Sensitivity of isoprene emission quantifications on environmental and vegetation parameters under Mediterranean conditions

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Abstract

Biogenic Volatile Organic Compounds (BVOC) play an important role in the chemistry of the atmosphere. Their emission rates depend on the interaction of environmental, biological, physical and chemical processes. Therefore, modelling of BVOC emissions is a complex task and the uncertainty of the emission data should be addressed.

The prime objective of the current study is to analyse the sensitivity of the isoprene emission quantifications to environmental and vegetation parameters as a part of the model uncertainty analysis. In particular, the influence of the CO_2 and O_3 atmospheric concentrations on isoprene emissions is investigated, looking at short-term fluctuation. Also, the influence of different assumptions in the input data considered by the modelling approach on the final emission inventory is stressed in the current work.

The study is performed for Portugal, focusing on the quantification of isoprene emissions under typical summer conditions in Mediterranean climate characterised by high temperature, drought stress and high ambient ozone concentrations. As a first step, the standard Guenther algorithm was applied to the study area. At next, a feedback from the atmospheric concentrations of CO_2 and O_3 on short-term emission fluctuations was analysed. For this purpose, O_3 data provided by a photochemical model (CAMx) and CO_2 data from point flux measurements have been used to estimate a correction factor for the isoprene baseline algorithm and to analyse their importance for the final emission estimates. Moreover, the grid resolution of land use data, their aggregation/disaggregation procedure as well as plant type classification are demonstrated to be an important source of uncertainty in the isoprene emission inventory.