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The DACCIWA Project: Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa

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This contribution provides an overview of the EU-funded DACCIWA (Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa) project. DACCIWA consists of 16 European and African research organisations. The project runs from 2013 to 2018 and is built around a major international field campaign in 2016. An important part of the DACCIWA mission is to work with operational centres, international programs, policy-makers and users to foster the uptake of research results and to actively guide sustainable future planning for West Africa. Amongst other things, this will be achieved through the writing of policy briefs and recommendations for model development towards the end of the project.

A key motivation for DACCIWA is the expected tripling of anthropogenic emissions in southern West Africa (SWA) between 2000 and 2030, the impacts of which on human health, ecosystems, food security and the regional climate are largely unknown. An integrated assessment of this problem, which is mostly due to massive economic and population growth and urbanization, is challenging due to (a) a superposition of regional effects with global climate change, (b) a strong dependence on the variable West African monsoon, (c) incomplete scientific understanding of interactions between emissions, clouds, radiation, precipitation and regional circulations, and (d) a lack of observations.

DACCIWA combines measurements in the field in SWA with extensive modelling activities and work with satellite data. In particular during the main DACCIWA field campaign in June-July 2016 high-quality observations of emissions, atmospheric composition and meteorological parameters were sampled. The campaign involved three research aircraft, three ground-based supersites, enhanced radiosonde launches, and intensive measurements at urban sites in Abidjan and Cotonou. These data will be freely available to the research community through our database at http://baobab.sedoo.fr/DACCIWA/ after November 2018.

First results show that in SWA international air quality standards are frequently violated with respect to particles and in pollution hot spots also with respect to some trace gases. Current emissions inventories, however, appear to underestimate emissions of some aerosol precursors. Particles are both locally produced but also advected in significant amounts from the extensive biomass burning fires in equatorial Africa. Background concentrations are so high that the susceptibility to cloud-aerosol interactions is low, while aerosol radiative effects likely have some relevance. The meteorology of SWA during June-July is dominated by the frequent occurrence of low-level stratus decks that form at night in connection with the passage of a coastal front and the development of a low-level jet. The radiative impact of these clouds is crucial for the regional energy balance and can significantly impact on SWA precipitation and the West African monsoon circulation. More specific aspects of DACCIWA research will be presented in other contributions to this session.