

Interactive comment on “Comparison of aerosol properties from the Indian Himalayas and the Indo-Gangetic plains” by T. Raatikainen et al.

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General comments:

The paper by Raatikainen et al. presents seasonal and diurnal differences of meteorological parameters, and micro- as well as optical properties from two sites in northern India, Gual Pahari and Mukteshwar.

The paper is well written and the scientific content is generally acceptable to be published in ACP. Nevertheless there are a number of critical points concerning the presentation style of the data, the novelty of the content, the general message of this paper, and the traceability of results.

The title of this paper is comparison of aerosol properties from the Indian Himalayas
C4979

and the Indo-Gangetic plains. Large parts of the text however, present meteorological and climatic parameters at the two sites. This should be shortened in favor for the aerosol measurements. Only meteorological data should be presented, which are relevant to interpret the aerosol data.

There is a loose presentation of data measured at the station with no common conclusion (e.g. some optical parameters are described in the text and data are shown in Figure 5, but common conclusions about optical properties are missing in the abstract as well as in section 4.)

The paper does not present neither novel concepts nor new data (most of the discussed data presented in the paper was published before by Komppula et al., 2009 and Hyvärinen et al. 2009, 2010). Also some Figures (e.g. Fig. 9) are presented elsewhere. Can the measurements at the two sites give some new insights on how the (extreme high) aerosol concentrations at Gual Pahari influence the monsoon cycle as stated in the introduction?

For the referee it is not clear, what is the final contribution of this paper for the scientific community in relation to the other three publications. The approach of the boundary layer dynamics on the aerosol concentration is really good. I would therefore suggest rewriting the paper focusing more on the boundary layer dynamics. I appreciate to intensify the discussion on the boundary layer dynamics effect, maybe by incorporating the radiation measurements at the sites.

For the above mentioned reasons I recommend a major revision of the paper.

We would like to thank Referee #2 for the comments. As mentioned in the replies to the comments of Referee #1, we have overemphasized the availability of data from the previous publications. This will be clarified and we will also change our topic from the comparison, where observed differences were explained by the boundary layer evolution, to the boundary layer evolution and its effect on aerosol concentrations in

both measurement sites. This means that sections related to meteorological parameters and trajectories will be greatly shortened and only figures and text with direct relevance to boundary layer dynamics and aerosol concentrations or optical properties will be kept. Absorption and scattering are generally strongly correlated with mass concentrations, so the conclusions are quite similar. However, we will try to pay more attention to the radiation data and also on aerosol physical properties (e.g. changes in absorption not related to changes in concentrations), but the data coverage is a clear limitation.

The main scientific finding was the effect boundary layer dynamics on aerosol concentrations, and this will be the only topic in the next version. This two year data series is clearly too short to show any correlation between aerosols and monsoon cycle. However, we have provided additional information about the origin of aerosol pollution in the foothills of the Himalayas.

Specific comments:

Please avoid words like “relatively”, “mostly”, “it looks like”, “interestingly” in favor to be more specific.

We will try to be more specific.

P11420 line 5 a.s.l. is not introduced

It will be introduced.

P11420 line 17-19 The description of the measurement site should be given in section 2.

Sites are described in section 2?

P11420 line 25 “These instruments were sampling from” should be “These instruments sampled the aerosol behind a PM10 inlet”

C4981

OK

P11421 The last sentence of section 2.1 could be cleared.

OK

P11421 line 15 “Most of the data” Which data?

It will be clarified that the data includes meteorological and aerosol mass, number and optical properties.

P11421 line 18 Please explain why 50% minimum data coverage was used.

It was used to remove noise from the data series.

P11421 line 21 (12 points), (24 points) could be cleared.

It will be explained that 12 points mean one point for each month and 24 points mean one point per hour.

P11422 line 14 How is the rainfall rate in Mukteshwar calculated?

There are no rainfall rates, just monthly totals (an average of those at the nearby stations).

P11425 line 5 Please avoid unusual units like cm³m⁻³. I’ve never seen it before.

OK

P11426 line 16-25 This paragraph should be combined with the description of the wind measurements in P11425 line 7-17

Significant changes will be made to this part of the text.

P11428 line 17 Explain the q-value

It will be explained.

P11429 line 11 “When applicable,...” This sentence could be cleared.

C4982

It will be cleared that this means mass and number concentrations, and scattering and absorption coefficients.

P11429 line 22 The same size range should be used for comparison.

It is likely that this data will be removed.

P11429 line 25 "Averaging, however, helps a lot." Please avoid such a phrase.

OK

P11430 Explain why the total and >40nm particle number concentration is so high during monsoon. Should they not be deposited by wet deposition?

This will be explained. The main reason is that wet deposition is most effective for the largest particles (above 500 nm) which are not important for number concentrations.

P11431 "wave length" should be "wavelength"

OK

P11431 Refine the definition of the absorption Angström exponent.

This is already defined in Hyvärinen et al., (2009).

P11431 line 26 The reference Hyvärinen et al., (2011b) is missing in the reference list.

Letter "ä" was missing from the name in the reference list.

P11432 line 11 Why favors wet deposition hygroscopic particles. Please clarify. Hygroscopicity is a measure of the affinity of a particle to absorb water, whereas deposition is a wash out process. What is the connection of both?

It is true that hygroscopicity is not important for wet deposition. We will rewrite this part of the text.

P11433 line 33 "quite low" Give a number.

C4983

Will be changed to "close to zero"

P11436 line 7 "good correlation" How good? Give a number.

Correlation coefficient ($r=0.858$) is given in Fig. 8 and also in the text (P11437).

P11436 line 9 Why is a ten day running mean used? Please clarify.

It will be clarified that averaging is needed to show the long-term trend. The number of data points was too low for monthly averages, so 10 day averaging was chosen.

Technical corrections:

Generally, the quality of the Figures should be improved. Use logarithmic axis if necessary. Multiplication with a factor (e.g. 4 in Figure 6) is unusual and should be avoided.

We will rescale axis so that the highest peaks are not shown. Also, it is possible to use separate axis.

P11424 line 4 "Here,..."

OK

P11424 line 10 "The available data presented here including..."

OK

P11425 line 18 "Time series of the meteorological data are shown including monthly..."

OK

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 11417, 2011.

C4984