Atmos. Chem. Phys. Discuss., 8, S7303–S7305, 2008
www.atmos-chem-phys-discuss.net/8/S7303/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mass concentrations of black carbon measured by four instruments in the middle of Central East China in June 2006" *by* Y. Kanaya et al.

Anonymous Referee #1

Received and published: 19 September 2008

General comments:

The MS gives a comparison of several widely-used measurement techniques for black and elemental carbon. The difference between methods found in this study agrees with the range found in similar studies, and the data add to the knowledge on the range of BC (or EC) concentrations in one of the most densely populated areas with high source strengths for BC (or EC). As no standard method exists to date, the pragmatic approach of using several methods side by side is a very reasonable approach if concentration data are needed to validate emission models. It certainly addresses question within the scope of ACP, gives proper credit to related work and should be published, but a

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few points should be addressed before final publication.

What I find a bit difficult to understand is the concept of using different instruments with different protocols at different times. The PSAP had a heated and an unheated inlet - why not also the MAAP? This might have helped in investigating whether the lensing effect is indeed responsible for the high BC concentrations or whether other effects might have been the cause. Why was the MAAP switched between a PM1 and PM2.5 inlet during the whole campaign, and not the other instruments as well? Changing from the NIOSH to the IMPROVE protocol on the Sunset instrument takes time and would not have been feasible on a daily basis, but it would have been very interesting to compare these two protocols at least during the biomass burning episodes. As the field study is of course completed, nothing can be done about it now. The authors, however, did as much as was possible with these limitations in the data set.

Specific comments

No information about how opt_EC was determined is given. Please add info (especially also on the conversion factor optical signa to opt_EC)

The MAAP is reported to overestimate BC concentrations at all times, and especially severely under conditions of aged aerosol. This overestimation is attributed to the lensing effect of BC particles with organic (and other non-absorbing) coatings, although no quantitative argument is given.

As the difference between methods is most severe during the biomass burning episodes, other reasons for the large MAAP_BC (or low thermal EC) concentrations are possible. All optical methods overestimate BC when other absorbing substances are present. Biomass smoke contains also light absorbing organic material (brown carbon; see review by Andreae and Gelencser, 2006, ACP, 3131 - 3148), and the mention of the thermogram with the OC peak at relatively high temperatures is an indication that brown carbon was present also in this episode. In the study by Reisinger et al. (referenced in the MS) all methods deviated most strongly from one another when brown

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carbon was present, which is similar to the findings of this MS.

Another reason might be that the Sunset instrument actually underestimates EC. The authors indeed mention this at one point in the MS, but as all the text is written in terms of overestimation of the other methods, one could get the impression that the Sunset instrument is, indeed, a standard, when it is not. I suggest to qualify the overestimation statements in this respect.

Technical details

The study is part of a larger field study focusing on aerosol and ozone chemistry. Is there already a reference to the other results of the study?

Explain acronym SUS

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14957, 2008.