Aerosol physical-chemical properties in Southern West Africa: Recent findings using the SAFIRE ATR42 aircraft within the DACCIWA project

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As part of the Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa (DACCIWA) project, airborne campaigns were designed to measure a large range of atmospheric constituents focusing on improve our current understanding on the effect of anthropogenic emissions on regional climate (Knippertz et al., 2015a). The targeted region, Southern West Africa (Fig. 1), holds currently a population of over 340 million people, and is predicted by the United Nations to reach about 800 million by 2050.

The climate in the region is characterized by large-scale atmospheric circulation system which controls precipitation over a land area of about 6 million km^2, directly impacting the water resources, agriculture and power generation of hundreds of millions of people. Besides its large natural variability, the West African monsoon system is also expected to be significantly affected by global and regional climate change, with large uncertainties on the role of local pollution (Booth et al., 2012; Knippertz et al., 2015b).

This work details results of the DACCIWA measurement campaign using the French aircraft SAFIRE ATR42, which in combination to German and British research aircraft, aim to characterize physical chemical properties of aerosols in the region using a suite of measurement techniques (e.g. C-TOF AMS, APITOF, SMPS, etc.) with supporting information from trace gases (e.g. PTRMS).

Among the goals of the campaign is to better understand aerosol sources (primary/secondary formation) and its role on cloud formation and development. The recently collected data will certainly aid understanding the coupling between human activities and regional climate in a sensitive, highly populated area.

Booth, B. B. B., Dunstone, N. J., Halloran, P. R., Andrews, T. and Bellouin, N.: Aerosols implicated as a prime driver of twentieth-century North Atlantic climate variability., Nature, 484(7393), 228–32, doi:10.1038/nature10946, 2012.

Knippertz, P., Coe, H., Chiu, J. C., Evans, M. J., Fink, A. H., Kalthoff, N., Liousse, C., Mari, C., Allan, R. P., Brooks, B., Danour, S., Flamant, C., Jegede, O. O., Lohou, F. and Marsham, J. H.: The dacciwa project: Dynamics-aerosol-chemistry-cloud interactions in West Africa, Bull. Am. Meteorol. Soc., 96(9), 1451–1460, doi:10.1175/BAMS-D-14-00108.1, 2015a.

Knippertz, P., Evans, M. J., Field, P. R., Fink, A. H., Liousse, C. and Marsham, J. H.: The possible role of local air pollution in climate change in West Africa, Nat. Clim. Chang., 5(9), 815–822, doi:10.1038/nclimate2727, 2015b.

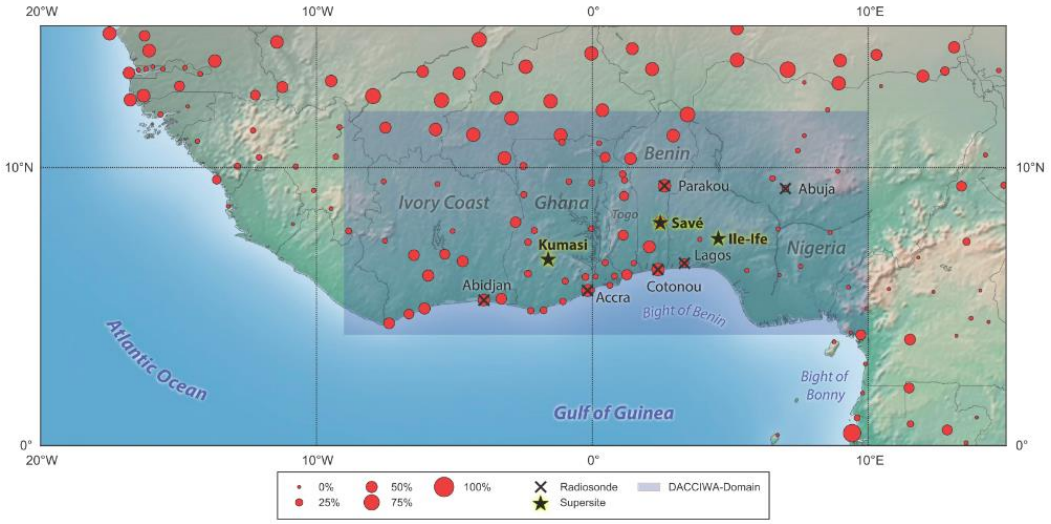

Figure 1. Geographical overview of the DACCIWA study area in southern West Africa highlighted in blue. Black stars mark the three DACCIWA supersites at Kumasi, Ghana; Savé, Benin; and Ile-Ife, Nigeria. Red dots mark synoptic weather stations. Reproduction from Knippertz et al. (2015a).