

## Emissions of wood stoves under real-life conditions

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Emissions of biomass burning can have significant impact on ambient concentrations of PM, BC, elemental and organic carbon (EC/OC) and PAHs. In most studies emissions are measured in the lab conditions under standard conditions (e.g. type of wood, size of logs). These conditions do not always represent real life practices. The aim of this study is to characterize emissions of residential wood combustion under real-life conditions.

The emission measurements reported in this paper are part of a larger study in which the impact of wood combustion on ambient concentrations (PM<sub>10</sub>, EC/OC, BC, PAHs) is studied in a rural residential area. Three different houses were selected in the study area to perform emission on the chimney: a cassette (2) and a wood stove (1) were used for wood combustion in these houses. The amount of wood was weighed before each loading.

The flue gases were diluted with ambient air by a funnel system with a fan. Dilution factor was determined based on CO<sub>2</sub> emissions in undiluted and diluted flue gas. Total PM was sampled in the dilution tunnel under isokinetic conditions. Sampling time was between 1-2h. Filters (quartz fibre, Munktell preheated at 450°C) were weighed before analysis according to EN 14907 (2005) in order to have more comparable results with ambient concentrations. One part of the filters was used for EC/OC analysis using thermal optical transmission method (TOT), the other part of the filter was used for levoglucosan analysis using methanol extraction, trimethylsilylation and GC-MS. For PAHs, the filter-condensation method was used with Tenax as solid sorbent to distinguish between more volatile and particle-bounded PAH's. PAH (16 EPA) samples were analyzed by LCGC-MS after Accelerated Solvent Extraction (ASE). PM mass fractions (PM<sub>2.5</sub>, PM<sub>10</sub>, TSP) were measured using Jonas impactor. In the flue gas also gaseous compounds (NO<sub>x</sub>, CO, SO<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>) were measured continuously.

Results showed that 95% of PM emissions were in PM<sub>2.5</sub> size fraction. PAH-emissions showed large differences between different wood burning appliances (more than a factor 10). Repeated measurement at one of the cassettes also showed large difference in total PAH emissions whereas the ratio of different PAHs was

very similar. Particle bounded PAH were dominated by fluoranthene and pyrene for the cassettes. Whereas for the wood stove especially benzo(a)anthracene and chrysene were measured in the particle phase. In the gas phase naftalene was the most dominant PAH, followed by acenaftylene en fenantrene.



Figure 1: Sampling set-up for emission measurements of wood stoves under real life conditions.

This paper will further discuss the results of the emission measurements including PAH, EC/OC, levoglucosan. In addition we will compare levoglucosan/PM ratios and PAH profiles to ambient values and estimated values.

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