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Diurnal cycle of the inter-tropical discontinuity over central Benin derived from a set of ground-based instruments

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In the framework of the AMMA project, a variety of meteorological and hydrological measurements have been performed in the area of Nangatchori (Central Benin, 9.6°N, 1.7°E) during the year 2006. Although the main emphasis was on the rainy season between June and September, a large number of remote sensing instruments have been measuring during the whole year with a high temporal resolution for the first time in West Africa. This dataset is a unique source for many different studies.

In the boreal winter the ITD (Inter-Tropical Discontinuity) lies close to the Guinean coast at the Atlantic ocean. The ITD represents the convergence zone between dry air to the north (Sahel) and moist air to the south. The northward move of the zenith position of the sun causes the ITD to move north in the course of the year, reaching its northernmost position in the months of July and August. Especially in the lower troposphere, the gradient between these different air masses is often very sharp and shows a distinct diurnal cycle.

This study will present this diurnal cycle of the ITD during the month of April 2006 using measurements of a microwave radiometer, a lidar ceilometer, a wind profiler, weather station data and GPS water vapour measurements. Through continuous sampling with high temporal resolution, the instrument package is well suited to capture the diurnal cycle of many atmospheric variables. In the study period 16 out of 18 nights showed a sharp change of various parameters around midnight, such as temperature, humidity, wind, or aerosol content. Temperature drops of up to 7 K within one hour could be observed, whereas the wind direction changed to southern directions carrying air masses with much higher humidity into the area.

The high data availability of > 85 % allows a statistical analysis of the full month in which Nangatchori is increasingly under the influence of tropical air. Thus the data set is well suited for an improved process understanding, model evaluation in a data sparse area and possibly together with additional observations the development of improved parameterizations.