Aerosol-radiation-cloud interactions in the South-East Atlantic: first results from the ORACLES-2016 deployment and plans for future activities

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Southern Africa produces almost a third of the Earth's biomass burning (BB) aerosol particles. Particles lofted into the mid-troposphere are transported westward over the South-East (SE) Atlantic, home to one of the three permanent subtropical stratocumulus (Sc) cloud decks in the world. The SE Atlantic stratocumulus deck interacts with the dense layers of BB aerosols that initially overlay the cloud deck, but later subside and may mix into the clouds. These interactions include adjustments to aerosol-induced solar heating and microphysical effects, and their global representation in climate models remains one of the largest uncertainties in estimates of future climate. Hence, new observations over the SE Atlantic have significant implications for regional and global climate change predictions.

Our understanding of aerosol-cloud interactions in the SE Atlantic is severely limited. Most notably, we are missing knowledge on the absorptive and cloud nucleating properties of aerosols, including their vertical distribution relative to clouds, on the locations and degree of aerosol mixing into clouds, on the processes that govern cloud property adjustments, and on the importance of aerosol effects on clouds relative to co-varying synoptic scale meteorology.

We describe first results from various synergistic, international research activities aimed at studying aerosol-cloud interactions in the region:

- NASA's airborne ORACLES (ObseRvations of Aerosols Above Clouds and Their IntEractionS) deployment in August/September of 2016,
- the DoE's LASIC (Layered Atlantic Smoke Interactions with Clouds) deployment of the ARM Mobile Facility to Ascension Island (June 2016 – October 2017),
- the ground-based components of CNRS' AEROCLO-sA (Aerosols Clouds and Fog over the west coast of southern Africa), and
- ongoing regional-scale integrative, process-oriented science efforts as part of SEALS-sA (Sea Earth Atmosphere Linkages Study in southern Africa).

We expect to describe experimental setups as well as showcase initial aerosol and cloud property distributions. Furthermore, we discuss the implementation of future activities in these programs in coordination with the UK Met Office's CLARIFY (CLoud-Aerosol-Radiation Interactions and Forcing) experiment in 2017.