Atmos. Chem. Phys. Discuss., 8, S3352–S3355, 2008
www.atmos-chem-phys-discuss.net/8/S3352/2008/

Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on “Sources of organic carbon in PM$_1$ in Helsinki urban air” *by* S. Saarikoski et al.

Anonymous Referee #3

Received and published: 4 June 2008

General Comments

The paper "Sources of organic carbon in PM1 in Helsinki urban air", by S. Saarikoski et al. addresses a question which is not solved yet for many places around the world. The organic carbon (OC) source apportionment is based on the Positive Matrix Factorization (PMF) technique. Four main OC sources are identified: secondary aerosol formation (associated with high O3 and oxalate), biomass combustion (associated with levoglucosan), long range transport (associated with sulfate and ammonium) and traffic (associated with EC and NOx).

I cannot comment on the validity of the PMF approach: I leave this to experts.

In contrast, I would like to draw the attention of authors and readers to a couple of points that have been discussed for decades in the USA and (a bit more recently) in Europe: sampling and analytical artifacts in OC and EC determination. While the community generally recognizes these issues, they are too often by-passed when results are published.

This is the case in this paper as well, although sampling artifacts are not completely ignored, but perhaps not enough accurately considered. My first concern regards the use of the back-up filter OC as a measure of the positive artifact. Although it was often used in the past, this "trick" relies on assumptions that are probably not (always) true. Furthermore, the authors' observation of a large amount of nitrate on the back up filters (interpreted as a piece of evidence that nitrate was lost from the front filter and trapped on the back up filter) provides an indication that the amount of OC found on the back up filter was probably not an accurate measure of the positive artifact. Perhaps the authors could tell us why they did not use the fact that the concentrations of OC derived from 24-hr (from filters) and 3-hr (from the on-line OC-EC analyzer equipped with a denuder) integrated measurements were very similar to show that their approach was in fine not so inaccurate.

The second question relates to negative artifacts. How much is the pressure drop below stage 8 of a low pressure Berner impactor operated at 80 L/min? Is the temperature drop within the impactor able to compensate for the pressure drop and suppress volatilization of semi-volatile species? What about losses from the on-line OC-EC analyzer's filter, placed downstream of a denuder, at a temperature that may be several 10's of degrees larger that ambient? I do not pretend we do have an answer to each of these questions. However, it should perhaps be stated that we are looking in this paper at the sources of the OC collected in the conditions of the experiment, which might well not be exactly the same as ambient particulate OC.

These questions of sampling artifacts plus possible discrepancies in OC/EC determinations linked to the use of different analytical protocols around the world make it quite difficult to compare data obtained in Finland, Japan, France,..., and the USA. Further-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

more, these references to studies carried out in other countries do not contribute to the authors' goal of determining the sources of OC in Helsinki and make the discussion heavier. All these data might be gathered in a Table and discussed in a dedicated paragraph if needed. The paper would indeed improve by being a bit more concise.

Specific Comments:

Page 7807, line 19-24: there are also studies showing that biomass combustion particles are much less harmful than traffic particles because the fraction of non soluble particles is much larger in the latter. Listening at experts, it seems that adverse health effects are not directly linked to the mass of PM inhaled.

Page 7812, line 22: was the efficiency of the denuder tested only once ? It might well depend on the OC mix, which is season dependent. As the denuder breakthrough + blank contributes significantly to the amount of TC collected every 3 hours, this question is critical.

Page 7815, line 23: of course sulfate was the most abundant ion, since nitrate was not considered.

Page 7816, line 6 and Fig. 1: is that really a seasonal variation or a drop that occurred beginning of October 2006, and another time in December 2006. Can these sharp changes be explained by e.g. meteorological conditions ?

Page 7817, line 4: the observation that Oxalate/OC is steady for $T<0^{\circ}C$ does not appear clearly on Fig. 3b.

Page 7819, line 7-8: the contribution of SOA is never properly "measured".

Page 7823, line 6: please clarify: "There can be a seasonal trend also for the biomass combustion particles in LRT".

Page 7828, line 1-3: are there also significant emissions of biogenic VOCs during winter ?

Figure 4, left panel: what are units on Y-axis, % ?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 7805, 2008.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper