

FINAL REPORT PROGRAM LEFE

Program LEFE/ "océan-atmosphère"	Airborn measurements of the low level atmosphere in the gulf of Guinea	Years 2015 - 2016
PI : Gaëlle de Coëtlogon, gdc@latmos.ipsl.fr , LATMOS Participating Laboratories : LISA, LATMOS, LA, IRCELYON, CNRM, LSCE, ...		Contribution to DACCIIWA (ERC 2015-2018), AEROCLO-sA (ANR) Other funding sources for AEROCLO-sA: LEFE, PNTS, CNES, EU FP7.

Objectives :

This project financed the purchase of twelve dropsondes to be initially launched during the DACCIIWA airborne campaign in June-July 2015. Because of the ebola crisis, the campaign was postponed until June-July 2016, but the available aircraft was not equipped to launch dropsondes; thus the latter have eventually been deployed during the AEROCLO-sA campaign off Namibia in August-September 2017. AEROCLO-sA is a multi-agency program initiated by France (ANR). It consists of German, Italian, Greek, South African and Namibian scientists, aiming to characterize the regional aerosols, biomass burning but also mineral dust and marine aerosols, for an observational-validated evaluation of their radiative effects in the southeastern Tropical Atlantic.

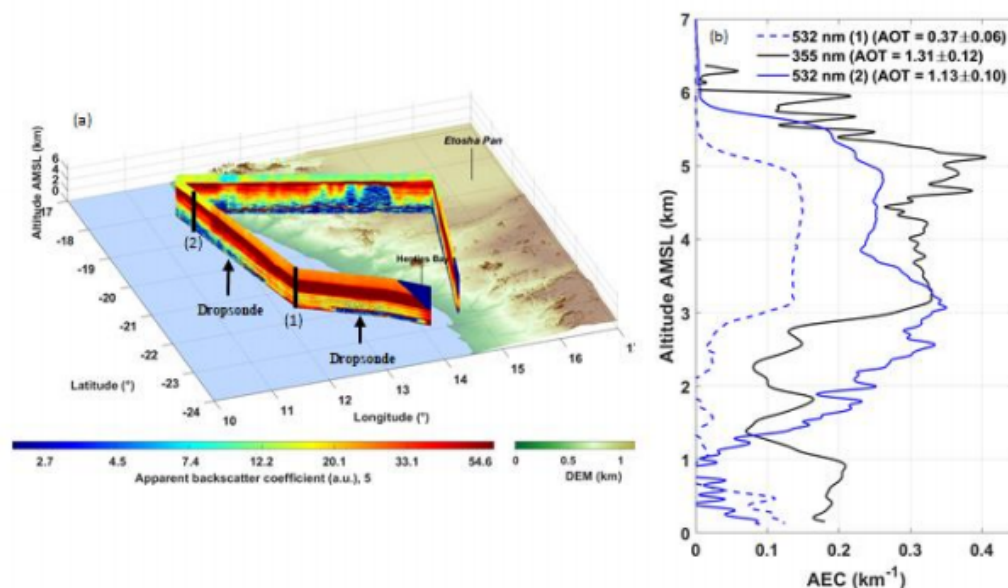


Figure 1 : a) distance - height evolution of the LNG-derived apparent backscatter coefficient at 532 nm below the SAFIRE Falcon 20 during the flight on 6 September 2017. The locations of the two launched dropsondes are indicated by arrows. The lidar aerosol extinction coefficient (AEC) profile labelled « 1 » shown in b) is obtained after inversion of the LNG observations averaged between the two locations of the dropsondes.

Main results :

The AEROCLO-sA field campaign was conducted between 22 August and 12 September 2017 over Namibia. An aircraft equipped with active and passive remote sensors and aerosol *in situ* probes performed a total of 30 research flight hours. In parallel, a ground-based mobile station with state-of-the-art *in situ* aerosol probes and remote sensing instrumentation was implemented over coastal Namibia, in addition to classical ground-based and radiosonde observations. The project brought twelve additional dropsondes that were deployed over the ocean and provided important information on meteorological parameters surrounding aerosol measurements.

The particularly high variability of atmospheric moisture and aerosol composition in the lower and middle

troposphere was clearly emphasized: within the atmospheric column, several layers of dry and moist air are stacked (see Fig. 1 and 2 for two examples of profiles). In addition, aerosols transported within the free troposphere are mainly polluted dust (i.e. dust mixed with smoke from fires in Angola) for the first 2 periods (22 August – 1 September), and smoke for the last part (3-9 September) of the campaign. A Lagrangian back-trajectory analysis showed that the high-altitude smoke (more than 5 to 6 km above mean sea level) comes from South America, through mid-latitudes westerlies. This results in a very complex mixture of aerosols over the coastal regions of Namibia that must be taken into account when investigating aerosols radiative effects above stratocumulus clouds in the southeast Atlantic Ocean.

Future of the project : comparison of surface heat fluxes estimated from numerical simulations (WRF), reanalyses, and in situ data (2006 and 2014 radiosondes, and 2006 and 2017 dropsondes), in collaboration with Alain Weill (paper still in progress).

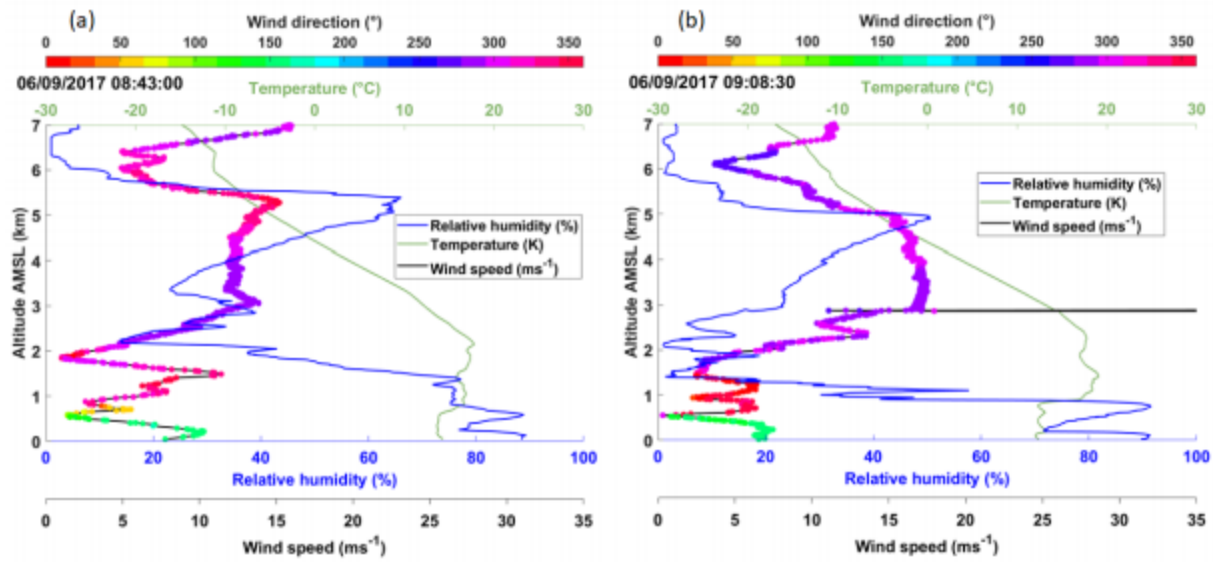


Figure 2 : profiles from dropsondes released at 0843 UTC (north) and 0908 UTC (south), at the locations shown in Figure 1.

Publications :

Formenti, P., et al., 2019 : the aerosols, radiation and clouds in southern Africa (AEROCLO-sA) field campaign in Namibia : overview, illustrative observations and way forward, BAMS, 10.1175/BAMS-D-17-0278.1.

Chazette, P., C. Flamant, et coauthors, 2019 : Evidence of the complexity of aerosol transport in the lower troposphere on the Namibian coast during AEROCLO-sA. Atmospheric Chemistry and Physics, 10.5194/acp-2019-507.

Conferences :

Chauvigné, A., and coauthors: Aerosol and cloud properties through 3MI airborne simulator measurements: AEROCLO-sA field campaign in the Namibian region, oral presentation. AGU Fall Meeting 2018, Washington DC

Formenti, P., and coauthors: The Aerosols, Radiation and Clouds in southern Africa (AEROCLO-sA) project: overview, research highlights and way forward, poster presentation. 2018 joint 14th iCACGP QS/15th IGAC SC, Takamatsu, Japan

Feuerstein, S., and coauthors: Modelling Namibian dust emission in the framework of AEROCLO-sA, oral presentation. 9th International Workshop on Sand / Dust storm and Associated Dustfall, Tenerife, Spain 22-24 May 2018

Various oral and poster presentation at the Special session AS1.40 Aerosols, radiation and clouds over the southeast Atlantic. Convener: Paola Formenti. Co-Conveners: J.M. Haywood , SJ Piketh , J. Redemann, P. Zuidema. European Geosciences Union General Assembly 2018, Vienna, Austria, 8–13 April 2018.