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Field and simulation experiments for investigating regional land–atmosphere interactions in West Africa: experimental set-up and first results

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Abstract West Africa is characterized by strong land surface changes due to various anthropogenic activities which influence the spatiotemporal patterns of hydro-meteorological fluxes and which might alter the availability of water resources. To investigate these questions, we use a novel two-way coupled atmospheric–hydrological model that allows for a consistent and dynamic simulation of regional land–atmosphere interactions in mesoscale river basins. This model is adapted stepwise for the West African Sudanian Savannah, focusing on a main tributary of the White Volta. In addition, the experimental set-up of three micro-meteorological stations using the eddy covariance technique is illustrated; they have been recently established in this region along a gradient of increasing agricultural activity. First measurements and simulation outcomes from the adaption of the atmospheric model are promising, but further model adaptation is crucial for a reliable simulation of surface fluxes on a daily or finer temporal scale.

Key words land–atmosphere interactions; coupled atmospheric–hydrological simulations; Weather Research and Forecasting model; land surface model; eddy covariance stations; hydro-meteorological fluxes; precipitation; West Africa