Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08350, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08350
EGU General Assembly 2008

Time-evolving Tropical Atlantic SST modes related to West African rainfall

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This work presents a description of the 1979-2002 Tropical Atlantic (TA) SST variability modes coupled to the anomalous West African (WA) rainfall during the monsoon season. This work updates the results given by other authors, whose studies are based on different datasets back to the 50's, including both, the wet and the dry Sahel periods. Enhanced CMAP dataset, which includes measures over the ocean, gives a complete picture of the interannual WA rainfall patterns for the dry period. Adjacent oceans role onto WA rainfall variability is analysed by using a new methodology based on Maximum Covariance Analysis, which provides, in the same mode, a time-evolving SST pattern related to WA precipitation. Those SST patterns could be used as boundary condition for future sensitivity experiments. The leading WA rainfall principal component is related to the Sahelian rainfall and the second mode to the anomalous precipitation over the coast of the Gulf of Guinea. The documented WA rainfall Dipole appears as two uncoupled modes with different forcing. The leading TA SST pattern, the Atlantic-Niño, is connected to the second WA rainfall principal component, while the Mediterranean SST anomalies appear to be associated with the Sahelian rainfall. The global signature of the TA SST patterns is analysed, in order to understand, on the one hand, the Pacific-Atlantic link in relation to WA rainfall, and on the other hand, if the Mediterranean Sea SST anomalies are a finger-print of larger-scale forcing. The dominant air-sea feedbacks at play in the development and damping of the leading SST mode are revised.