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> Interactive Comment

Interactive comment on "Elemental and organic carbon in PM₁₀: a one year measurement campaign within the European Monitoring and Evaluation Programme EMEP" *by* K. E. Yttri et al.

Anonymous Referee #2

Received and published: 10 May 2007

Referee Comment on the manuscript "Elemental and Organic Carbon in PM10:..." by Yttri et al.

General Comments:

This manuscript deals with the measurement of carbonaceous particulate matter in aerosols collected at 12 rural/background sites and 2 sub-urban sites across Europe, using, mainly, the EMEP measuring network.

Taking into account the relative importance of carbonaceous material in continental atmospheric aerosols and the lack of extensive measurements of carbonaceous aerosol



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characteristics in rural areas in Europe, across the seasons, this work and its conclusions are important for the understanding of the behaviour, formation processes and origins of the European continental aerosol..

The conclusions taken from this experimental campaign are very much in agreement with another recent rural carbonaceous aerosol study across Europe (CARBOSOL) and the observed levels of EC, OC and tracers, such as levoglucosan, are quite similar, although different analytical methodologies were employed in each study. This permits to have confidence on the representativeness of the results and conclusions.

In general I agree with the interpretation of the concentration data and the conclusions/suggestions of possible causes for the observed concentrations behaviour across Europe and from winter to Summer, in the manuscript.

In my opinion the manuscript is written mostly in a clear manner but, in the tentative of explaining thoroughly each detail and parameter, there is a repetition of similar arguments when dealing in different sections with the aspects of EC, OC and TC; EM, OM and TCM; etc., which makes the reading somehow tiresome. I think that by reorganizing the manuscript it would be possible to make it shorter, without loosing any important information and interpretation.

Generally most of the discussion about TC gives very similar results than when discussing OC and should happen only in cases when the results are exceptionally divergent. Also average annual values can be obtained directly from the averages of winter and summer averages.

As an example I think that there are too many Tables with too much information that could be reorganized and condensed. For example Table 7 has too many Pearson correlation coefficients columns. Also information in Table 4 can be directly calculated from Tables 5 and 6.

I agree with Referee 1 in relation to the doubts raised concerning the decisions taken

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by the authors in relation with the way of dealing with interferences from organic blanks either resulting from filter contamination during storage and transport or adsorption of semivolatile gaseous organics by the filter substrate or desorption from particles (or filter substrate in this case) of semivolatiles, during sampling. The way the authors resolved the problem doesn't seem to be clearly explained nor correct. A correct strategy is important to minimize possible biases, principally for low volume sampling at remote locations with low levels of particulate organics.

Specific Comments:

1- Collection of PM10 particles may contain important contribution of soil, principally in dusty environments. Carbonates may be then an important carbon contributor to the aerosol. Nothing is referred in relation to this in the manuscript. Is the filter decarbonated before OC and EC analysis? If not, in this NIOSH methodology carbonates will be measured (at least partially) as OC. If this is the case, the higher levels of OC in PM2.5-10 during summer, in Figure 7, may also be resultant from carbonates in the soil.

2- page 3864, lines 1-10,- The determination of WSOC uses an analytical methodology that may result in interferences, as result of suspension of particulate EC or insoluble organic particles, during the extensive sonication. Filtration of the extract through a 0.2 um Teflon filter should reduce this probable interference. The subject should be discussed in the manuscript.

3- Page 3865, lines 7-12- It seems from this paragraph that in all samples the analysed and measured filter blanks were not subtracted from the exposed filter measurements. This decision seems a bit incongruent with all extensive discussion in the paper about the importance of blank contamination and interferences. It seems that the decision is based in a non clear and scarcely described experiment(?) showing that in a QBQ evaluation the value of the blank decreased to half. The decrease of blank values in a second quartz filter on a QBQ set up, although not impossible, does not seem to

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be common. So it is important that this point needs to be discussed and clarified. Where these QBQ experiments done extensively, at all sites across Europe, during different seasons? Or were they only limited at one location and one period of the year? Anyway, even if the experiments are generally observable and the blanks decrease to half values during QBQ sampling, the more correct option should be to subtract this half value.

4- Page 3866, 10-17- the interpretation of results and explanations given for bank values in this paragraph are not clear to me. Why possible lower values of particulate OC during summer are the explanation for higher positive artefacts of OC (related mostly with absorption of gases on filter substrate)?. Also, lower concentrations of VOCs in winter, if they result in lower adsorption in the filter substrate will give a lower positive artefact (but will not underestimate it). Furthermore, lower VOC values in winter are counter-balanced by lower temperatures and easier adsorption of these VOCs.

5- Page 3870, lines 11-16 - increase of coarse OC in summer could not also result from an increase in plant debris and pollen in summer? (besides the possible increase in carbonates - if decarbonation is not done previous to EC/OC analysis).

6- Page 3870, lines 25-26 - I don't understand this sentence. Why the coarse OC is not subject to positive artefacts? If I understood correctly, on lines 2-4 of the same page it is said that the same sampling methodology is used for both size fractions in order to have identical positive artefacts. It seems to me that the artefacts are related mostly with the filter substrate and not with coarse or fine particles deposited in it. Anyway this discussion seems to be irrelevant when the authors decided to forget anything about artefacts in their blank corrections (by not correcting blanks).

7- Page 3876, lines 1-5 - In my opinion to use the values of the RM 8785 of EC/OC between the NIOSH and the IMPROVE methodologies to calculate the EC levels in Europe, if the IMPROVE method was employed, has to be done with caution because the EC/OC relation between the two methods is dependent from the type of samples

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and seems to vary strongly from urban kerbside to rural samples. The RM 8785 is made with urban particles and most of the measured aerosol in this study is rural.

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