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Chemical composition of PM_1 and PM_{10} fraction collected in urban atmosphere of Krakow, southern Poland during 2018-2019 period

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Two fractions of suspended particulate matter (PM_1 and PM_{10}) were collected on daily basis in the urban atmosphere of Krakow, southern Poland, during one-year period (April 2018 - April 2019). The following compounds were examined: elemental carbon (EC), organic carbon (OC), carbohydrates (among them levoglucosan – a recognized biomass tracer), as well as ions (Li^+, Na^+, NH_4^+, K^+, Mg^{2+}, Ca^{2+}, F^-, Cl^-, NO_2^-, Br^-. NO_3^{2-}, PO_4^{3-}, SO_4^{2-}). Thermal-optical analysis with a Sunset carbon analyzer, (Sunset Lab. Inc.) was used to obtain information about organic and elemental carbon concentration, while HPAE-PAD Dionex ICS 3000 system was employed to determine the concentration of 14 carbohydrates. Concentration of ions was analysed using isocratic ion chromatography on an ICS-1100 instrument (Thermo Scientific).

Distinct seasonality of chemical composition of PM_1 and PM_{10} fraction was observed. Levoglucosan concentration ranged from 0.01 ug/m^3 to 0.90 ug/m^3 (PM_1 fraction) and from 0.01 to ug/m^3 to 1.95 ug/m^3 (PM_{10} fraction) during the analysed period. Arabitol and Mannitol were detected only in PM_{10} fraction and ranged from 0.01 ug/m^3 and 0.02 ug/m^3, during winter season and to 0.15 ug/m^3 and 0.10 ug/m^3, respectively, during summer season. Significant seasonal differences were also found for ion concentrations: from 0.49 µg/m^3 (SO_4^{2-}), 0.15 µg/m^3 (NO_3^-) and 0.05 µg/m^3 (NH_4^+) during summer season, to be compared with 11.16 µg/m^3 (SO_4^{2-}), 9.30 µg/m^3 (NO_3^-), 9.25 µg/m^3 (NH_4^+) for winter season. The concentration of organic and elemental carbon in PM_{10} fraction ranged from 2.0 µg/m^3 to 48.9 µg/m^3 (OC) and from 0.3 µg/m^3 to 10.0 µg/m^3 (EC), to be compared with 1.4 µg/m^3 to 18.1 µg/m^3 (OC) and 0.2 µg/m^3 to 4.4 µg/m^3 (EC) for PM_1 fraction.

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