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Atmospheric Aerosol Investigation In Vilnius using Stable Carbon Isotopes

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The effects of aerosols on the atmosphere, climate, and public health are among the central topics in current environmental research. Spatially urban air pollution is a major public concern world-wide.In this study the results of experimental research are presented, the basis of which is the investigation of 13C/12C variations δ13C of stable carbon isotopes in total carbonaceous aerosols in Vilnius city, Lithuania. The main aim of the work is to identify the origin of carbonaceous aerosols. Two autumns and one spring sampling campaign were designed with the aim to determine the changes in the air caused by the beginning/end of the heating season.
The experiment was performed during several sampling periods. The first period lasted from 26 November to 06 December 2010. The second was from 04 April to 16 May 2011. The third was from 12 to 29 October 2012. Atmospheric aerosols, according to their aerodynamic diameters, were collected with an eleven-stage impactor "MOUDI". The stages have 50% aerodynamic diameter cut-offs of 18.0, 10.0, 5.6, 3.2, 1.8, 1.0, 0.56, 0.32, 0.18, 0.1 and 0.056 μm, for stages 1–11, respectively.
The analysis proceeds essentially in two stages. In the first, MOUDI foils were analyzed with EA-IRMS (FlashEA 1112 coupled to ThermoFinnigan Delta Plus Advantage). Half of the foil was measured directly (TC δ13C values). The rest was heated in the oven (400 °C) to remove organic part and measured EC+CC δ13C values (carbonates were not removed with acid).
During the second stage of the analysis, corrections are made and OC δ13C values were calculated using isotopic balance equation: .
As the main aim of the study was to identify the origin of incoming carbonaceous aerosols, air mass back trajectories were calculated using the HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model.