

Ten days of intensive air quality measurement at the international airport of Budapest

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Keywords: Aerosol formation, size distribution, air pollution, PM and source apportionment, air traffic emissions

A ten days long intensive air pollution measurement campaign was performed at the international airport of Budapest from 26 June to 5 July, 2008. A monitoring station was installed at terminal 2A. The monitored components were: CO, NO_x, SO₂, O₃, measured by Horiba gas monitors; PM_{2.5}, PM₁₀ by Rupprecht & Patashnick TEOM monitors; black carbon by Magee Scientific aethalometer; size fractionated aerosol above 250 nm by a Grimm 1.108 aerosol spectrometer; and the total particle number by a TSI 3775 CPC. In addition, hourly aerosol samples were collected onto Teflon filters that later were chemically analysed.

The airport traffic is the highest at Terminal 2, consequently the air quality is the worst there (Schürmann, 2006). Mainly PM exceedances were registered during previous campaigns (Groma, 2008). For this reason the main goal of the campaign was to study the chemical composition of the aerosol for the deduction of the possible sources. Ionic composition of the aerosol was determined after dissolving the PM_{2.5} samples by ion chromatography. Atmospheric concentration of sulphate, nitrate, ammonium and chloride ions were determined. Prior to the sample destruction, elemental composition was measured by XRF that provided quantitative elemental composition from S to Pb. Table 1 contains the correlation coefficients between PM_{2.5} mass and the chemically/optically determined mass balance.

Table 1. Correlation of total elemental mass (E), total ionic mass (I), black carbon mass (BC) with the total PM_{2.5} mass.

$\mu\text{g}/\text{m}^3$	E	I	BC	E+I	E+BC	I+BC	E+I+BC
PM _{2.5}	0.21	0.27	0.28	0.52	0.38	0.49	0.57

It can be seen from the table that none of E, I or BC correlates with the total PM_{2.5} mass. However, their sum shows a weak correlation. This result arises from the difference in time evolution of the three aerosol components' concentrations that indicate difference of the sources. Although sulphate/nitrate concentration does not correlate by the BC, it is not impossible that they have the same sources, such as aircraft and service vehicles. Namely BC originates directly from combustion; the sulphate/nitrate aerosol is a product of atmospheric chemical reactions that delay its appearance after the emission occurs.

Figure 1 shows the correlation between PM_{2.5} mass and the analytically determined mass balance (E+I+BC). It can be seen that in addition to the weak correlation, only 20% of the total PM_{2.5} mass could

be detected by the above mentioned analytical methods. Organic aerosol or fine fraction of silicates could be assumed to be responsible for the non-detected 80% of the total PM_{2.5} mass.

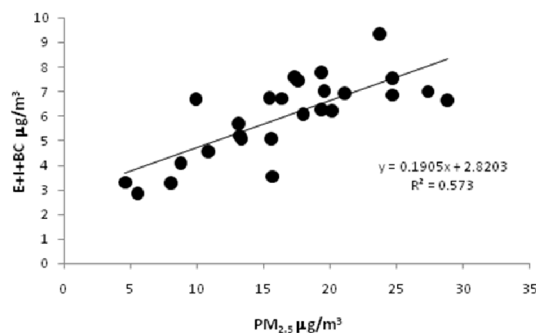


Figure 1. Correlation between TEOM measurements and the analytically determined masses of the aerosol

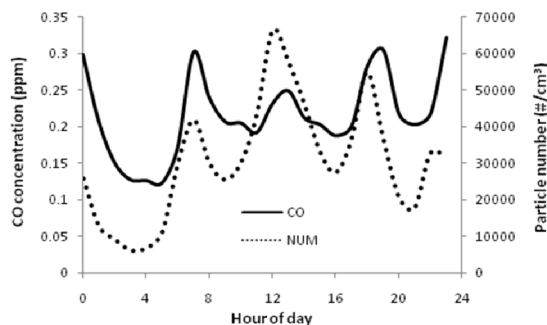


Figure 2. Daily cycles of particle number and CO concentrations.

Figure 2 presents the average daily cycles of total particle number ($d > 10$ nm) and CO concentrations. Both curves have three peaks in agreement with the three rush periods of the airport's traffic. Even though the three traffic peaks have similar maximal intensities, the middle CO peak is smaller, while the total particle number peak is higher than the outer ones. Since the mixing height is maximal around noon, the lower middle CO peak is clear, while the high particle number values around noon can be elucidated by secondary aerosol formation.

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