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Assimilation of MSG land-surface temperature into land-surface model simulations to constrain estimates of surface energy budget in West Africa

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In the semi-arid regions of West Africa the surface energy partition is related closely to near-surface moisture availability. Such moisture availability exhibits marked heterogeneity at scales of a few kilometres, related to the passage of storm systems during the previous one or two days. The associated variations in surface fluxes affect planetary boundary layer properties at the mesoscale, which may in turn affect rainfall and the seasonal development of the West African monsoon.

Atmosphere models used to study this land-atmosphere coupling are sensitive to the soil moisture initial condition. There exists no observation network for soil moisture in West Africa, so models rely on data from atmosphere analyses, which are often unable to describe adequately surface variation at the mesoscale. Additionally, retrospective estimates of the seasonal surface energy and water budgets using land-surface models are biased by persistent model errors in soil moisture. Anomalies in near-surface (top few centimetres) soil moisture are anti-correlated with anomalies in land-surface brightness temperature, which is observed by the SEVIRI thermal infra-red sensors onboard the Meteosat Second Generation (MSG) satellites. Here, we present methods developed for assimilating the MSG land-surface temperature product from the Land SAF to constrain estimates of the surface energy and water budgets using the JULES land-surface model. This MSG temperature product has a pixel size of approximately 3 km in this region, and is known to provide information of surface wetness anomalies at the scales of interest. The results will provide, for a large region of West Africa, improved initial conditions for modelling studies and seasonal estimates of the surface energy and water budgets.