

Variability of the atmospheric boundary layer over West Africa observed by ground-based remote sensing instruments

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One of the main goals of the AMMA project was to enhance the knowledge on the West African monsoon and the related atmospheric processes. Therefore, two locations were equipped with a variety of remote sensing instruments in 2006: Nangatchori (Benin, 9.7°N, 1.7°E) and Niamey (Niger, 13.5°N, 2.1° E). In Nangatchori, the atmospheric remote sensing setup consisted of a 14-channel microwave radiometer (HATPRO), a lidar ceilometer CT25K, two wind profilers (UHF, VHF), and a low-power vertical Doppler radar (Micro Rain Radar MRR). A very similar instrument setup was at the mobile facility of the Atmospheric Radiation Measurement (ARM) Program in Niamey.

The climate in West Africa is mainly characterized by the strong contrasts between the moist monsoon flow to the south and the dry Harmattan air to the north. The interface between these two flows, called the Inter-tropical discontinuity (ITD), shows a distinct annual cycle (from 6°N in January to 20°N in July). Important factors for the onset of the monsoon season are temperature, humidity and wind conditions in the planetary boundary layer (PBL). By using a combination of ground-based remote sensing observations it is possible to get a comprehensive and continuous view of these parameters, as satellites do not provide satisfactory information of the lowest atmospheric layers.

The one-year deployment of many of the instruments in Nangatchori and Niamey provides a very good overview of the annual cycle of various atmospheric parameters. In addition, the high temporal resolution of these measurements compared to radiosondes allowed the analysis of temporal boundary layer development and the passage of fronts.

In this presentation statistical analysis of boundary layer parameters, such as temperature and humidity profiles, integrated water vapour, cloud liquid water content as well as cloud base heights and cloudy times will be made, with regard to both diurnal and annual variability. Furthermore, a comparison between measured profiles and the results of a mesoscale model for a case study will be presented.