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A satellite-based study of the links between soil moisture and convection initiation in West Africa

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In order to investigate the role of soil moisture in triggering deep convection over West Africa, a combined analysis of moisture estimates and land surface temperature with MCS initiation was carried out. The moisture estimates are based on AMSR-E microwave sensing measurements (resolution: 0.25degree). Land Surface Temperature Anomalies (LSTA) are derived from MSG which have a finer scale (resolution: 0.05degree). Information on mesoscale convective system is provided by an automated method for tracking convective systems called ISIS which uses high-frequency Meteosat data. The ISIS product allows identifying when during the day and where deep convection is triggered. The study focuses mostly on the daytime convective initiation observed during the 2006 monsoon season.

During the monsoon season, variability of soil moisture is found to be large across the Sahel. This is particularly strong beyond the temporary imprint of rainfall events and associated soil gradients. The combination of AMSR-E and ISIS data confirms that convection is initiated more frequently over dry soil which is in agreement with previous case studies. In addition, some seasonal variations are highlighted. LSTA data analysis confirms what is found with AMSR-E data: initiation is favoured over warm patches.

The high resolution LSTA data are used to investigate in further details the importance of soil moisture gradients on convection initiation. The proportion of initiations related to soil moisture forcing is estimated with consideration of the seasonal cycle. Finally, the timing of these initiations in the diurnal cycle is discussed.

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