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Possible relations between organic aerosols analysed by aerosol mass spectrometer and EC/OC analyzer

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Analysis of carbonaceous aerosols by elemental and organic carbon (EC/OC) analyzer can provide additional information in the form of OC fractions. These may improve characterization of organic aerosol [1].

We compared two sets of PM₁ aerosol data – summer (22.-26.6. and 13.-31.7.2012) and winter (12.-29.1.2013) – measured at a Prague urban background site (50°7'36.47"N, 14°23'5.51"E, 277 m ASL). We wanted to determine whether the OC fractions from EC/OC analyzer can indirectly provide also information on the chemical composition or in other respects improve aerosol characterisation. In addition to EC and OC, also concentrations of pyrolytic carbon (PC), OC fractions (temperature ranges – OC1: <200°C, OC2: 200-300°C, OC3: 300-450°C and OC4: 450-650°C) and their share in organic aerosol (OC_x/OC) were studied. The study involved following data obtained by the Aerodyne aerosol mass spectrometer (AMS): Total organic mass (Org) and characteristic organic aerosol fragments m/z 43 (Org₄₃), 44, 57 and 60 and their share in organic mass named as f₄₃ (Org₄₃/Org), f₄₄, f₅₇, f₆₀. Furthermore, meteorology, trace gases concentrations, and resulting factors from ME-2 (multilinear engine) PMF analyses of AMS organic aerosol were used in this comparison.

We observed very low or insignificant correlations between specific OC_x/OC and AMS fractions in summer. However, during winter we observed correlations that can associate individual OC fractions with different sources. Most volatile OC₁/OC fraction correlated positively with f₅₇ (0.46), f₆₀ (0.35) and with wood burning org. aerosol factor (0.42), while anti-correlations were observed with f₄₄ (-0.54) and O₃ (-0.36). Conversely, OC₃/OC correlated with f₄₄ (0.41) and O₃ (0.57) and anti-correlated with f₄₃ (-0.45), SO₂ (-0.42), CO (-0.72), which indicated that it is a kind of oxidized background aerosol. Share of PC correlated with f₄₃ (0.41), SO₂ (0.52) and CO (0.63) which suggested it is a part of the carbonaceous aerosols associated with combustion.

[1] Vodička *et al.* (2015), *Sci. Total Environ.*, **518-519**, 424-433. Ack: CSF P209/11/1342. EU H2020: 654109