Geophysical Research Abstracts
Vol. 15, EGU2013-3086, 2013
EGU General Assembly 2013

Analysis of African climate variability at pre-industrial, 4kyr and 6kyr BP simulations by Self-Organizing Maps

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Results from three simulations of the IPSL-CM5A (96 x 96) coupled ocean-atmosphere model from the modern pre-industrial control (1000-year long) and mid-Holocene at 4kyr (400-year long) and 6kyr (910-year long) BP have been used to investigate changes in the seasonal sub-Saharan rainfall patterns and their links with sea surface temperatures (SST) of the main oceanic basins. Self-organizing maps and hierarchical ascendant classifications have been performed over the whole data set to highlight the main rainfall anomaly patterns ("monsoon regimes") for each season of the year. Then, composite maps of SST, mean sea level pressure and low-levels wind anomalies, have been computed for every class of rainfall anomaly patterns. In northern summer, eight monsoon regimes are defined. Three of them are mostly present in the pre-industrial period, other three in the 6kyr period, and the last two are evenly distributed in the three periods. On the other hand, the 4kyr period is scattered within all the eight monsoon regimes. A discriminant analysis shows that these eight regimes can be well differentiated by the main SST modes of the oceanic basins, in particular the Guinea gulf and the Mediterranean basin. Similar analyses have been conducted for the other seasons and will be presented too. This work has been funded by the French Agency for National Research through the research project C3A.