

Radiocarbon and TC/EC/OC analyses of atmospheric aerosol samples from five Hungarian cities

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During the first half of 2015 PM₁₀ aerosol samples were collected from five Hungarian cities (Budapest, Debrecen, Miskolc, Nyíregyháza, Pécs) and were analyzed to determine their total-, elementar- and organic carbon content and specific C-14 activity. 12 individual daily samples were collected from each cities covering the Winter-Spring –early Summer period of 2015.

Biogenic and fossil carbon concentrations were calculated from the total carbon content and its ¹⁴C results. Total carbon content was the highest at Nyíregyháza. The lowest C content was measured from Pécs samples, where the maximal concentration was around 10 ug/m³ and minimum was around 5 ug/m³. According their ¹⁴C concentration the fossil ratio was always much lower than the biogenic one. In only one case (in Nyiregyhaza) fossil C content exceeded the 10 ug/m³ value, otherwise it was always around 5 ug/m³ for all the investigated cities.

The highest PM₁₀ concentrations were detected during February of 2015, when there were very cold arctic weather conditions and very slow air movements supported rather high atmospheric aerosol concentrations in all cities. The anthropogenic aerosol concentration was scaled up linearly together with the rising total aerosol amounts. C-14 and aerosol C content combined results are clearly indicating that there are much more biogenic C aerosol in the city air during the winter/heating period than during the spring or the summer. Rising total aerosol concentration can be explained by the rising number of cities and population while rising biogenic content is most likely due to the domestic wood burning.

EC/OC ratio of each sample were analyzed by thermo-optical method (Sunset). In most cases (4 cities) OC ratios were rather high (70-90%) and did not show any correlation with the radiocarbon (biogenic) carbon content of TC fraction. In the case of Miskolc city samples collected in a heavy traffic area, high correlation was observed between OC ratio and the fossil carbon content of the aerosol but only during the early Summer period when OC was rather low (50-70%).

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