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THE NOCTURNAL BOUNDARY LAYER OF THE WEST AFRICAN MONSOON IN OBSERVATIONS AND NUMERICAL PREDICTION MODELS

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Few detailed studies of the nocturnal boundary layer (NBL) in the Sahelian region of Africa exist, despite the significant role the boundary layer plays in this moisture sensitive region. Investigation into nocturnal processes has thus far been limited due to a lack in detailed observations, and literature is often based on a more general model of tropical boundary layer behaviour.

An AMMA field experiment was conducted in August 2005, involving personnel from France, the UK and Mali. Tethered balloon soundings were conducted near Hombori (15.2N, 1.5W), on the AMMA Gourma super site. The balloon was used to profile the immediate boundary layer up to 200m using a PTU sonde.

We present the complete set of profiles for the experiment period, along with a more detailed analysis of the NBL, identifying key features and linking them to large and local scale processes.

The observations reveal some characteristic structures in the NBL evolution. On most of the nights the surface layers show a defined inversion in temperature and humidity fields after sunset. During the night a stable surface layer develops, eroding the inversion, reducing temperatures throughout the profile. The formation of a low level nocturnal jet was also observed on several occasions. But possibly the most significant outcome is the variability in observations from one night to the next.

In addition to the presentation of the raw results, analysis of the larger scale synoptic patterns and the effect that synoptic and convective dynamics might have had on the local scale boundary layer are also examined. Satellite data and model information are combined to produce a detailed overview of the atmospheric situation in the region, which is then used to speculate on the differences in observations from the NBL.

Finally, data is compared to ECMWF and the UK Met Offices Unified Model operational analysis to further examine the processes and to evaluate the performance of numerical weather prediction models in representing this important feature in the west African monsoon.

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Convective wind system with aerosols, named "haboob", Hombori in Mali, West Africa.