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Anthropogenic plumes from metropolitan areas and biomass burning emissions in West Africa during DACCIIWA – airborne measurements on board the DLR Falcon 20

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The DACCIIWA (Dynamics-Aerosol-Chemistry-Cloud Interactions over West Africa) airborne field campaign was conducted in Southern West Africa in June/July 2016. Three European research aircraft (DLR - Falcon 20, SAFIRE - ATR 42 and BAS - Twin Otter) were deployed from Lomé/Togo and conducted research flights across Ivory Coast, Ghana, Togo and Benin. On board the DLR Falcon O₃, SO₂, CO, NO₂ and aerosol fine mode particle number concentration and size distribution were measured during a total of 12 scientific flights.

Until now only few airborne trace gas measurements were conducted in Southern West Africa. Therefore, this field experiment contributes to the knowledge of the chemical composition of the lower troposphere between 0 – 4 km. During several flights pollution plumes from major population centers – Lomé/Togo, Accra/Ghana, Kumasi/Ghana, and Abidjan/Ivory Coast – were probed below, inside and above clouds. Here, enhanced trace gas and particle concentrations were observed. In addition, plumes from biomass burning emissions were detected which were transported to West Africa. The composition of the pollution plumes are presented as well as transport pathways using HYSPLIT (Hybrid Single-Particle Lagrangian Integrated Trajectories) trajectory calculations. Ozone enhancements in the biomass burning pollution plumes of up to 70 ppb were observed compared to background concentrations of ~ 30-40 ppb.

Furthermore, HYSPLIT atmospheric dispersion simulations are used to estimate anthropogenic SO₂ city emissions.