



Isoprene emissions modelling for West Africa: MEGAN model evaluation and sensitivity analysis

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Isoprene emissions are the largest source of reactive carbon to the atmosphere, with the tropics being a major source region. These natural emissions are expected to change with changing climate and human impact on land use. As part of the African Monsoon Multidisciplinary Analyses (AMMA) project the Model of Emissions of Gases and Aerosols from Nature (MEGAN) has been used to estimate the spatial and temporal distribution of isoprene emissions over the West African region. During the AMMA field campaign, carried out in July and August 2006, isoprene mixing ratios were measured on board the FAAM BAe-146 aircraft. These data have been used to make a qualitative evaluation of the model performance.

MEGAN was firstly applied to a large area covering much of West Africa from the Gulf of Guinea in the south to the desert in the north and was able to capture the large scale spatial distribution of isoprene emissions as inferred from the observed isoprene mixing ratios. In particular the model captures the transition from the forested area in the south to the bare soils in the north, but some discrepancies have been identified over the bare soil, mainly due to the emission factors used. Sensitivity analyses were performed to assess the model response to changes in driving parameters, namely Leaf Area Index (LAI), Emission Factors (EF), temperature and solar radiation.

A high resolution simulation was made of a limited area south of Niamey, Niger, where the higher concentrations of isoprene were observed. This is used to evaluate the model's ability to simulate smaller scale spatial features and to examine the influence of the driving parameters on an hourly basis through a case study of a flight on 17 August 2006.

This study highlights the complex interactions between land surface processes and the meteorological dynamics and chemical composition of the PBL. This has implications for quantifying the impact of biogenic emissions on the atmospheric composition over West Africa and any changes that may occur with changing climate.

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