Aerosol and cloud properties through 3MI airborne simulator measurements: AEROCLO-sA field campaign in the Namibian region

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Aerosols directly impact the Earth's climate by scattering and absorbing solar and telluric radiations and indirectly by modifying cloud properties and lifetime. In order to improve the retrieval of aerosol and cloud properties, the European Space Agency (ESA) and EUMESAT developed a new spaceborne imaging radiometer with Multi-viewing, Multichannel, Multi-polarization capabilities (3MI) which will be launched in 2021 (METOP-SG). A 3MI airborne simulator, OSIRIS, has been developed at Laboratoire d'Optique Atmospheric (LOA, France) in order to evaluate new retrieval algorithms for 3MI. The total and polarized radiances sampled by OSIRIS between 440 and 2200 nm, and the new retrieval algorithms [1–3], allow to simultaneously retrieve the aerosol and surface properties over land and ocean, or the aerosol and cloud properties in case of aerosols above clouds. Different inversion methods are used as full image multi-pixel and single pixel retrievals.

The present work focuses on the use of this new approach to study strong biomass burning aerosol loading and their impacts over the Southeast Atlantic. During the AEROCLO-sA field campaign over the Namibian region, in August and September 2017, aerosol optical thicknesses up to 1.5 at 500 nm have been retrieved. The region is also characterized by a deep and permanent stratocumulus deck mainly located over the ocean. Thus, the combination of a large panel of in-situ and remote sensing instrumentations allows to obtain a complete view of the atmospheric composition and study aerosol-cloud interactions and radiative effects. Different vertical atmospheric structures and above different scenes have been observed including well-mixed plumes or strong stratification as well as decoupled or mixed aerosol-cloud layers. We will notably present the spectral absorption of aerosols as well as the cloud microphysical properties retrieved in function of various aerosol/cloud scenarios. Sun-photometer optical thickness measurements and particle size distribution retrievals [4], performed during descents in spiral also give interesting information on the vertical aerosol distribution and will also be presented. The inversion method

is also compared with other airborne flux and in-situ measurements as well as available satellite retrievals (e.g. SEVIRI, MODIS).

References

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