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# Physiochemical characterisation of biomass burning plumes in Brazil during SAMBBA

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Biomass burning represents one of the largest sources of particulate matter to the atmosphere, which results in a significant perturbation to the Earth's radiative balance coupled with serious negative impacts on public health. Globally, biomass burning aerosols are thought to exert a small warming effect of 0.03 $Wm^{-2}$, however the uncertainty is 4 times greater than the central estimate. On regional scales, the impact is substantially greater, particularly in areas such as the Amazon Basin where large, intense and frequent burning occurs on an annual basis for several months (usually from August-October). Furthermore, a growing number of people live within the Amazon region, which means that they are subject to the deleterious effects on their health from exposure to substantial volumes of polluted air.

Results are presented here from the South American Biomass Burning Analysis (SAMBBA), which took place during September and October 2012 over Brazil. A suite of instrumentation was flown on-board the UK Facility for Airborne Atmospheric Measurement (FAAM) BAe-146 research aircraft. Measurements from the Aerodyne Aerosol Mass Spectrometer (AMS) and Single Particle Soot Photometer (SP2) form the major part of the analysis presented here.

The aircraft sampled several fires in close proximity (approximately 150m above the most intense fires) in different areas of Brazil. This included two extensive areas of burning, which occurred in the states of Rondonia and Tocantins. The Rondonia fire was largely dominated by smouldering combustion of a huge single area of rainforest with a visible plume of smoke extending approximately 80km downwind. The Tocantins example contrasted with this as it was a collection of a large number of smaller fires, with flaming combustion being more prevalent. Furthermore, the burned area was largely made up of agricultural land in a cerrado (savannah-like) region of Brazil.

Initial results suggest that the chemical nature of these fires differed markedly, with BC concentrations being an order of magnitude greater in the Tocantins case (up to 50 $\mu$g $m^{-3}$ of BC) compared with the Rondonia case (up to 5 $\mu$g $m^{-3}$ of BC). Organic matter (OM) concentrations were similar in both cases, with maximum concentrations peaking between 4-5 mg $m^{-3}$. Such concentrations are approximately more than 100 times greater than those sampled in the "background" regional haze. This variation of BC to OM ratio has potentially large implications for the radiative balance in the respective regions, as BC represents the major absorbing component of biomass burning aerosol. Further analysis will compare the aerosol mass concentrations with gas phase species, as well as probing the chemical and physical evolution of the aerosol as it advects downwind and is diluted with regional air. In particular, such analyses will focus upon the aging of the organic aerosol component as well as examining how the mixing state of the BC particles evolves. Such properties have important implications for the life cycle and formation of particulate material, which governs its subsequent impacts.