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Elemental and organic carbon in PM_{10}: a one year measurement campaign within the European Monitoring and Evaluation Programme EMEP

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Abstract. In the present study, ambient aerosol (PM_{10}) concentrations of elemental carbon (EC), organic carbon (OC), and total carbon (TC) are reported for 12 European rural background sites and two urban background sites following a one-year (1 July 2002–1 July 2003) sampling campaign within the European Monitoring and Evaluation Programme, EMEP http://www.emep.int/). The purpose of the campaign was to assess the feasibility of performing EC and OC monitoring on a regular basis and to obtain an overview of the spatial and seasonal variability on a regional scale in Europe.

Analyses were performed using the thermal-optical transmission (TOT) instrument from Sunset Lab Inc., operating according to a NIOSH derived temperature program. The annual mean mass concentration of EC ranged from 0.17±0.19 μg m^{-3} (mean ± SD) at Birkenes (Norway) to 1.83±1.32 μg m^{-3} at Ispra (Italy). The corresponding range for OC was 1.20±1.29 μg m^{-3} at Mace Head (Ireland) to 7.79±6.80 μg m^{-3} at Ispra. On average, annual concentrations of EC, OC, and TC were three times higher for rural background sites in Central, Eastern and Southern Europe compared to those situated in the Northern and Western parts of Europe. Wintertime concentrations of EC and OC were higher than those recorded during summer for the majority of the sites. Moderate to high Pearson correlation coefficients (r_p) (0.50–0.94) were observed for EC versus OC for the sites investigated. The lowest correlation coefficients were noted for the three Scandinavian sites: Aspvreten (SE), Birkenes (NO), and Virolahti (FI), and the Slovakian site Stara Lesna, and are suggested to reflect biogenic sources, wild and prescribed fires. This suggestion is supported by the fact

that higher concentrations of OC are observed for summer compared to winter for these sites. For the rural background sites, total carbonaceous material accounted for 30±9% of PM_{10}, of which 27±9% could be attributed to organic matter (OM) and 3.4±1.0% to elemental matter (EM). OM was found to be more abundant than SO_4^{2-} for sites reporting both parameters.

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