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Uncertainties in modelling future hydrological change over West Africa

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The aim of this work is to evaluate the current knowledge and uncertainties about the impact of increasing greenhouse gases and aerosols on the West African Monsoon. For this purpose, coupled and time-slice simulations are used. A global measure of the monsoon changes is defined in order to avoid regional biases and have the largest significance for the results. The position and width of the monsoon in latitude are the main focuses. The Coupled General Circulation Models (CGCMs) from the Coupled Models Inter-Comparison Project - Phase II (CMIP2) show very little agreement on the impact of climate change on the monsoon. It is found that very simple discriminations between the models are unrelevant to get a better signal.

The role of the different forcings in time-slice simulations is then investigated. It is shown that the Sea Surface Temperature (SST) and particularly the pattern of the SST is the most important forcing. This accounts for the diversity of the results either from the coupled or the forced simulations with different SST changes. With a fixed SST set, there are still lower uncertainties coming first from the Atmospheric General Circulation Models (AGCMs), the way they balance greenhouse gases, aerosols and global SST increase. Moreover, the longitudinal repartition and the amount of precipitations in the AGCMs are still too poorly represented to allow any study of their evolution. Finally the uncertainty due to the Land Surface Models (LSMs) is not negligible as it may change the sign of the climate change signal. The greenhouse gases, the aerosols and the LSMs are shown to have more impact in august, when the monsoon is the highest on the continent.