

CLARIFY-2016

Cloud-Aerosol-Radiation Interactions and Forcing: Year 2016 (CLARIFY-2016)

CASE FOR SUPPORT PART 2: The Science Case

1. EXECUTIVE SUMMARY:

The representation of clouds, aerosols and cloud-aerosol-radiation impacts remain the largest uncertainties in climate change, limiting our ability to accurately reconstruct and predict future climate change. The SE Atlantic is a region where high atmospheric aerosol loadings from biomass burning and semi-permanent stratocumulus cloud are co-located, providing a natural laboratory for studying the full range of aerosol-radiation and aerosol-cloud interactions and their perturbations of the Earth's radiation budget. These perturbations have a significant impact, not just locally but also via global teleconnections on wider changes in climate. There have never been detailed measurements of the combined cloud-aerosol-radiation system over the SE Atlantic although such measurements are crucial in constraining the current generation of large eddy simulation, numerical weather prediction and climate models. CLARIFY-2016 will deliver a wide range of airborne, surface-based and satellite measurements of clouds, aerosols, and their radiative impacts to 1) improve representation and reduce uncertainty in model estimates of the direct, semi-direct and indirect radiative effect of absorbing biomass burning aerosols; 2) improve our knowledge and representation of the processes determining stratocumulus cloud microphysical and radiative properties; 3) challenge, validate and improve satellite retrievals of cloud and aerosol and their radiative impacts; 4) improve numerical models of cloud and aerosol and their impacts on radiation, weather and climate. CLARIFY is a major consortium programme consisting of 5 principal UK universities with project partners from the UK Met Office, European universities and research institutes and the US NSF ONFIRE (Observations of Fires Impact on the southeast Atlantic Region; 5 NASA research centres and 8 USA universities) and US NASA ORACLES (Observations of Aerosols above Clouds and their interactions; 22 USA universities and research labs) consortia making CLARIFY a truly international, synergistic project.