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Regional climate model simulation of projected 21st century climate change over an all-Africa domain: Comparison analysis of nested and driving model results.

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We analyze a transient climate change simulation for the 21st century (1980-2100) over a large all-Africa domain carried out with the RegCM3 regional model driven by the ECHAM5 global model. We focus the analysis on a comparison between the driving and nested model runs. For present climate, the two models show temperature and precipitation biases of similar magnitude, but different spatial patterns. In particular the bias patterns in the regional model are more similar to an analogous simulation driven by reanalysis fields. In the transient simulation, while the temperature changes are strongly driven by the global model, the precipitation change patterns are more different across the two models, particularly over the West Africa and Sahel region. A targeted analysis suggests that this is due to the different simulation by the two models of the local response to ENSO forcing and of local soil moisture/precipitation feedbacks. Our results thus indicate that local processes and internal model physics are key elements in determining the precipitation change signal simulated by the nested regional model in this large domain experiment, especially over equatorial and tropical regions. This adds an element of uncertainty that needs to be address through the use of ensembles of regional model experiments as planned in the CORDEX project.