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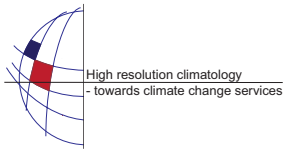

Sensitivity of a mesoscale convective system to soil moisture perturbations in West Africa

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The response of a mesoscale convective system (MCS) to soil moisture inhomogeneities in West Africa is investigated in a sensitivity study. Convection permitting simulations with the COSMO-Model driven by ECMWF analyses were performed. Several scenarios were investigated, including homogeneous soil type and soil moisture, and homogeneous soil type with a north-south oriented band in which the soil moisture is either reduced or increased.

Precipitation related to the MCS was continuously strong in the homogeneous case. When the MCS approached the band with reduced soil moisture precipitation decreased because of higher convective inhibition (CIN) ahead of the band. Over the drier band precipitation increased again. The moist band caused an increase of precipitation before the MCS reached the band and a decrease in the area with higher soil moisture caused by very high CIN values. Soil moisture inhomogeneities induced thermal circulations which led to modified conditions in the lower troposphere and to changes in CIN and accounted for the modification of precipitation of an MCS. In the dry band case, a precipitating cell already developed in the western part of band in the late afternoon, where convergence, generated by thermal circulations and supported by downward mixing of momentum from the African Easterly Jet, triggered convection.