Winter particulate matter (PM10) sources for an Austrian-Slovenian border region.

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Air pollution by particulate matter derived from biomass burning is recognized as a worldwide problem and is considered from the point of view of scientists and politicians, respectively. Many European regions have difficulties with keeping the internationally, nationally or locally defined limit values. Emission sources may cause pollution across the borders, what makes one-sided reduction policies inefficient. This is true also for residential burning particles, as observed e.g., in Aosta Valley (IT, FR, CH, Finardi *et al.,* 2002).

The following study was set by local authorities of South Austria and North Slovenia in order to develop efficient methods to improve the local air quality. The scientific goal was to obtain a detailed chemical characterization of collected particulate matter, information about its sources and the optimization of methods for assessment of source contributions.

Particulate matter sampling was conducted at four urban and three background stations in Carinthia (AT), South Styria (AT) and Maribor region (SI). PM10 was collected between 29.01.2011 and 28.02.2011 daily (24h), on quartz fibre filters (Pallflex, 150mm), using high volume samplers (~700m³). The particle mass was determined gravimetrically.

Circular filter aliquots (with 10mm diameter) were used for the determination of carbon parameters (organic carbon, OC and elemental carbon, EC) with a thermal-optical method (*Sunset OCEC Aerosol Lab Analyser*), using a EUSAAR2 temperature protocol (Cavalli *et al.,* 2009). Inorganic ions and sugars were analysed using ion chromatography (*Dionex*) with conductivity (ions) or pulsed amperometric detection (saccharides). For this purpose 3 to 5 filter aliquots (10mm) were eluted with extra pure Milli-Q (resistance 18.2 MΩ) water (anions, sugars) or with 12 mM methane sulphonic acid (cations).

HULIS (humic like substances) were determined with a TU Vienna derived method (Limbeck *et al.*, 2005) comprising an NDIR analysis of CO_2 evolved from combustion of water- and alkali-extract treated with appropriate solid phase extraction.

Selected elements including Al were analysed using X-Ray Fluorescence.

Aerosol water content was assessed with thermo-gravimetric method in which the loss of weight of a filter aliquot heated to 100°C in a thermo-balance under nitrogen atmosphere and kept at this temperature for 5 minutes is equivalent to the aerosol H_2O.

Source analysis was performed using a simple macro-tracer approach, describing up to nine main aerosol sources (Puxbaum *et al.,* 2005). This model involves anhydrosugars: levoglucosan and mannosan as specific tracers for wood burning (Schmidl *et al*., 2008, 2011, own unpublished data).

Except for the rural background station in Styria the short-term PM10 threshold value was exceeded between 17 and 20 times during the measurement period. The average PM10 concentration observed for urban sampling points was 60 µg/m³.

The contribution of biomass burning was lowest in the rural background in Styria (22%), and accounted up to 40% in Carinthia (urban background), being the most relevant local PM10 source. Similar significance was observed for secondary inorganic aerosols (ammonium sulphates and nitrates): between 29% (Carinthia, urban traffic) to 48% (Styria rural background). Traffic near locations were characterized by a higher impact of fossil fuel emissions (expected mainly from Diesel engines), mineral dust (carbonates and silicates) and de-icing salt (both from the re-suspension). On the other hand a higher amount of organic secondary aerosols was found at background measurement sites.

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