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Atmospheric Pollution from Shipping and Oil platforms of West Africa (APSOWA) observed during the airborne DACCIWA campaign

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In the framework of the European DACCIWA (Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa) project, the airborne study APSOWA (Atmospheric Pollution from Shipping and Oil platforms of West Africa) has been conducted in July 2016 to study emissions from oil rigs and maritime traffic in the Gulf of Guinea. The measurements were performed during four flights of about 3-4 hours including meandering transects through emission plumes in the planetary boundary layer (around 300 m asl) off the coast of West Africa from Ivory Coast to Togo.

Several instruments have been used on-board the DLR Falcon-20, providing measurements of the pollutants O_3 , CO, NO_2 , SO_2 , aerosol content and meteorological parameters. This set of trace gases can be used to fingerprint different sources of local air pollution.

The first part of our study is focused on the FPSO Kwame Nkrumah facility operating in the Jubilee oil field off the coast of Ghana. Aircraft observations have been combined with a nested-grid regional scale Lagrangian particle dispersion model (FLEXPART) to estimate surface emission fluxes from this platform. A simplified inverse method is used and repeated until the modelling output and aircraft observations converged. The estimated fluxes of CO, SO_2 , NO_2 are compared to global (EDGAR, MACCcity) and regional (Deetz and Vogel, 2017, in press) inventories. A second part of the study provides the first results of the APSOWA flights for the study of the impact of shipping emissions on the regional air quality. Using data from Marine Traffic, ship positions during the campaign are identified. Then, FLEXPART is used to quantify the contributions of the ship emissions to the aircraft observations. Finally, direct measurements in the MBL around $4^\circ N$ latitude along the Ghana coast show no strong evidence of the presence of an atmospheric pollution maritime corridor simulated by MACCcity.