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The COSMO-CLM contribution to CORDEX-CORE Africa

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The COordinated Regional climate Downscaling EXperiment - Coordinated Output for Regional Evaluation (CORDEX-CORE) is a baseline set of homogeneous downscaled climate simulations and projections of regions worldwide. It provides an answer to the IPCC requirements for coordinated climate simulations at finer scales than Global Climate Models. The African continent is one of the priority domains of CORDEX-CORE. However, some precipitation deficiencies over this domain are shown by former studies using the Regional Climate Model developed by the COnsortium for Small scale Modeling (COSMO-CLM).

We use the recent COSMO 5.0 – CLM 9 model version, driven by ERA-Interim at the boundaries of the CORDEX-Africa domain on a 0.44° spatial resolution. Validations with TRMM-3B42, PERSIANN-CDR and MSWEP precipitation products show a clear continental dry bias, in particular over Eastern Africa, as well as a precipitation overestimation over the Atlantic and Indian ocean at the ITCZ latitudes. To investigate the reasons of such bias, multiple sensitivity experiments are performed, tuning some key convection scheme parameters. The implementation of both the subgrid-scale cloud scheme and the Integrated Forecast System scheme are also tested and present a significant reduction of the precipitation bias. However, its geographical location remains unchanged. Possible underlying physical reasons are investigated by studying the convection in the troposphere, the evapotranspiration from the surface, the moisture convergence and divergence and the humidity throughout the troposphere with earth observational datasets (i.e. AIRS or GLEAM). The ultimate goal is to have a better understanding of the model performance and the optimal parameter settings for CORDEX-Africa simulations. As such, this project aims to contribute improved COSMO-CLM simulations for Africa to CORDEX-CORE.