Long-term monitoring, chemical composition and source apportionment study of $PM_{2.5}$ in Augsburg, Germany

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Knowledge of the temporal and spatial variation of particulate organic matter (POM) and its chemical composition are clearly needed to understand its climate and adverse human health effects. To protect both human health and the environment, it is important to combat pollutant emissions at the source and identify and implement the most effective reduction measures at local, national and international levels. Comprehensive studies are therefore necessary to evaluate the characteristics of PM at the different sources. Organic compounds of biogenic and anthropogenic origin often represent a large fraction, up to 40%, of total PM mass. The concentrations of organic compounds ranging from below $pg.m^{-3}$ to $mg.m^{-3}$[1].

A monitoring site for detailed physical and chemical characterization of ambient fine and ultrafine particles was established in Augsburg in October 2004. The station is located on the premises of the University of Applied Sciences (Fachhochschule) Augsburg (Fig.1). Daily samples of $PM_{2.5}$ were collected at the monitoring site of Fachhochschule in Augsburg city. Allowing for a thorough monitoring of particle associated organic substances and the different sources of PM pollution. The long-term monitoring data, every fifth day samples (from 2007 to 2012) are analyzed for their particulate organic compounds (POC) and carbon fraction (EC/OC) and will be considered in our investigation.

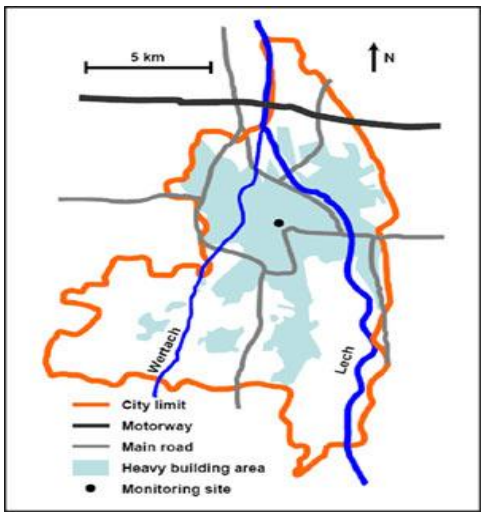

Figure1. Monitoring site in Augsburg

In-situ derivatization thermal desorption gas chromatography time of flight mass spectrometry (IDTD-GC-ToF-MS) [2] is used for the chemical characterization of POC. Elemental and organic carbon fraction (EC/OC) are analyzed by thermal-optical analysis IMPROVE-A protocol.

Results of source apportionment analysis of PM_{10} in Augsburg have been published recently. In our present study, the main sources of POC were identified using positive matrix factorization (PMF) [3]. More than 80 organic species under investigation will be used for PMF analysis, including PAH, oxidized PAH, n-alkanes, iso & anteiso alkanes, hopanes, resin acids, fatty acids, anhydrous sugars and phenolic compounds.

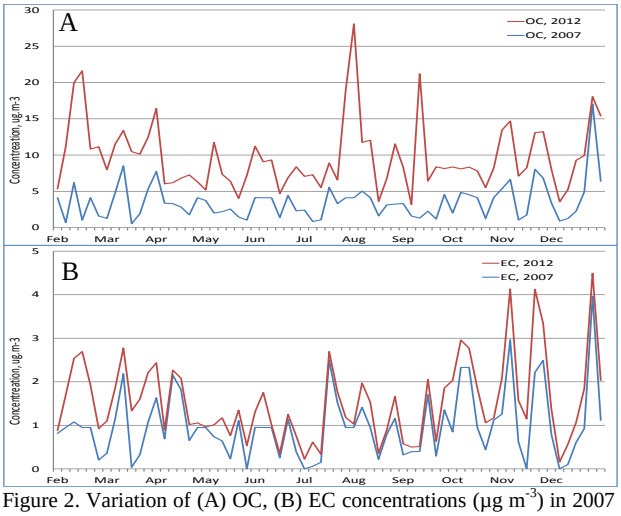

Figure 2. Variation of (A) OC, (B) EC concentrations (µg m^{-3}) in 2007 and 2012

The health effects of organic compounds in aerosols are currently investigated in the framework of the Helmholtz Virtual Institute of Complex Molecular Systems in Environmental Health, HICE (www.hice-vi.eu).

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