Modelling amazonian biomass burning aerosol using WRF-Chem

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Aerosols constitute some of the largest uncertainties in climate forcings in current models. Biomass burning aerosols (BBA) can make up a large proportion of the aerosol population. However, concentrations of BBA vary widely depending on season and location. In the Amazon dry season concentrations as high as 10,000 cm^{-3} have been observed (Roberts *et al.*, 2003). With their high proportion of black carbon, BBA are known to be strongly absorbing, with SSA close to the boundary between being net absorbers and scatterers, meaning the net radiative forcing can be uncertain (Forster *et al.*, 2007). Nonetheless, BBA can impact greatly on local weather and climate due to their optical properties and ability to act as CCN, influencing clouds in the region.

The South AMerican Biomass Burning and Analysis (SAMBBA) consortium is an international research project consisting of seven British Universities, UK Met Office, University of Sao Paulo and INPE (Brazilian Space Agency). It has been set up to investigate the sources, properties and impacts of BBA from the Amazon on the regional and global scale. SAMBBA consists of both an extensive measurement and modelling campaign. The measurement campaign consisted of a series of research flights using the modified FAAM BAE-146, carried out in September and October 2012 in Brazilian Amazonia. Detailed measurements profiling the chemical and aerosol content of the background Amazonian troposphere and within biomass burning plumes were taken.

The modelling component of the consortium is organised as a hierarchy of models, acting over a range of scales, from global to cloud resolving. The Weather Research and Forecasting Model with Chemistry (WRF-Chem) has been applied at the regional scale (25 km horizontal grid spacing, with nests for particular case studies run at 5 km) to investigate how BBA are emitted and processed in the atmosphere.

WRF-Chem is a fully-coupled, "online" regional climate model with fully consistent meteorological and air quality components, each using the same transport, grid spacing and timestep (Grell *et al.*, 2005). A parameterisation has been developed that calculates the injection height of biomass burning aerosols into the upper atmosphere, based on land-use and the fire source strength and size (Frietas *et al.* 2007). This has been integrated into WRF-Chem and used in the past to simulate biomass-burning events in Canada (Grell *et al.*, 2011)). Currently the biomass burning emissions this scheme is designed to work with are only compatible with bulk GOCART and the MADE/SORGAM modal aerosol schemes. We are modifying the scheme to function using MOSAIC sectional aerosol (Zaver *et al.*, 2008), in order to better resolve the size distribution of BBA.

We will be presenting preliminary model results for the SAMBBA campaigns. The vertical and horizontal distribution of the BBA in the model will be evaluated and size distribution of new and aged BBA assessed. Early comparisons between WRF-Chem results and aircraft measurements for particular case studies will be will also be shown and the implications discussed.

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