A year-long chemical characterization of PM$_{10}$ in Flanders (Belgium) in 4 major cities and 3 types of locations

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From July 2011 until July 2012 the Flemish Environment Agency (VMM) carried out its fourth “Chemkar PM$_{10}$” campaign as part of the European Life+ ATMOSYS project. This was a large scale chemical characterization project of PM$_{10}$ in Flanders (Belgium) in four major cities (Antwerp, Ghent, Bruges and Ostend; see also Figure 1). In each city measurements were done at 3 types of locations: a streetcanyon, an urban background and a regional road. The focus of the current project was to compare the results on both a city and location type level. Such comparison allows us to assess the contribution to PM$_{10}$ that can be attributed to local contributions like a streetcanyon. Besides the total PM$_{10}$ mass, ions, metals also elemental- and organic carbon (EC/OC) and levoglucosan (wood burning tracer) were analysed.

Experimental setup:

During one full year PM$_{10}$ was sampled simultaneously on every 4th day at each location type in each city totaling about 1000 samples (including field blanks).

Sampling was done for 24h with one Leckel SEQ 47/50 low volume sampler at 2.3 m$^3$/h on 47mm Pallflex® Tissuquartz™ 2500 QAT-UP filters. After sampling the PM$_{10}$ mass concentration was determined by dual weighing of the filters according to the European reference method EN14907. Next, the filters were punched for chemical analysis and stored at -18°C until analysis. One punch (1.5 cm$^2$) was used for the determination of elemental and organic carbon (thermal/optical transmittance) with the NIOSH protocol. Another punch (1.5 cm$^2$) was used for determination of levoglucosan by means of GC/MS after derivatisation with N,O-bis(trimethylsilyl)trifluoroacetamide (BSTFA) containing 1% trimethylchlorosilane (TMCS).

Results:

On average, concentrations in the street canyons were 7.5 µg/m$^3$ higher than at the urban background sites. This local contribution was mainly due to the resuspension of mineral dust (+ 3 µg/m$^3$), organic matter (+2 µg/m$^3$) and elemental carbon (+ 1 µg/m$^3$). Figure 2 shows more detailed results for the streetcanyons in each city.

More results and extended analysis will be presented at the conference.