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# Airborne aerosol measurements over West Africa during the AMMA SOP 1 and 2 field campaign

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In July-August 2006, a large field campaign took place in West Africa, forming part of the international AMMA (African Monsoon Multidisciplinary Analyses) project. Several ground based sites and 5 aircraft were involved in the project. This paper presents findings from the aerosol particle measurements made on board the UK Facility for Airborne Atmospheric Measurements (FAAM), a BAe146 research aircraft. The BAe146 was operational at Niamey Airport, Niger between 19th July - 20th August 2006 and in Dakar, Senegal between 21-28 August 2006. The operating region therefore covers a large area of West Africa, and some of the Atlantic Ocean off the coast of Senegal. Data was collected during both altitude profiles and straight and level runs. The aerosol instrumentation onboard included: a TSI 3025 UCPC measuring number concentrations of particle greater than 3 nm; a Passive Cavity Aerosol Sizing Probe (PCASP) for measurement of the ambient size of particles in the size range 0.3 to 3 um; a 3 wavelength TSI nephelometer to measure the aerosol scattering coefficient; a single wavelength absorption photometer to determine the absorption coefficient; a DMT Cloud Droplet Probe to determine the ambient size of particles in the 3 to 30 um diameter range; a GRIMM 1.109 Optical Particle Counter (OPC) to determine the dry sampled size of particles in the 0.3 to 3 um size range; an Aerodyne Aerosol Mass Spectrometer (AMS) to determine the online, size resolved mass loading of submicron, non refractory particulate components at one minute resolution. Limited filter collections were also made.

There is good data coverage from these instruments for the vast majority of the flights. The AMS data reveals a very clean mass loading across the operating region.

A preliminary analysis of the AMS data has been performed in conjunction with data from the other instruments, and examples of biomass burning, dust, urban plumes, and areas dominated by biogenic emissions have been identified. Biomass burning layers were encountered between 6 and 10N. These showed a similar spectral signature to those measured in the same region in the dry season and appear to have originated in the southern hemisphere. Urban plumes from Niamey and Lagos were measured, and were characterised by a significant hydrocarbon signature typical of near-source fossil fuel emissions. The concentration in these plumes was not dissimilar to, but perhaps smaller than many European cities, perhaps demonstrating the total fuel use was not very large. Emission ratios relative to CO have been estimated. In regions of biogenic emission, where high levels of isoprene and other VOCs were measured, there was little evidence of enhanced organic aerosol loading, typically observed when secondary organic aerosol (SOA) has been produced. The extent to which observable organic loading is observed has been determined on the basis of statistical comparison as individual data points are rarely above the detection limit of the instrument. This illustrates that the loadings are very low and that models of SOA formation may well be overpredicting in clean, biogenic environments.