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Impact of biogenic emissions on air quality over Europe

Efthimios Tagaris, Rafaella-Eleni P. Sotiropoulou, Nikos Gounaris, and Spyros Andronopoulois
National Center for Scientific Research DEMOKRITOS, Greece (tagaris@ipta.demokritos.gr)

The impact of biogenic volatile organic compound (BVOC) emissions on air quality over Europe is assessed for a summer month (i.e. July, 2006) using Models-3 (i.e. CMAQ, MM5, SMOKE) modeling system. The Community Multiscale Air Quality (CMAQ) v4.7 Modeling System with the Carbon Bond mechanism (CB05) is used for the regional air quality modeling. Meteorological fields are derived using the Penn State/NCAR Mesoscale Model (MM5). Emissions are processed by the Sparse Matrix Operator Kernel Emissions (SMOKE v2.6) modeling system for converting the resolution of the emission inventory data to the resolution needed by the air quality model. TNO has provided a gridded anthropogenic emissions database for the year 2006 over Europe in a 0.1×0.1 degrees resolution. The Biogenic Emission Inventory System, version 3 (BEIS3) is used for processing biogenic source emissions. Gridded land use data in 1 km resolution provided by the U.S. Geological Survey (USGS), the default summer and winter emission factors and meteorological fields are used to create hourly model-ready biogenic emissions estimates. Results suggest that biogenic emissions increase simulated daily maximum 8 hours ozone average ($Max8hrO_3$) concentrations over Europe by 5.6% for July 2006. BVOC emissions increase $Max8hrO_3$ concentrations more than 5ppbV in a big part of Europe while locally it is more than 10ppbV. Despite the general trend of reduction in PM2.5 concentrations (about -2% on average over Europe during July 2006) there are regions where PM2.5 concentrations are simulated higher due to BVOC emissions. This is related to the change in PM2.5 component concentrations: an increase in organic carbon concentration and a decrease in sulfate concentration are simulated (13.6% and -5.6% on average over Europe during July 2006, respectively) while changes in nitrate concentrations are noted regionally.

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