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Variability of the daytime sahelian boundary layer sampled at Agoufou via tethered ballon and kite flights in August 2006

F. Guichard(1) and L. Kergoat(2)
(1) CNRM-GAME (CNRS and Meteo-France), (2) CESBIO (CNRS, CNES,IRD,UPS)

A combination of tethered ballon and kite flights has been carried out over the malian site of Agoufou (located at 1.5W-15.3N, within the AMMA northern site); boundary layer (BL) data were collected almost daily from the 12 to the 31 August 2006. Pressure, temperature, humidity, wind speed and direction together with CO2 concentration were measured either entirely over the whole depth of the boundary layer at a high spatial (˜20m) resolution (vertical profiles up to 2km AGL whenever possible, with a ˜2h time sampling), or in the mixed layer when the wind was too strong for ballon flights (2-s time series around 300-400 m AGL).

This dataset will allow extending the analysis of CO2 surface emission achieved with nightime boundary layer data acquired in 2004 and 2005; they provided estimation of CO2 respiration fluxes over the Agoufou savannah site (Kergoat et al. 2005). With 2006 data, daytime CO2 fluxes (i.e. now respiration minus photosynthesis) will be estimated for golden days, via convective boundary layer budgets.

The good temporal coverage and spatial resolution of this dataset further allows to study the observed day-to-day variability of this scarcely documented sahelian boundary layer, during the core of the monsoon season, and to assess its representation in models; it is the focus of this presentation.

The sampled convective boundary layer typically grows from a few hundreds of metres in the mid-morning up to 1.2 km or more by the early afternoon. The BL wind speed is often stronger in the morning, with strong wind shear at the top of the BL where the wind speed increases significantly. Strong BL wind speeds persist all day however on a few days.

Preliminary analysis indicates that the measurement period documents a transition from an overall dryer, warmer, "clearer" to a colder, moister and cloudier boundary layer, which is reasonably well captured by the ECMWF analysis, and may be linked to the intraseasonal variability observed at larger spatial scales. It also shows a strong day-to-day variability of BL wind speed, thermodynamical and CO2 concentration fields which is closely connected with the sequence of observed convective events, and less well reproduced by the analysis.