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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The EMEP Intensive Measurement Period campaign, 2008–2009: Characterizing the carbonaceous aerosol at nine rural sites in Europe" *by* Karl Espen Yttri et al.

Anonymous Referee #2

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This paper describes a quantification of the sources contributing to the organic carbon (OC) and elemental carbon (EC) components of samples of particulate matter (PM) collected at nine rural background locations spanning from Italy in the south to southern Norway in the north. PM samples were collected in two tranches: autumn (fall) 2008 and winter/spring 2009.

A standard approach to the source apportionment has been applied. Chemically, the samples have been spit into OC and EC concentrations via the EUSAAR-2 temperature programme, analysed for the carbon-14 content of the total carbon (TC) using accelerator mass spectrometry, and quantified for levoglucosan, mannosan and galactosan

tracers via HPLC-MS. These measurements are used to provide apportionment of the TC into a set of natural vs anthropogenic and primary vs secondary sources. To assess the impact of uncertainties in the apportionment, a sensitivity analysis on the apportionment is performed using a Latin hypercube approach to sampling within uncertainty ranges on apportionment parameters. This methodology has been applied a number of times before by combinations of these authors in similar carbonaceous aerosol source apportionment studies. It is supplemented in this work with use of atmospheric chemistry transport modelling to both help refine apportionment, e.g. to estimate the proportion of wildfire and agricultural burning within the overarching biomass-burning OC source, and to evaluate the closure of model simulated OC and OC with measured OC and EC. The latter reveals that biomass burning sources of carbonaceous aerosols are underestimated in standard national emissions inventories.

The analysis is comprehensive and the presentation of the work in the paper is likewise comprehensive, clear and accurate.

A question is how relevant do the results remain for present day, given that the samples were collected 10 years ago? Other than that I find the paper to be suitable for publication with only very few typographical corrections, and ACP is an appropriate journal for this work.

I was pleased to read the honesty of the authors about some PM samples having unfeasibly large carbon-14 values, the origin of which cannot be pinpointed. Whilst it is easy to identify samples with carbon-14 values that are way out of line with what can be expected for 'normal' samples, there is the concern that other carbon-14 values that are not way out of line may also be unknowingly 'contaminated' in some way and thus yield error in apportionment that is not recognised. At present, there seems no way to resolve this.

Minor formatting errors:

L472: should refer to sections 4.1-4.5.

L476: delete the duplicate “same”.

L509: should refer to section 4.2.

L597: replace “barely” with “only”.

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