Origin of particulate matter measured at traffic site in Prague, Czech Republic

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Significant funds are being spent in a number of cities of the European Union to improve air quality. There is a need for a good understanding of the dominant sources that contribute significantly to increased particulate matter (PM) concentrations. The aim of this work was to determine the chemical composition and origin of PM at the traffic site in the capital city of the Czech Republic, Central Europe.

Two one-month-long measurement campaigns were conducted from February to March (Period A), and from November to December 2020 (Period B), at a traffic site in Prague. $PM_{2.5}$ elemental concentrations were determined by Xact 625i Ambient Metals Monitor and PM_1 elemental and organic carbon (OC/EC) concentrations by field semi-online OCEC analyser with 2-h time resolution. Also, PM_{10} mass concentrations were measured by Beta gauge with 1-h time resolution, along with gases and meteorology. Additionally, 12-h PM_1 samples were collected using a Leckel LVS-3 sampler for a subsequent chemical analysis (water-soluble ions and sugars by ion chromatography – IC). Satellite measurements (ERA hourly dataset provided by the Copernicus Climate Change Service) were also used to calculate the boundary layer height (BLH) and 72-h back-trajectories (GDAS 1°) were calculated every hour by the Hybrid Single Particle Lagrangian Integrated Trajectory model (HYSPLIT).

Positive Matrix Factorization (PMF, US EPA PMF 5.0) was applied to the Xact elemental concentrations to separate 13 resp. 12 elements into different factors and time series (Tab 1.).

Table 1. Overview of PMF determined factors.

Individual factors correlated very well with other variables. *Secondary inorganic aerosol (SIA) – Sulphates* and *Secondary inorganic aerosol (SIA) – Sulphates and local combustion* respectively *Local combustion* with EC, OC and with , , levoglucosan and ; *Marine aerosol and roads salting* with and ; *Transport resuspension* with EC and NO_x and *Resuspension and construction work* with .

At this traffic site, the polar plots showed the traffic contributions corresponded to the main local traffic sources and influence of dispersion conditions (BLH and back-trajectories) on PM sources.

	Period A	Period B
Factor 1	Secondary inorganic aerosol (SIA) – Sulphates	Secondary inorganic aerosol (SIA) – Sulphates and local combustion
Factor 2	Marine aerosol and roads salting	Marine aerosol and roads salting
Factor 3	Transport resuspension	Transport resuspension
Factor 4	Resuspension and construction work	Resuspension and construction work
Factor 5	Local combustion	