

Interactive  
Comment

## ***Interactive comment on* “Effect of the summer monsoon on aerosols at two measurement stations in Northern India – Part 1: PM and BC concentrations” by A.-P. Hyvärinen et al.**

### **Anonymous Referee #1**

Received and published: 23 March 2011

This paper is quite interesting and gives a good description of the monsoon's effect on particles concentration. However it would have been good, in my opinion, to describe a little better the BC decrease. Looking at the figures, the reader is left somehow with some questions on how can the monsoon have the same effect on any particles type and in both locations. Being the main focus of this paper, the decrease of concentration with rain accumulation would deserves a more detailed explanation and a more comprehensive interpretation of the figures.

General comments:

Page 1723 : lines 18-20 This conclusion is rather surprising. BC is indeed usually not

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hygroscopic unless aged and therefore coated with hygroscopic matter. So I would have several comments /questions regarding this conclusion:

-Firstly, do you think BC is aged enough in Gual Pahari such as it becomes more hygroscopic than PM10?

-Secondly, it is surprising to see the same behavior in both stations. One been in the free troposphere for most of the time, it would be expected for the BC to be coated and therefore to activate like any other particles whereas in Gual Pahari I would expect the BC to be freshly emitted and therefore with a thin or no coating. Would you have an explanation to this really surprising similitude?

-Finally, as the author observes in figure 5 the R2 of the PM10 data is rather small and looking at the point at 800mm rain accumulation it looks like the uncertainty in the slope for the PM10 is rather high. So can you really state that BC is better scavenged than PM10 based on this figure?

In addition to these comments, it would be interesting to have more explanations on how did the author calculate each point. In my understanding and looking at figures 5 and 6, you should have many more points for each rain accumulation and for each year. Did you average the data to retrieve this graph?

I do not really understand either, still looking at figures 5 and 6, why don't you have more data point for Gual Pahari. Would it be possible to average the data in a different way such as you would get more points in the intermediate rain accumulation and more point for Gual Pahari?

Page 1724, Line 10. It would certainly be interesting to look at how long it takes for the concentration to decrease/increase to below/above the WHO guidelines but it is not actually shown.

Figure4 :

Would you have an explanation to the fact that the concentrations are still increasing in

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April and May while the rain accumulation is increasing dramatically? Are the PM<sub>2.5</sub> from a different sector in this period explaining different hygroscopicity or an increase of the pollution such that the rain is not enough to counterbalance? Section 3.5 treats of the high concentration but do not really explain that particular point and the origin of the particle. Would this fall into the same explanation such as dust particles? The author states in the figure caption that the data are in ambient condition. However I believe that the WHO guideline of 25 $\mu$ g/m<sup>3</sup> are in STP? Could you correct the data to STP conditions so the comparison can actually be done.

More specific questions: Page 1720 line 12. It seems that you had rain data available in Gual Pahari and yet the rainfall you seemed to have used is stated (on page 1721, line22) to be an average of 3 stations closeby . Could you clarify this point. Which rainfall data did you use?

Page 1720 ,line 24 : The data collection rate seems really low to me. Is there a specific reason why the monthly average limit chosen is so low ? Have you had trouble with the instrument?

Page 1721, line 19: Could you state how far are the stations used to calculated the rainfall from Mukteshwar or put them in the map.

Page 1724 : line 15. I assume here that you mean that the concentrations are normalized to the mean value of the concentrations during the monsoon period but I think it could be stated in a clearer way.

Page 1725, line 13. How is the official monsoon calculated? Why is it worth mentioning? Could you clarify?

Page 1726, line 14. You mention an average BC fraction in PM<sub>2.5</sub> of 13.5% in Gual Pahari. However I can only see a 9% fraction in the figure 10. Is there a possible error in the text or the graph?

Page 1729 , line 2: As a general comment, I think a possible reason for this difference

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between the two stations could also be the fact that one station, as you mentioned, is in the free troposphere for most of the study.

Typing errors : Page 1720. Line 23 : are presented

Page 1726 , line 9 : to have a noteworthy mass

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1715, 2011.

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