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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol optical properties and radiative forcing in the high Himalaya based on measurements at the Nepal Climate Observatory – pyramid site (5100 m a.s.l)" *by* S. Marcq et al.

Anonymous Referee #3

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This paper describes the diurnal and seasonal optical properties of aerosols sampled at a high-elevated site in Himalaya and estimate the aerosol radiative forcing for the different seasons and for several air-masses origins. It is an interesting paper worth publishing but several minor points have to be worked out more carefully.

General comments:

- It is not clear throughout the whole manuscript what the relative humidity of the sampled air is. In the abstract it is not mentioned if the reported single scattering

albedo is for dry or ambient conditions. In the "site and instrument description" section, the RH of the measured aerosol is not given. In the paragraph describing the total and back scattering coefficients (pages 5634 and 5635), Nessler et al. (2005) dealing with the effect of humidity on the absorption coefficient is cited (procedure for high humidity) but not the Nessler et al. paper concerning the scattering coefficient. It is not clear if the procedures cited are used to correct dry measurement for ambient RH, as described by Nessler et al. In the result section, it is mentioned that the relative humidity in the nephelometer is not controlled (p.5642 lines 14). The applied measuring and correcting procedures have to be well defined. The impact of the RH variation on the seasonal cycle of the scattering coefficient and of the single scattering albedo has to be discussed.

- the Nephelometer is on the PM2.5 inlet and the MAAP on the PM10 inlet. It is important to discuss the resulting error induced on the single scattering albedo and the direct radiative forcing.
- in the second section, the 4 seasons are described as pre-monsoon, monsoon, post-monsoon and winter. In the other section, the summer season and the dry season are also mentioned. Can you please use only one denomination for clarity purpose?
- The special events are not really well described. Can elevated concentrations of particles be also due to regional pollution? When are these SE more frequent ? A small description of the "large scale changes" discussed by Bonasoni et al. 2010 would be appreciated.
- The most commonly used abbreviation for the single scattering albedo is ω_0 (instead of W).
- in § 4 AOD is used and in §5 AOT !
- figure captions are missing.

- sometimes pre-monsoon is written with a capital letter and sometimes not.

Specific comments:

- p. 5629 line 16: dry or ambient single scattering albedo ?
- p. 5630 lines 17-20: rephrase, not clear.
- P. 5630 line23: not only to scatter but also . . .
- P.5630 lines24-26: does BC originates mostly from incomplete combustion ? brown carbon should perhaps also be mentioned.
- page 5631 lines 15-17: not very clear for me. Could you give some precisions ?
- page 5631 lines 17-20: increased precipitation lead to a decrease of the aerosol load over India. What is then the effect on the radiative forcing ? (if mentioned in Lau and Kim, since this is clearly not the results presented in the paper).
- P. 5634 line 1. site and instruments description.
- p.5635 line 7: limited the measurement record to the following periods:. . .
- p. 5635 line 20 to p. 5636 line 2: a lot of similar information is in both paragraphs. It is also not necessary to indicate the number of 5-min samples.
- P. 5640 lines11-13: This phenomenon was already discussed elsewhere ?
- P. 5640 line 16. 2 verbs in the main sentence!
- P. 5641 lines 5-6: scavenging also explains the weak (please not week!!) diurnal cycle as explained on lines 20-21 for the absorption coefficient cycle.

- P. 5641 line 10. does NOT show any influence. . . ?
- P. 5643 lines 26-28:This is also seen for all other parameters related to optical and chemical properties.
- P. 5644 line 14: higher values than what ? This sentence seems not very clear to me.
- P. 5644 line16: the variability is probably not difficult to explain (see error bars of figure 1). But the similarity between BG and RP seems difficult to explain to me!
- P. 5644 line20: EC may be used for the first time
- § 4.3: why is the asymmetry factor g not described?
- P. 5645 line 14: divides the atmosphere into several layers
- P. 5647 lines 2-5: you discuss actually BOA briefly on page 5648. Why don't you discuss F(TOA) ? Brackets are inexistent in table 2. Table=2 is not correct.
- P. 5647 line 10: instead is misused.
- P. 5647 line 19: Do you have an explanation why the radiative impact is larger during the pre-monsoon season? Is the global aerosol load larger before the monsoon?
- P 5648 line 17: table 3 does not exist in the paper.
- Table 2: the different radiation forcing are not well described in the caption (in the text it is ok), for example Fs is not described.
- Figure 1: why are the standard deviation for scattering and absorption coefficient larger in March-April and the single scattering albedo one in June-August?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 5627, 2010.