Seasonal variations of stable carbon isotopic composition of fine atmospheric aerosol from three distinct sites, Lithuania

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Fine fraction carbonaceous particles are the most important components of the atmospheric aerosol due to their direct effect on human health. Numerous studies have been conducted in different locations worldwide to gain insight into sources and properties of the atmospheric aerosol. Previous studies carried out in Lithuania have focused on the source apportionment of aerosol particles, characterization of specific pollution events, variation of organic and elemental carbon (Garbaras et al., 2008; Ulevicius et al., 2010; Masalaite et al., 2015). However, all these studies were conducted over the period ranging from a few weeks to a few months and/or at one or two sampling sites at the same time. Thus, despite valuable information received from previous studies, the need for the data comparison obtained at all three sites was clear.

The aerosol particles (PM_1 size fraction) were collected during the sample campaign from 1 January to 30 December of 2014 at three sites situated in Lithuania: the urban location of Vilnius, the coastal location of Preila and the forest location of Rugsteliskis. 56 quartz microfiber filters from the urban, 75 from coastal and 71 from forest sites were measured to receive the seasonal variations at all three sites. The bulk total carbon (TC) values were determined using an elemental analyser (Flash EA 1112) coupled via an ConFlo III interface with an isotope ratio mass spectrometer (Thermo Finnigan Delta Plus Advantage) (EA – IRMS).

The seasonal variation of the monthly averaged $\delta^{13}C_{TC}$ values of aerosol particles from urban, coastal and forest sites is shown in Fig. 1. The seasons were defined according to the end and beginning of the heating season at the urban site. Meanwhile, the difference between seasons was not so obvious at coastal and forest sites, thus a transition period was introduced. The source mixing equation was applied to verify the idea of mixing of two distinct sources.

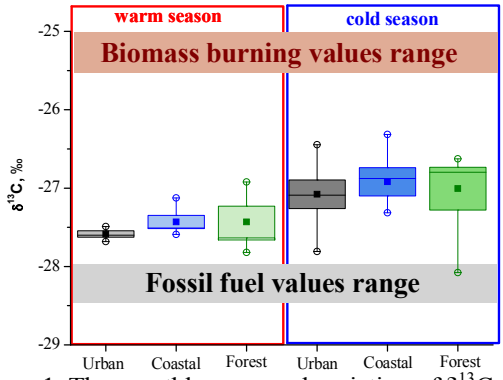

Figure 1. The monthly averaged variation of $\delta^{13}C_{TC}$ in aerosol particles from urban, coastal and forest sites in warm and cold seasons.

The results revealed that ^{13}C depleted aerosol particles were dominant during summer at all three sites. Meanwhile the aerosol most enriched in ^{13}C was observed during a cold season reaching maximum at the coastal site in February ($\delta^{13}C_{TC}$ = -26.3±0.6 ‰). This variation was related to a few main sources dominating during separate seasons. The source mixing equation allowed us to distinguish the impact of the biomass burning and fossil fuel combustion during a cold season and the input of the biogenic source during a warm season.

Garbaras, A., Andriejauskiene, J., Bariseviciute, R., Remeikis, V. (2008) *Lith. J. Phys.* **48**, 259-264.

Masalaite, A., Remeikis, V., Garbaras, A., Dudoitis, V., Ulevicius, V., Ceburnis, D. (2015) *Atmos. Res* **158–159**, 1-12.

Ulevicius, V., Byčenkienė, S., Remeikis, V., Garbaras, A., Kecorius, S., Andriejauskienė, J., Jasinevičienė, D., Mocnik, G. (2010) *Atmos. Res*. **98**, 190-200.