Detection of intra-seasonnal leading signals for the rainfall onset over the Sudanian and Sahelian belts : experimental hindcast

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Using rainfall estimates from the 5-day version of CMAP and GPCP data along with multi scale spatial key descriptors of atmospheric dynamics from NCEP/DOE2, we first define a West African monsoon onset index to precise its successive dates of occurrence over the period 1979-2004 (28-29 June in mean with a standard deviation of 8.5 days). Then we focus on the three main types of time evolutions of that index at the moment of the monsoon onset in terms of precipitation, pressure, temperature and winds at different levels to detect the most robust associated signals and select on the mid-May mid-June period different sets of potential predictors for onset dates. Basically, late (early) onsets are preceded by more (less) rainfall southward to the equator by the end of May, then by a clear decrease (increase) of the normal northward cross equatorial gradient in mid-June.

Finally we present experimental cross validated hindcasts of the dates of onset always based upon 4 predictors using both reanalyzed atmospheric data and observed rainfall estimates. Accurate forecasting schemes are obtained, especially with CMAP rainfall (time tendencies and cross equatorial gradients) over the Gulf of Guinea. In this context, the hindcasted series are highly significant when compared to observations (75% of explained common variance with the sole rainfall predictors) and can reach 82% of variance when a zonal wind descriptor of regional scale is added. Basically, a late (early) onset is preceded by more (less) rainfall southward to the equator by the end of May, then by a clear decrease (increase) of the normal northward cross equatorial gradient by mid-June.