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Mixing State and Optical Properties of Biomass Burning Aerosol during the SAMBBA 2012 Campaign

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Emissions of black carbon are a global phenomenon associated with combustion activities with an estimated 40 % of global emissions from biomass burning. These emissions are typically dominated in regional hotspots, such as along the edges of the Amazon Basin, and contribute to the regional air quality and have associated health impacts as well as the global climatic impacts of this major source of black carbon as well as other radiatively active species.

New airborne measurements will be presented of biomass burning emissions across the Amazon region from the South AMerican Biomass Burning Analysis (SAMBBA) campaign based at Porto Vehlo, Rondônia, Brazil in September 2012. This airborne campaign aboard the FAAM BAe-146 coincided with the seasonal peak in South American biomass burning emissions, which make up the most dominant source of atmospheric pollutants in the region at this time. SAMBBA included dedicated flights involving in-situ measurements and remote sensing of single plume studies through to multi-plume sampling of smouldering and flaming vegetation fires, regional haze sampling, and measurements of biogenic aerosol and gases across Amazonas.

This presentation summarises early findings from the SAMBBA aircraft observations focusing on the relationship between biomass burning aerosol properties; size distributions, aerosol mixing state and optical properties from a suite of instruments onboard the FAAM BAe-146. The interplay of these properties influences the regional radiative balance impacting on weather and climate.

The Leeds airborne VACC (Volatile Aerosol Concentration and Composition) instrument is designed to investigate the volatility properties of different aerosol species in order to determine aerosol composition; furthermore it can be used to infer the mixing state of the aerosol. Size distributions measured with the volatility system will be compared with ambient size distribution measurements this allows information on organic coating loadings to be derived.

Cases of different aerosol mixing state have been identified from almost entirely externally mixed aerosol with a mono-modal size distribution across the rainforest of Amazonas in contrast to sampled Rondônian regional haze which was identified to be externally mixed with a coated non-volatile core with a volatile mode.

Future and ongoing analysis from SAMBBA will improve the knowledge of the regional and climatic implications of biomass burning activities in the Amazon basin which are a significant issue globally.