Geophysical Research Abstracts,
Vol. 11, EGU2009-10404, 2009
EGU General Assembly 2009

Simulation of the 2005 and 2006 West African Monsoon: preliminary results on the effects of solar, SST and large scale forcings

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In this study we use regional modeling to detect the onset of the West African Monsoon (WAM). We use the Weather, Research and Forecasting (WRF) model in order to simulate two contrasting years: 2005 and 2006 for which the difference of the timing of the WAM onset (abrupt displacement of the ITCZ from 5°N to 10°N approximately) is significant (larger than the climatological variance) and is associated with a delay of the presence of the cold tongue in the Gulf of Guinea. 2006 is used as the reference year since the Special Observing Period (SOP) of the AMMA experiment is helpful to evaluate the model's ability to simulate the WAM dynamics. To evaluate the relative importance of the processes implicated in the WAM dynamics, we perform three simulations in which we shift one of the SST, large scale or solar forcings at a time by fifteen days. We then compare the timing of the onset, the location and intensity of the precipitations. The diagnostic we use for the onset detection is based on the seasonal and latitudinal variability of the precipitation as the WAM onset is signaled by a considerable decrease of convection which lasts a few days and thereafter by a northerly displacement of the ITCZ.
Our domain of interest extends from 40 °W to 40 °E and from 20 °S to 50 °N with an horizontal resolution of 40km. The first results show a great sensitivity of the model to the large scale forcing which also seems to mainly control the timing of the onset. Moreover, the temperature gradient between the sea and the land seems to have limited impact on the timing of the WAM onset, but it mainly controls the inland humidity advection and in consequence the intensity and localization of rainfall. To confirm these results, we will apply the SST forcing of 2005 on simulation of 2006 and vice-versa to determine the connection between the SST of the Guinean Gulf and the WAM onset.