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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effect of the summer monsoon on aerosols at two measurement stations in Northern India – Part 2: Physical and optical properties" *by* A.-P. Hyvärinen et al.

Anonymous Referee #1

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General comments

The aim of this paper is on my opinion interesting for the scientific community, as stated in the very well written section "Introduction". Unfortunately the other sections didn't meet the expectations.

It is stated in the Introduction that a comparison of the physical and optical properties retrieved in different years in each site will be presented, but in the paper there is no discussion about yearly differences.

Concerning the description of sites of measurements, instruments, and some results, the author often refers to the companion paper Hyvarinen et al, 2010 "Effect of the

summer monsoon on aerosols at two measurement stations in Northern India – Part 1: PM and BC concentrations" submitted to the same Journal, and actually under review. I believe that even if this paper is strictly related to the other one, it must be conceived as a self-consistent paper, providing all the information necessary to the reader. The lack of these information makes the reading and understanding of the paper not easy at all.

The description of aerosol size distribution (section 3.1) in the two locations and their intercomparison, shows a confused structure. Please check my detailed comments in the next section.

Section concerning scattering and absorption estimation is very fair. Firstly, instruments used for estimating absorption and scattering coefficients are not presented in the appropriate section (2.2) and it is not clear which instrument is used for measuring scattering coefficient in Gual Pahari. Secondly, Figure 5, 6 and Table I are not very clear and not sufficiently described. For example no comment is done for the yearly difference in the time patterns behaviour of Figures 5 and 6, and there is no scientific discussion on the behaviour of scattering coefficient, respect to the absorption coefficient. The range of variability of SSA for Mukteshwar site is too large (0.75-0.90) for characterizing absorbing properties: it is needed analysing narrower intervals of SSA values and give a comment on the hypothetical reason of such oscillations. It would be also important correlating results from the seasonal behaviour of number particle concentrations and the behaviour of SSA .

High values of AOD during monsoon, are explained with the presence of dust. Is dust recognisable using Lidar measurements depolarization? Could the AOD high values be related also to the sea salt advection? To check this point I recommend using AERONET estimation of refractive index, whose values can give important information for discriminating the mean columnar aerosol components from dust to sea salt. Also the behaviour of AERONET SSA versus wavelength can help to understand the presence of dust in the atmosphere.

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In the conclusions are stated some things not discussed in the text, as the linear relationship of the decrease of aerosol concentrations respect to the local rainfall, or the relation between SSA and the ratio BC/PM2.5. It is also stated that the dust during the monsoon period is from the Thar Desert, but no back-trajectory was shown neither discussed in the paper.

Specific comments Abstract: line 33: “the size distribution at Mukteshwar is unimodal”, please specify that the distribution refers to measurements taken at ground level. Line 37 – 38: “ an increased particle volume at around 3 – 4 um”: is it radius or diameter? 2.1: It is important insert a map of sites location, and describing a little the locations, in order to make the paper self consistent.

2.2: For the same reason above, please explain how data were processed: 1) seasonal division; 2) kind of average performed; 3) backtrajectories

3: Line 124-125: “ rainfall was more....to the mountain location”, I think it is important explaining this point as done in the companion paper.

3.1

The scheme used to describe total analysis is, on my opinion, confusing. I suggest: 1) a description of the seasonal behaviour of the 3 modes in the two sites; 2) a comparison of the behaviours in point 1; 3) a description (and a comparison) of the seasonal behaviour of the ratios among the 3 modes.

Please add an analysis of yearly differences.

Line 152: I’d like to see a Figure as Figure 3 but for Mukteshwar Line 158: “ this behaviour was similar as in Mukteshwar” : about Mukteshwar it is only stated that Accumulation mode decreases in the rainy period, but nothing is stated about Aitken mode. Please specify this comment. Line 166 : had for hand Line 181- 183: relate this comment with the one made in line 168.

3.2 Line 197: why a comment on the variation of concentrations in a paragraph where

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we were talking about scattering and absorption coefficients? What the authors wanted to highlight? Line 203-204 : please change this sentence, since it seems that the absorption by Nephelometer is obtained by the Aethalometer. What is the instrument devoted to scattering coefficient estimation in Gual Pahari? Please move the description of these instruments in section 2.2 Line 215: it is need an combined analysis between SSA behaviour and the variation of the 3 modes number concentrations. Line 217: from Figure 7 there are no data in the pre/post-monsoon period, how the average mean and percentiles are calculated?

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C2545/2011/acpd-11-C2545-2011-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 1749, 2011.