



Update of biogenic VOC emission inventory and its application in the atmospheric chemistry/aerosol model CAMx

Katerina Zemankova, Peter Huszar, Jan Bednar, and Josef Brechler

Charles University in Prague, Faculty of Mathematics and Physics, Dept. of Meteorology and Environment Protection, V Holesovickach 2, Prague 18000, Czech Republic (katerina.zemankova@mff.cuni.cz)

Biogenic sources such as oceans, soils and especially vegetation have been shown to emit significant amounts of volatile organic compounds (VOCs) into the atmosphere. It has been estimated that in global scale biogenic VOCs (BVOCs) are emitted in 10 times higher amounts when compared to VOCs of anthropogenic origin [?]. However, description of an interaction between biosphere and atmosphere is not an easy task, modelling of BVOC fluxes is linked with relatively high uncertainties, mainly arising from insufficient description of sources, their temporal and spatial dynamics and emission potentials.

Due to lack of input information BVOC emission inventories applied in air pollution modelling are often based on generalized land cover categories such as „coniferous”, „deciduous” or „mixed” forest, missing more detailed specification of plant species composition. In order to increase the accuracy of biogenic VOC inventory an updated input land cover dataset has been prepared. The dataset consists of 230 land cover categories and describes the land cover of the European domain with 1 km resolution. This dataset is mainly based on the single tree species database from the European project of JRC in Ispra - Agriculture, Forestry, and Other Land Uses in Europe (AFOLU) [?] which covers most of the domain. For the locations where AFOLU data were not available, i.e. basically non-EU areas, the USGS Eurasia land cover database has been used. Emission potentials for new land cover categories were obtained either from the laboratory measurements or from the literature. The Guenther et al. (1995) model algorithm with modifications based on the publications survey has been used for the calculation of biogenic VOC emission fluxes.

Effects of updated land cover dataset and consequent BVOC emission inventory on concentrations of low level ozone at different sites in Europe were studied using chemical transport model CAMx (Comprehensive Air quality Model with eXtensions, Environ). Period of July and August 2010, was selected for the simulation assuming that amounts of BVOC emissions are the highest in this part of year and meteorological conditions during summer season are favorable for low level ozone formation.

Model was operated on three nested domains. Smallest domain being focused on the area of the Czech Republic in the spatial resolution of 3 km. Intermediate domain covered the area of central Europe with spatial resolution of 9 km and the third domain of 27 km spatial resolution covered most of the Europe (excluding northern parts) and Mediterranean. The CAMx model was driven by meteorological prognostic model WRF (Weather Research & Forecasting Model). Anthropogenic emissions of atmospheric pollutants for this study were obtained from the European project MEGAPOLI.

Results of three CAMx model runs were compared to measured data at different European sites. In the first model run no biogenic VOC emissions were taken into account. The second model run accounted for BVOC emission inventory based on generalized land cover dataset. Finally, the updated BVOC emission inventory based on speciated land cover categories was applied in the third model run.

References

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