One-year monitoring of nitro-organic compounds in biomass burning PM_{10} filter samples

A. Kahnt[1], S. Behrouzi[1], R. Vermeylen[1], M. Safi Shalamzari[1], J. Vercauteren[2], W. Maenhaut[1,3] and M. Claeys[1]

[1]Department of Pharmaceutical Sciences, University of Antwerp, BE-2610 Antwerp, Belgium
[2]Flemish Environment Agency (VMM), BE-2000 Antwerp, Belgium
[3]Department of Analytical Chemistry, Ghent University, BE-9000 Gent, Belgium

Keywords: Biomass Burning, Nitro-aromatics, Nitrooxy organosulfates, Resin acid.
Presenting author email: Ariane.Kahnt@ua.ac.be

Biomass burning aerosol (BBA) contains a significant fraction of nitro-aromatic compounds and recent studies identified nitrocatechols ($C_6H_5NO_4$, MW 155) and methyl-nitrocatechols ($C_7H_7NO_4$, MW 169) as main constituents. These compounds were proposed as tracer compounds for processed (secondary) BBA (Iinuma *et al.*, 2010). Higher homologues of methyl-nitrocatechols ($C_8H_9NO_4$, MW 183) were described also recently as abundant compounds in ambient filter samples (Kitanovski *et al*., 2012a, b). Furthermore, nitrocatechols and their methyl homologues were shown to correspond to the abundant yellow-coloured compounds of humic-like substances that were isolated from BBA (Claeys *et al.*, 2012). Taking into account the abundance of nitro-aromatic compounds in atmospheric aerosol samples and their potential effects on health and climate, the aim of the present study was to examine their time series over a whole year and their relationships with other known tracers for BBA and biogenic secondary organic aerosol.

PM_{10} filter samples were collected from a rural station in Hamme, Belgium, which was recently shown to be largely impacted by biomass burning (Maenhaut *et al.*, 2012). The extracted filter samples were further investigated in terms of liquid chromatography combined with negative ion electrospray ionisation mass spectrometry and different compounds were quantified. The targeted compounds included four nitro-aromatic compounds (MWs 139, 155, 169, and 183), nitrooxy organosulfates (MW 295) originating from α-pinene and the resin acid dehydroabietic acid, DHAA (MW 300) (Figure 1).

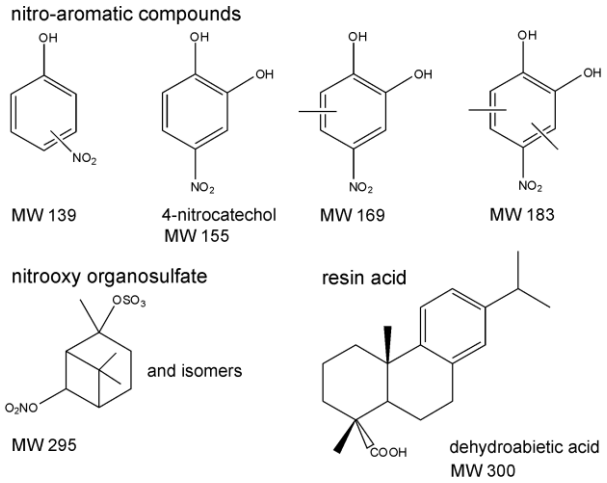

Figure 1. Targeted compounds in the present study.

A strong seasonal variation was observed for the nitro-compounds with highest concentrations during the winter months (Figure 2), followed by the autumn, spring and summer periods. In agreement with a previous study (Kitanovski *et al.*, 2012b), high correlations between the nitrocatechols and methyl-nitrocatechols were observed, with r-values up to 0.97. There were also substantial correlations (r-values up to 0.68) between these BBA tracers and the primary BBA tracer levoglucosan.

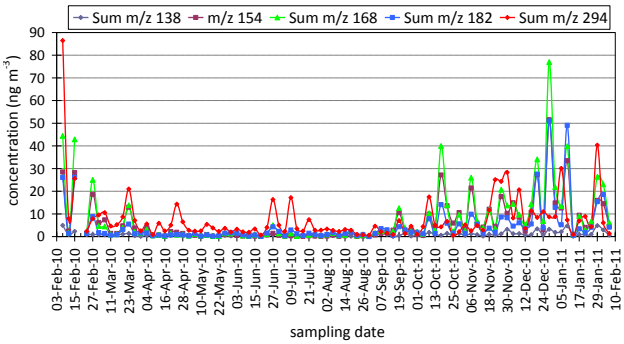

Figure 2. Time series for PM_{10} nitro-aromatic compounds in Hamme, Belgium.

Based on the DHAA measurements and the correlation analysis, the burning of softwood and foliage of coniferous trees is likely an important source for the formation of all of the targeted species.

This work was supported by the Belgian Federal Science Policy Office through the network project "Biogenic Influence on Oxidants and Secondary Organic Aersosol: theoretical, laboratory and modeling investigations (BIOSOA).

Claeys, M., *et al.* (2012), *Environ. Chem*. **9**, 273-284.
Iinuma, Y., *et al.* (2010), *Environ. Sci. Technol*. **44**, 8453-8459.
Kitanovski, Z., et al. (2012a), *Rapid Commun. Mass Spectrom.* **26**, 793-804.
Kitanovski, Z., *et al.* (2012b), *J. Chromatogr. A*, **1268**, 35-43.
Maenhaut, W., *et al.* (2012), *Sci. Total Environ*. **437**, 226-236.