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Representation of the west african water cycle by the LMDZ GCM during the AMMA campaign

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The West African Monsoon (WAM) is responsible for almost all annual precipitation in the Sahel region, is the system which couples continent and oceanic surface with the atmosphere and where interactions between spatial and temporal scales dominate the monsoon variability. The complex interaction between these different components are not well understood, which explain inpart the relative weakness of meteorological and climatic forecasts for this regions of the world. The AMMA program deployed an important number of observations in west Africa region during a several year with a focus on the wet season of 2006. Some statistical tools and the modele-to-satellite approach are used to evaluate the day to day variability of water cycle. The LMDZ General Circulation Model is used in the nudged version with Re-analysis. Sensitivity experiments have been performed in order to highlight the behaviour of the nudged model under a wide range of conditions: spatial and vertical resolution, surface scheme formulation as well as for the forcing and driving parameters: relaxation time, type of analysis (ECMWF, NCEP/GFS), Sea Surface Temperature (climatology vs. 2006) and the nudging variables (wind, temperature, and combination). A combination of satellite data (E.g., GPCP rain estimates, METEOSAT Free tropospheric humidity,...) and in-situ observations acquired during the AMMA campaign (temperature and humidity profiles from radiosondes,...) are all used to evaluate the simulation in the full summer season 2006. One configuration nevertheless gave results very close to the observed for the average seasonal rainfall and has been further analyzed. Based on daily averages, the synoptic variability in rainfall is estimated using correlation and false alarm rates computations that reveal that the model captures the observed variability very well over the ocean over the Dakar region but fails to reproduce the day to day chronology over the Sahelian region. The sensitivity of the physical parametrization shows an important difference between the region of Dakar influenced by the large scale oceanic circulation and the region of Niamey where the parametrization of convection determines the monsoon variability. The method used in this work is important on the framework of the regional modelling program CORDEX. Detailed water vapor budgets and comparisons with observations will be further discussed at the conference.