Title: OC/EC ratio observations in Europe: Re-thinking the approach for apportionment between primary and secondary organic carbon

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Abstract: This study explores a large set of OC and EC measurements in PM(10) and PM(2.5) aerosol samples, undertaken with a long term constant analytical methodology, to evaluate the capability of the OC/EC minimum ratio to represent the ratio between the OC and EC aerosol components resulting from fossil fuel combustion (OC(ff)/EC(ff)). The data set covers a wide geographical area in Europe, but with a particular focus upon Portugal, Spain and the United Kingdom, and includes a great variety of sites: urban (background, kerbside and tunnel), industrial, rural and remote. The highest minimum ratios were found in samples from remote and rural sites. Urban background sites have shown spatially and temporally consistent minimum ratios, of around 1.0 for PM(10) and 0.7 for PM(2.5).The consistency of results has suggested that the method could be used as a tool to derive the ratio between OC and EC from fossil fuel combustion and consequently to differentiate OC from primary and secondary sources. To explore this capability, OC and EC measurements were performed in a busy roadway tunnel in central Lisbon. The OC/EC ratio, which reflected the composition of vehicle combustion emissions, was in the range of 03-0.4. Ratios of OC/EC in roadside increment air (roadside minus urban background) in Birmingham, UK also lie within the range 03-0.4. Additional measurements were performed under heavy traffic conditions at two double kerbside sites located in the centre of Lisbon and Madrid. The OC/EC minimum ratios observed at both sites were found to be between those of the tunnel and those of urban background air, suggesting that minimum values commonly obtained for this parameter in open urban atmospheres over-predict the direct emissions of OC(ff) from road transport. Possible reasons for this discrepancy are explored. (C) 2011 Elsevier Ltd. All rights reserved.

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