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The role of convectively coupled equatorial Rossby waves in the West African monsoon

S. Janicot (1), F. Mounier (2), S. Gervois (3), B. Sultan (1), and G.N. Kiladis (4)

(1) IRD, LOCEAN/IPSL, UPMC, Paris, France (serge.janicot@locean-ipsl.upmc.fr), (2) EQECAT, Paris, France, (3) CNRS, LATMOS/IPSL, UPMC, Paris, France, (4) PSD/ESRL, NOAA, Boulder, CO, USA

The intra-seasonal scale variability of rainfall and convection in the African monsoon has been investigated in the recent past years, highlighting the importance of 10-30-day periodicities in rainfall and convective activity over West and Central Africa during the summer. Two independent modes of variability have been detected in the 10-30-day range. One of these two modes, called here the Sahelian mode, is characterized by a westward propagative envelop of convection from eastern Africa to the western tropical Atlantic, associated with a cyclonic circulation ahead of this envelop contributing to enhanced moisture advection and increased convection.

In this study we have investigated the relationships between this mode and the occurrence of convectively coupled equatorial Rossby (ER) waves during northern summer. The ER signal has been extracted from the NOAA OLR data by filtering within a box delineated by the dispersion curves of the theoretical ER waves following the Wheeler and Kiladis (1999) techniques. The main EOF mode of the 10-30-day part of this ER signal has been computed and projected onto the unfiltered OLR and atmospheric fields. It displays over sub-Saharan Africa a pattern very similar to the theoretical ER, then demonstrating the occurrence of such wave within the African summer monsoon. This pattern shows a high similarity with the pattern related to the Sahelian mode but also some differences on its southern part. The correlation between the time variation of these two signals is higher than +0.6, meaning that the Sahelian mode can be partly explained by the occurrence of ER waves.