P2-2 Apportionment of the particulate carbonaceous fraction by Ionic and Mass Balance (IMB) in a traffic influenced urban atmosphere in Portugal

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The IMB source apportionment method previously developed for particulate matter (PM) contamination in a background marine dusty atmosphere (Cardoso et al., 2018) was adapted for application in an urban atmosphere containing large amounts of carbonaceous PM. PM2.5 and PM10 aerosol samples, collected at a traffic site during for one year in Porto, Portugal, within the AIRUSE project, and analysed for OC, EC, levoglucosan, ions and trace elements, were used to test the methodology.

The IMB method relies on ionic and mass balances and on the use of edge lines between analysed species, associated with bibliographic information, to, totally, apportion the measured PM mass. Here we detail the carbonaceous aerosol component.

From the Al/Fe edge line, the amount of Fenex, originated from non-exhaust traffic, was estimated. The edge line between Fenex and EC was used to calculate ECnex emitted from the same non-exhaust road traffic source. Edge lines between the remaining EC, (EC-ECnex), or OC, and levoglucosan permitted the determination of biomass burning carbonaceous emissions (ECbb and OCbb). The edge line between the remaining OC (OC-OCbb) and EC (EC-ECnex-ECbb) was used to estimate secondary OCsec and traffic exhaust primary carbonaceous matter (OCtraf, ECtraf). The observed edge lines compared very favourably with ratios in emission sources taken from bibliography.

Ten sources/formation processes were estimated with the adapted IMB methodology, accounting for, on average, 85% of the measured total mass concentration. Based on bibliographic and thermodynamic information, water was added to water soluble and hygroscopic source components, bringing the PM coverage to approximately 100%. The IMB methodology was compared with Positive Matrix Factorization (PMF) applied to the same samples (Amato et al., 2016), showing comparable results, principally in what refers to the carbonaceous fraction. In summer, secondary organic matter, together with secondary inorganic aerosol formation, dominated PM2.5 and PM10. In winter, there was an important contribution of biomass burning to the measured PM.

References

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