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Fossil and non-fossil sources of organic carbon (OC) and elemental carbon (EC) in Göteborg, Sweden

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Abstract. Particulate matter was collected at an urban site in Göteborg (Sweden) in February/March 2005 and in June/July 2006. Additional samples were collected at a rural site for the winter period. Total carbon (TC) concentrations were 2.1–3.6 μg m^{-3}, 1.8–1.9 μg m^{-3}, and 2.2–3.0 μg m^{-3} for urban/winter, rural/winter, and urban/summer conditions, respectively. Elemental carbon (EC), organic carbon (OC), water-insoluble OC (WINSOC), and water-soluble OC (WSOC) were analyzed for ^{14}C in order to distinguish fossil from non-fossil emissions. As wood burning is the single major source of non-fossil EC, its contribution can be quantified directly. For non-fossil OC, the wood-burning fraction was determined independently by levoglucosan and ^{14}C analysis and combined using Latin-hypercube sampling (LHS). For the winter period, the relative contribution of EC from wood burning to the total EC was >3 times higher at the rural site compared to the urban site, whereas the absolute concentrations of EC from wood burning were elevated only moderately at the rural compared to the urban site. Thus, the urban site is substantially more influenced by fossil EC emissions. For summer, biogenic emissions dominated OC concentrations most likely due to secondary organic aerosol (SOA) formation. During both seasons, a more pronounced fossil signal was observed for Göteborg than has previously been reported for Zurich, Switzerland. Analysis of air mass origin using back trajectories suggests that the fossil impact was larger when local sources dominated, whereas long-range transport caused an enhanced non-fossil signal. In comparison to other European locations, concentrations of levoglucosan and other monosaccharide anhydrides were low for the urban and the rural site in the area of Göteborg during winter.

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