrated the importance of such feedbacks on storm initiation across Sub-Saharan Africa (Taylor et al, 2026). Here we examine how well observed mesoscale soil moisture structures across Africa are captured in medium resolution (0.1 degree) products generated within the European Space Agency Climate Change Initiative Soil Moisture project.

We use two approaches to evaluate soil moisture products at the mesoscale. Both are based on simple spatial correlations at the sub-1 degree scale with independent observations of related variables. Firstly, we quantify the spatial consistency between changes in soil moisture over 12 hours (consecutive overpasses) and accumulated precipitation. Interestingly, this analysis highlights the shortcomings of well-used precipitation products (e.g. IMERG) at this scale compared to a recent deep learning-based product (Rain Over Africa; Amell et al 2025). Secondly, we compare patterns of anomalous soil moisture with daytime Land Surface Temperature (LST) from Thermal Infrared imagery. We find that the active microwave-based ASCAT soil moisture product (with effective spatial resolution ~15km) outperforms passive microwave-based products (SMAP, SMOS, AMSR-2) and model-based ERA5-Land data in this exercise, with consistently stronger negative soil moisture-LST correlations. Finally, we use medium resolution soil moisture to demonstrate an impact on convective activity.

Amell, A., Hee, L., Pfreundschuh, S., & Eriksson, P. (2025). Probabilistic Near-Real-Time Retrievals of Rain Over Africa Using Deep Learning. *arXiv preprint arXiv:2505.18881*. <https://doi.org/10.1029/2025JD044595>

Taylor, C. M., Klein, C., Barton, E. J., Hahn, S., & Wagner, W. (2026). Wind shear enhances soil

moisture influence on rapid thunderstorm growth. *B Uhi fY.*  
<https://www.nature.com/articles/s41586-025-10045-7>