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Representation of the West African Monsoon System in the aerosol-climate model ECHAM6-HAM2

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The West African Monsoon (WAM) is a major component of the global monsoon system. The temperature contrast between the Saharan land surface in the North and the sea surface temperature in the South dominates the WAM formation. The West African region receives most of its precipitation during the monsoon season between end of June and September. Therefore the existence of the monsoon is of major social and economic importance.
We discuss the ability of the climate model ECHAM6 as well as the coupled aerosol climate model ECHAM6-HAM2 to simulate the major features of the WAM system. The north-south temperature gradient is reproduced by both model versions but all model versions fail in reproducing the precipitation amount south of 10° N.
A special focus is on the representation of the nocturnal low level jet (NLLJ) and the corresponding enhancement of low level clouds (LLC) at the Guinea Coast, which are a crucial factor for the regional energy budget. Most global climate models have difficulties to represent these features. The pure climate model ECHAM6 is able to simulate the existence of the NLLJ and LLC, but the model does not represent the pronounced diurnal cycle. Overall, the representation of LLC is worse in the coupled model. We discuss the model behaviors on the basis of outputted temperature and humidity tendencies and try to identify potential processes responsible for the model deficiencies.