2.043 Properties and impacts of biomass burning aerosol over the Amazon region – a summary of the South American Biomass Burning Analyses (SAMBBA) project.

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Abstract:

Biomass burning from wildfires is one of the largest sources of absorbing and organic aerosol on the planet. It has a significant influence on cloud properties and makes a substantial contribution to the radiation balance of the atmosphere on continental scales. Such perturbations have an effect on regional weather and climate and can influence net growth of the biosphere. Despite the importance of these effects across continental regions such as Amazonia, there are considerable gaps in our knowledge that limit accurate prediction. These result from: inaccurate prediction of optical properties from the physical and chemical properties of biomass burning aerosol; uncertainty over the controls on the aerosol distribution throughout the atmosphere resulting from emissions and dispersion of large plumes; the inability of regional and global models to represent the measured atmospheric burden across major regions of burning without significant moderation of emissions; recent changes in burning practices that significantly alter the optical properties and spatial extent of biomass burning aerosol; shortcomings in model representations of absorbing aerosol that limit our understanding of aerosol-cloud-precipitation feedbacks; and the complexity of capturing the net response of the biosphere to the competing stimuli of reduced radiation, increased fraction of scattered light, and increased ozone resulting from biomass burning.

During 2012 a major experimental study to investigate biomass burning across the southern margins of Amazonia took place. We present the major results from this joint Brazil-UK programme, which involved a large research aircraft – the UK Atmospheric Research Aircraft (FAAM) and a number of ground-based measurement sites, and utilised a range of regional and climate models. We demonstrate how this study has been able to address or constrain the process uncertainties discussed above, advance methods to capture feedbacks and quantify their magnitude, and summarise the remaining outstanding research questions.