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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 #1

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This paper describes how measurements from remote sites in Europe are used to estimate source apportionment of carbonaceous aerosols. While the overall methodology is sound, some additional discussion and clarification of the methodologies is needed before the paper is suitable for publication.

Major Comments:

Abstract: The abstract is very long, and hard to discern what is important versus what is less important. I suggest cutting the length by at least a third by focusing only on the most important findings. Much of the methodology can simply be left in the text and is not needed in the abstract.

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Discussion paper

Lines 163-220: The authors need to include some information on the size of aerosols that each of the instruments accounts for. I wonder if the size range is the same for each instrument. This is important when all the data sources are used together. If the size range is different, it will affect the source apportionment analysis. Not so much on the types of sources, but the relative contribution of the sources.

Long-Range Transport: There is no discussion in the text regarding the role of long-range transport of aerosols into Europe on the measurements that were collected and analyzed. The source apportionment assumes the source originate in Europe and the authors further speculate on uncertainties in European emissions inventories. It is possible that long-range transport will not be significant for certain time periods. The one-month sampling periods for the winter and spring period is relatively short, so the conclusions in this study may not be applicable over longer periods in general.

Modeling: The authors need to include some text on how the model accounts for long-range transport through its lateral boundaries (and how the initial conditions are generated and what type of spin up period is used). These results may or may not affect their analyses, depending how strongly the local emissions really explain the observed variability at the remote measurement sites. Some discussion on representativeness of the measurements is needed in the context of the 50 km grid spacing used. For some remote sites, the measurements may be representative over the 50 km grid. But this may not be the case for sites located in mountainous regions. The authors show the results of two emission scenarios, which will affect the amount of SOA produced by the model. What I would like to see is some additional discussion regarding how the model is used to speculate on errors in the emissions inventories. There are many SOA methodologies at present and one could get a range of answers in simulated organic matter.

Specific Comments:

Lines 92-93: The authors link carbonaceous aerosols to climate forcing and adverse

health effects; however, it seems to downplay the role of inorganic aerosol components on climate forcing and adverse health effects. For climate forcing and health effects, it is the total aerosol mass that matters. I understand the authors are trying to justify their work on studying carbonaceous aerosols (which often makes up a majority or large fraction of total aerosol mass), but the sentence they used is a bit misleading.

Line 302: Why is OC from biomass burning emissions treated as non-volatile? What makes that OC different from anthropogenic OC that is treated as volatile? Some discussion from the literature is needed to make this assumption, and my understanding is that whether biomass burning emissions are volatile and whether biomass burning emissions contributes significantly to SOA formation is still debatable.

Line 409: It is not clear what the plus/minus values mean. Are they the uncertainty range? Or are they a standard deviation? Please be specific.

Lines 438-440: The authors should try to explain why the EC/TCp ratio did not change much between the winter and spring period. I would have expected SOA to be more pronounced in the summer which would increase TCp. But maybe SOA formation is not that significant for those sites in the spring. Also, I am wondering what is the significance of the EC/TCp ratio? That is not described here, so it is difficult to know why readers should care about this ratio. The values are reported, but what is the significance?

Lines 518-519: The authors state that agricultural burning is banned, but I gather that it still happens. But if it was banned, why would it be a major source of air pollution? I think something is missing in the intent of this sentence which is confusing to me.

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