Geophysical Research Abstracts, Vol. 9, 03326, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03326

Assessing emission fluxes of isoprene over Europe: Combination of meteorology and land use information on a high spatial resolution

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Emissions of isoprene are strongly dependent on leaf temperature and photosynthetic photon flux density. Temperature and surface solar radiation are key driving variables in published emission algorithms (Guenther et al., 1993, 1995 (G95), 2006 (MEGAN); Schuh et al. 1997).

The European landscape is characterised by a great variety of climatic and orographic zones and biomes, ranging from boreal forests in Scandinavia and Russia to Mediterranean shrub vegetation. For millennia, the European land cover has been intensively modified by man to create an extremely patchy landscape; therefore it is of great importance to use high resolved spatial meteorological surface data and land cover data for modelling isoprene emissions.

Distribution of tree species from the ICP Forest level1 network, and of crop species from the CAPRI-project were combined with land cover (CLC2000/GLC2000) maps to a new land cover map covering the European continental domain (-20˚W,20˚N to 40E˚,70˚N). The forest raster maps contain 115 tree species (Köble and Seufert, 2001), the crops raster maps 26 crop species and the CORINE Land Cover 2000 contains 50 vegetation classes. Information is available on a spatial resolution of 1 km by 1 km. For the purpose of this study all land use data was aggregated to 10 km by 10 km and projected on a regular latitude/longitude grid.

Meteorological data provided by the European Centre for Medium Range Weather Forecast (ECMWF) is employed to calculate isoprene emissions. The European domain is resolved at a horizontal resolution of $0.5^{\circ} \times 0.5^{\circ}$ using the operational forecast data and at $1^{\circ} \times 1^{\circ}$ for the ERA-40 reanalysis. In addition, new data from climate runs with the Climate Version of the "Lokal-Modell" (CLM, http://clm.gkss.de) is now available on a high horizontal resolution for Europe.

Two different emission algorithms, G95 and MEGAN, were used to calculate emission fluxes of isoprene over Europe. Additional factors controlling the emission rates as density of green leaves, soil moisture, and phenology of leaves can be taken into account in the new MEGAN algorithm. A complete list of base emission factors for all tree and crops species and for the landcover classes was compiled from the updated survey performed by Lenz et al. (2001) to calculate the isoprene emission inventory.

The focus of this work is to study the effect of using meteorological data with different spatial resolution on isoprene emissions over Europe. Resulting European isoprene emission fields can be used in future to investigate secondary particle formation from isoprene with a global chemistry transport model.

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