



Source apportionment of elevated BaP concentrations in PM10 aerosols in an alpine valley in Austria

Heidi Bauer, Hans Puxbaum, Nicole Jankowski, and Lylian Sampaio Cordeiro Wagner

Vienna University of Technology, Institute for Chemical Technologies and Analytics, Vienna, Austria
(heibauer@mail.zserv.tuwien.ac.at)

INTRODUCTION: In a village situated at 1215 m a.s.l. in a natural preserve in an Austrian alpine valley elevated BaP concentrations have been measured in the last years. A highly frequented highway leading from Italy to Germany passes near the village. Monthly means of particulate BaP concentrations show a clear seasonal trend with values below 1 ng/m³ during the warmer months and with concentrations up to 9 ng/m³ in the cold season. Annual averages in the years 2000 – 2005 ranged between 1.4 and 2.8 ng/m³ - much higher than the EU target value of 1 ng/m³. We used a macrotracer model developed at the Vienna University of Technology to determine the contributions of the sources for BaP emissions, which were mainly space heating with wood and traffic from the highway.

EXPERIMENTAL: The macrotracer concept is a nine component model to derive source contribution and explains 80-100% of PM10 aerosols in Austria. The amount of traffic exhaust is derived by using EC as tracer, whereas EC produced by wood burning is subtracted, the amount of wood smoke is derived by the anhydro-sugar levoglucosan and the ratio between the anhydro-sugars levoglucosan and mannosan. For the source apportionment of BaP the applied factors reflect on the one hand the composition of the automotive fleet in Austria and on the other hand the composition of the fire wood in the region. Filter samples collected with a high volume sampler in winter were analyzed for PM10 aerosol mass, total, organic, elemental and carbonate carbon, HULIS, anhydro-sugars, polyols and ions (major ions and organic acids) and PAHs. In the same way emission samples taken at a motor test stand and at a test stand for wood combustion were analyzed (Schmidl et al. 2008). The saccharides were determined using high pH anion exchange and pulsed amperometry (HPAE-PAD). Details of the analytical method are given in Iinuma et al., 2009. Elemental and organic carbon were determined with a thermal-optical instrument (Sunset lab) and PAHs were analyzed with GS-MS.

RESULTS: In winter wood smoke and traffic contributed to 40% and to 9% to PM10 aerosol, respectively. Average BaP concentrations in this time amounted to 1.6 ng/m³. Source apportionment between wood smoke and traffic showed a clear dominance of the wood smoke source. 80% of BaP concentrations can be attributed to wood smoke, while traffic exhaust accounts only for 3%.

REFERENCES:

- Iinuma, Y., Engling, G., Puxbaum, H., Herrmann, H. (2009). A highly resolved anion-exchange chromatographic method for determination of saccharidic tracers for biomass combustion and primary bio-particles in atmospheric aerosol. *Atmos. Environ.* 43, 1367-1371.
- Schmidl, C., Marr, I.L., Caseiro, A., Kotianová, P., Berner, A., Bauer, H., Kasper-Giebl, A., Puxbaum, H. (2008). Chemical characterisation of fine particle emissions from wood stove combustion of common woods growing in mid-European Alpine regions. *Atmos. Environ.* 42, 126-141.