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Secondary organic aerosol from biogenic VOCs over West Africa during AMMA

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Abstract. This paper presents measurements of organic aerosols above subtropical West Africa during the wet season using data from the UK Facility for Airborne Atmospheric Measurements (FAAM) aircraft. Measurements of biogenic volatile organic compounds (BVOC) at low altitudes over these subtropical forests were made during the African Monsoon Multidisciplinary Analysis (AMMA) field experiment during July and August 2006 mainly above Benin, Nigeria and Niger. Data from an Aerodyne Quadrupole Aerosol Mass Spectrometer show a median organic aerosol loading of $1.07 \mu\text{g m}^{-3}$ over tropical West Africa, which represents the first regionally averaged assessment of organic aerosol mass (OM) in this region during the wet season. This is broadly in agreement with global model predictions based on partitioning schemes, although there are large uncertainties associated with such estimates. In contrast our own calculations based on aerosol yields from isoprene and monoterpenes during chamber studies under represent the OM measured in this region on a comparable scale to the under representations of OM by predictive models in the mid latitudes. As global models rely on similar yield calculations in their global estimates, as our calculations this points to further systematic differences between global model estimates and measurements of SOA, most likely caused by use of incorrect BVOC emission rates. The under predictions of OM by our calculations and those in the mid latitudes employ yields extrapolated from chamber data obtained at higher mass concentrations – more recent yield data for α -pinene obtained at ambient concentrations in a flow through chamber (Shilling et al., 2008) show considerably better agreement with our data.

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