

## Characterisation of particle-phase wood smoke tracer compounds in ambient air of a residential area

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Keywords: wood smoke, organic tracer, GC-MS, ambient air pollution.

With the increasing concern of global climate change, the interest in using wood as renewable fuel has been considered as sustainable energy source for domestic heating in every part of the world during winter especially, where wood is available. In residential villages of Germany, located in forest-rich areas, wood burning causes regional haze with high PM<sub>10</sub> concentrations in the ambient air, resulting in significant annoyance and nuisance with complains among the inhabitants. To justify measures against this pollution, it was important to determine and characterise different wood smoke tracer compounds in the ambient air during winter in a residential area.

From November 2005 to March 2006 particle-phase PM<sub>10</sub> samples were collected at a residential site Dettenhausen located in the "Naturepark Schoenbuch" near Stuttgart, Germany. Samples were extracted using toluene with ultrasonic bath and analysed by gas chromatograph-mass spectrometry (GC-MS). Altogether 26 organic compounds including retene, methoxyphenols, levoglucosan and dehydroabietic acid were detected and quantified in this study. The total methoxyphenol levels were in the range of 2–451 ng/m<sup>3</sup> with the highest concentrations occurring during winter inversion episodes (PM<sub>10</sub> = 60–95 µg/m<sup>3</sup>) in Dettenhausen. The ambient concentrations of different wood smoke tracers are shown in Table 1. Syringol and its derivatives are found in large amounts in hardwood combustion but no significant quantities are detected in softwood emissions. Whereas, guaiacol and its derivatives are emitted from both softwood and hardwood combustion with varying emission rates (Schauer *et al.*, 2001) and the concentrations of guaiacol derivatives are higher in the softwood smoke compared to hardwood smoke (Bari *et al.*, 2008). It was evident that in the ambient air, high concentrations of syringol derivatives and significant concentrations of guaiacol derivatives, dehydroabietic acid and retene were found, indicating the dominant influence of hardwood and softwood combustion to ambient PM<sub>10</sub> load in the residential area. Levoglucosan was detected in all particle-phase ambient PM<sub>10</sub> samples (Figure 1).

The characterisation of different wood smoke organic tracers allows to better assess the

contribution of wood smoke to the winter ambient PM<sub>10</sub> loadings in residential areas.

Table 1. Ambient concentrations of wood smoke tracer compounds.

Tracers	Mean (ng/m <sup>3</sup> )	Range (ng/m <sup>3</sup> )
Syringaldehyde	15.2	0.01–61
Acetosyringone	48.8	0.02–214
Syringylacetone	9.4	0.08–109
Propionylsyringol	9.9	0.01–46
Sinapylaldehyde	5.9	0.66–32
Vanillin	0.3	0.02–1.02
Acetovanillone	0.08	0.01–0.31
Guaiacylacetone	3.9	0.01–19
Coniferyldehyde	1.4	0.02–5.2
Levoglucosan	806	35–3223
Dehydroabietic acid	3.8	0.02–15
Retene	0.7	0.02–3.4

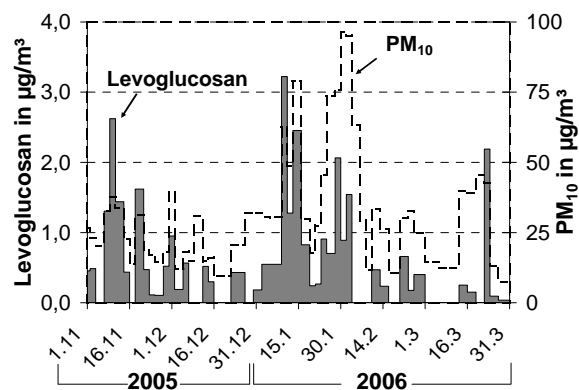


Figure 1. Temporal profile of ambient concentrations of levoglucosan and PM<sub>10</sub>.

The authors would like to thank the Institutes of Universitaet Stuttgart. Md. Aynul Bari is receiving a doctoral grant from Baden-Wuerttemberg state.

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Bari, M. A., Baumbach, G., Kuch, B., & Scheffknecht, G. (2008). *Atmos. Environ.*, Doi:10.1016/j.atmosenv.2008.09.006.