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Stable Carbon Isotope Ratio of OC and TC in Aerosol Particles at Urban, Marine and Forest Sites

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Atmospheric aerosols contain up to 50 % (of) organic substances, thus substantially contributing to aerosol climate forcing and affecting human health. In addition to health and climate impacts, aerosol particulate matter is increasingly recognized for its role in biogeochemical cycles. δ^{13}C value of carbonaceous aerosols is a useful tracer for distinguishing the origin of carbonaceous materials. Stable carbon isotope ratios were determined for organic carbon (OC) fraction and total carbon (TC) of PM1 collected on quartz fiber filters in Lithuania in March 2013 at three sites: the urban location of Vilnius, the coastal location of Preila and forest location of Rugsteliskis. The isotope values varied from -27.5 ‰ to -25.5 ‰ for OC and -27.9 ‰ to -25.4 ‰ for TC. δ^{13}C values of TC of the marine site were depleted with some exceptions, at the forest site they were most enriched and the values of the city were in between. The city had the narrowest variation in TC indicating one main source of aerosol particles. The situation was different for OC values. δ^{13}C values of the marine and the forest sites were relatively depleted, meanwhile the city site values were enriched and OC had a highest variability (1.6 ‰). The city samples had the best correlation (TC via OC). The marine values varied over a wide range (1.5 ‰) compared to the forest ones. The difference between TC and OC was not as high at the marine and city sites as at the forest site (the variation was about 5 times larger - the average OC was 1 ‰ depleted). This indicates that VOC had a different origin than TC in the forest and in the city. Meanwhile marine aerosol particles had more or less the same source of OC and TC.