Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-435-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-selected black carbon mass distributions and mixing state in polluted and clean environments of northern India" *by* Tomi Raatikainen et al.

Anonymous Referee #1

Received and published: 17 July 2016

I think this paper needs to be more conclusive (too many hypothesis at the moment) before it can be accepted. The writing itself I feel a bit lengthy. The major points in particular:

-the BC sources are not clear, some back trajectory analysis will be helpful. This unclearness goes through all of the texts when discussing if the source is local or transported etc. The discussions on diurnal variation are also weak because of lack of source analysis. With clear source analysis, these discussions should be tidier.

-the main limitation is most of the information is derived from DMA360nm, which could only represent a fraction of total BC. The most populated total particle size may not represent the most populated rBC size, therefore combing the rBC size at other DMA

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sizes will be also useful. I would suggest to analyse and compare the rBC information at all DMA sizes together.

-the chamber temperature introduces some instrument bias, I guess the SP2 laser power was affected by this? how have you corrected this regarding the reduced detection efficiency when reduced laser power?

-the BC mixing state as derived from DMPS-SP2 is not clear, did you calculate as rBC size divided by mobility size? I don't think page 7 has explained what you have done sufficiently. This is really important but this only appears in supplement. The uncertainty of this method is largely from the particle morphology, however it is hard to tell without particle mass measurement (though you measured rBC mass but this is not the total BC-containing particle mass). I think the main texts need to address this uncertainty aided by more thorough analysis at different DMA sizes.

-The bimodal mode of rBC under cleaner environment looks interesting which needs more detailed analysis, such as how much fraction of the smaller mode, how will this fraction be related to the sources. Some very relevant references may be helpful to aid this observation (doi:10.5194/acp-14-10061-2014; doi:10.5194/acp-12-1681-2012).

Specific:

Fig.3 I would like to see a full set of rBC core size distribution for all of the DMA sizes, also the project standard deviation.

Fig.4 There is a significant fraction of tail on the rBC mass distribution. This seems to be two modes of BC distribution, maybe we could do a lognormal fitting on one mode and then the remaining is the other mode. and why is that?

Fig. 5 what do the small markers stand for? What is the point for the fitting?

Page 8-10, I found the whole section is a bit too lengthy but not really discussing your own results.

I found problematic for the fitting in Fig. 7. Because you are measuring the total particle mobility size but only the rBC mass content.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-435, 2016.

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