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Dry intrusions in the West African monsoon mid-troposphere during the AMMA experiment

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Mid-troposphere dry air patches (RH < 10%) have been recently detected over the African monsoon region and in particular over Sahel. At 500 hPa, these dry air features are thought to play a complex role onto convection: inhibition isolated convective cells but favouring already organized convection by feeding rear-inflow currents with dry air. The inhibiting action of the dry air onto convection comes from the temperature inversion induced by radiation at the bottom of the dry layer and/or by entrainment of dry air in ascending parcel that decreases its buoyancy. The organizing effect is associated to mesoscale currents within and around long lasting squall lines. This mid-tropospheric dry air has been shown to originate from the mid-latitudes upper level jets, therefore coined extra-tropical dry intrusions.Among all the forcings that control the dynamics of the West African monsoon, the role of a dry mid-troposphere needs to be clarified. The present study is dedicated to this objective and it is focused on extra-tropical dry air intrusions in the West African mid-troposphere during the AMMA campaign.
The low level dynamics is documented (African Easterly Jet, African Easterly Wave) thanks to the NCEP operational analysis. It is completed by the radiosondes especially for the temperature and water vapor distribution. Back-trajectory are computed in order to highlight the origin of the tropospheric air mass. Finally Meteosat Second Generation derived water vapor and cloud and rainfall parameters are used to characterize the convective activity and its moist environment.

Dry intrusions in the African mid troposphere during the summer 2006 have been shown to be associated with two major modes of occurrences: a 40-50 days mode and a 10-20 days mode. The long mode exhibits negative anomaly of the rainfall and a very large scale structure covering the whole West Africa region when occurring while the short mode is more restricted to the Sahelian longitude. Similarly AEWs are noted to exist simultaneously to the dry events but the detailed analysis of their relationship needs more long time series.

A scenario will be set up to explain and document the extra-tropical dry intrusions variability and their possible link with tropical variability. In particular we will investigate the reason why the AEWs that passed over the Sahel during some extra-tropical dry intrusions are not associated with any significant rainfall.