



## **Nocturnal Boundary Layer over Southern West Africa during the Monsoon Season: Comparison of Nights with and without Stratus Clouds**

Karmen Babić (1), Norbert Kalthoff (1), Bianca Adler (1), Julian F. Quinting (1), Fabienne Lohou (2), Marie Lothon (2), and Cheikh Dione (3)

(1) Karlsruhe Institute of Technology (KIT), Institute of Meteorology and Climate Research - Troposphere Research, Eggenstein-Leopoldshafen, Germany (karmen.babic@kit.edu), (2) Laboratoire d'Aérodynamique, Université de Toulouse, CNRS, UPS, France, (3) African Center for Meteorological Applications for Development, Niamey, Niger

Nocturnal stratiform low-level clouds (LLC) frequently form over the continental parts of southern West Africa during the summer monsoon season. Although LLC cover large areas and persist long into the following day and, thus, affect the regional climate, they are still unsatisfactorily represented by state-of-the-art weather prediction and climate models.

A ground-based field campaign was conducted within the framework of the DACCIWA (Dynamics-Aerosol-Chemistry-Cloud-Interactions over West Africa) project in June and July 2016 and a comprehensive and high-quality dataset needed for process studies of the interaction between LLC and atmospheric conditions was obtained. In this study, we use remote sensing and in-situ data measured at the supersite in Savè (Benin). We use ERA5 data for a composite analysis of large-scale conditions and trajectory calculations. During the campaign, the LLC formed quite frequently, but their characteristics, such as formation and dissolution times as well as cloud-base height varied considerably from day to day. Also, several stratus-free nights occurred during the campaign. Here we analyze differences in the atmospheric-boundary layer conditions between nights with and without stratus clouds and assess the main factors leading to these differences. Additionally, we study how the observed differences influence the main processes relevant for the development of LLC.

We find that in general LLC form during an undisturbed monsoon flow, while stratus-free nights are observed during the pre-monsoon period and under disturbed monsoon conditions. The characteristics of the low-level jet (jet axis height and speed) are observed to be similar during stratus and stratus-free nights. The main differences are found with respect to large-scale pressure patterns, indicating a stronger Saharan heat low for stratus nights, which are also on average colder and moister than the stratus-free nights. The interplay between the magnitude of cooling related to the horizontal cold-air advection from the Gulf of Guinea and the background level of moisture seem to be crucial factors for the LLC formation.