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A mini backscatter lidar for airborne measurements in the framework of DACCIWA

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During the international campaign of the European program Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa (DACCIWA), investigating the relationship between weather, climate and air pollution in southern West Africa, a mini backscatter lidar was embedded on the French research aircraft (ATR42) of the Service des Avions Français Instrumentés pour la Recherche en Environnement (SAFIRE). This implementation was made possible thanks to the support of the Centre National d'Etude Spatial (CNES), with the aim of assessing the relative relevance of airborne or spaceborne (e.g. Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations, CALIPSO) remote sensing instruments. The lidar complemented the various in-situ observations carried out on the plane, by identifying the aerosol layers in the atmospheric column below the aircraft, and bringing strong constraints for the validation of other measurements.
The field campaign took place from 27 to 16 July 2016 from Lomé, Togo. The aircraft conducted flights between $\sim$1 km and $\sim$5 km above the mean sea level (amsl), allowing the coupling of in situ and remote sensing data to assess the properties of the aerosol layers. Aerosol plumes of different origins were identified using the coupling between the lidar cross-polarized channels, satellite observations and a set of back trajectories analyses. During several flights, depolarizing aerosol layers from the northeast were observed between 2.5 and 4 km amsl, which highlight the significant contribution of dust-like particles to the aerosol load in the coastal region. Conversely, air masses originating from the east-southeast were loaded with a mixing of biomass burning and pollution aerosols. The former originated from Central Africa and the latter from human activities in and around large cities (Lomé). The flight sampling strategy and related lidar investigations will be presented and discussed.