4.188 African biomass burning pollutes large parts of the south east Atlantic boundary layer – results from the CLouds and Aerosol Radiative Impacts and Forcing: Year 2017 (CLARIFY-2017).

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Abstract:

The African continent is the largest global source of BBA (around 50% of global emissions) which is transported offshore over the underlying semi-permanent cloud decks

making the SE Atlantic a regional hotspot for BBA concentrations. While global climate models agree that this is a regional hotspot, their results diverge dramatically when attempting to assess aerosol-radiation-interactions and aerosol-cloud-interactions. Hence the area presents a very stringent test for climate models which need to capture not only the aerosol geographic, vertical, absorption and scattering properties, but also the cloud geographic distribution, vertical extent and cloud reflectance properties. Similarly, in order to capture the aerosol-cloud-interactions adequately, the susceptibility of the clouds in background conditions; aerosol activation processes; uncertainty about where and when BBA aerosol is entrained into the marine boundary layer and the impact of such entrainment on the microphysical and radiative properties of the cloud result in a large uncertainty.

The CLARIFY-2017 experiment sought to address these major challenges since measurement methods and high resolution model capabilities have developed rapidly over the last few years and are now sufficiently advanced that the processes and properties of BBA can be sufficiently constrained. The UK Facility for Airborne Atmospheric Measurements (FAAM), was operated from Ascension Island in August and September to measure in-situ and remotely sensed aerosol and cloud and properties while advanced radiometers measured aerosol and cloud radiative impacts. The aircraft measurements took place at the same time as the NASA ORACLES programme, the DoE-funded LASIC programme, and the CNRS AEROCLO-sA project.
We present an overview of the data and discuss the physical, chemical, optical and radiative properties of biomass burning aerosols and the physical properties of stratocumulus clouds and discuss initial model results of aerosol-radiation interactions in weather and climate models and the representation of aerosol-cloud interactions across a range of model scales.