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Understanding Land-Atmosphere Interactions on Mesoscales Using Observations and GCMs over the Sahel

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Land surface properties such as soil moisture, albedo and vegetation cover are known to impact atmospheric moisture conditions through induced energy and moisture fluxes. Semi-arid regions such as the Sahel in Africa demonstrate higher sensitivity of surface fluxes to soil moisture, which in turn affects precipitation variability and initiation of convective rain storms.
Absence of accurate soil moisture and surface fluxes estimates together with large variations in model simulated soil-moisture-precipitation feedback require improved understanding of the mechanisms involved.
The study analyzes existing observational data from land surface remote sensing products. Daily estimates of soil moisture, precipitation and land surface fluxes together with atmospheric state parameters, and a unique African Monsoon Multidisciplinary Analysis (AMMA) data set of convective initiations are used to better understand coupling mechanism between soil moisture and rainfall over the Sahel at mesoscales.
Statistical approach to analyze sensitivity of afternoon deep convection to underlying soil moisture conditions was applied to the twice-daily Advanced Microwave Scanning Radiometer (AMSR-E) soil moisture product and 3-hourly TRMM Multi-satellite Precipitation Analysis (TMPA) precipitation data over the Sahel. Further, sensitivity of applied statistical metric to higher resolved soil moisture proxy parameters, such as Land surface analysis Satellite Application Facility (LandSAF) land surface temperature and turbulent fluxes was investigated. Finally, using ECMWF Re-Analysis (ERA Interim) atmospheric parameters, conclusions on typical atmospheric conditions prior convective initiations were done.