



Volatile organic compound sources for Southern Finland

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Volatile organic compounds (VOCs) have several sources, both biogenic and anthropogenic. Emissions of biogenic VOCs in a global scale are estimated to be an order of magnitude higher than anthropogenic ones. However, in densely populated areas and during winter time the anthropogenic VOC emissions dominate over the biogenic ones.

The aim of this study was to clarify potential local sources and source areas of VOCs in different seasons. Diurnal behaviour in winter and spring were also compared at two different sites in Finland: SMEAR II and III (Station for Measuring Ecosystem - Atmosphere Relations). SMEAR II is a rural site located in Hyytiälä in Southern Finland 220 km North-West from Helsinki whereas SMEAR III is background urban site located 5 km from the downtown of Helsinki. The volume mixing ratios of VOCs were measured with a proton-transfer-reaction mass spectrometer (PTR-MS, Ionicon Analytik GmbH, Austria) during years 2006-2011. Other trace gases such as CO, NO_x and SO₂ were also measured in both sites and used for source analysis. Source areas for long term VOC measurements were investigated with trajectory analysis and sources for local and regional concentrations were determined by Unmix multivariate receptor model.

Forest fires affect air quality and the biggest smoke plumes can be seen in satellite images and even hinder visibility in the plume areas. They provide temporally and spatially well-defined sources that can be used to verify source area estimates. During the measurement periods two different forest fire episodes with several hotspots, happened in Russia. Forest fires which showed up in these measurements were in 2006 near the border of Finland in Vyborg area and 2010 in Moscow area. Forest fire episodes were clearly observed in trajectory analysis for benzene, toluene and methanol and also CO and NO_x. In addition to event sources continuous source areas were determined. Anthropogenic local sources seemed to be dominant during winter in both sites. However during spring biogenic influence increased. In addition to source analysis this behaviour was visible in enhanced diurnal cycles of VOCs (Patokoski et al., 2014, in press). We will present important sources and source areas for Southern Finland's concentrations.

References:

Patokoski, J., Ruuskanen, T.M., Hellén, H., Taipale, R., Grönholm, T., Kajos, M.K., Petäjä, T., Hakola, H., Kulmala, M. & Rinne, J., 2014. Winter to spring transition and diurnal variation of VOCs in Finland at an urban background site and a rural site. *Boreal Env. Res.* 19. In press.