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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The measurement of aerosol optical properties at a rural site in Northern China" *by* P. Yan et al.

Anonymous Referee #2

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Matters to address (in order of appearance)

1. (In the Abstract and in various sections of the paper) A crucially important issue to address in this paper: Why are more polluted areas or sources giving rise to higher values of aerosol single scattering albedo [SSA] ? A more detailed explanation is required. The results from this work would appear to contradict findings from previous work of several authors. Secondary aerosol formation is alluded to as a possible explanation of higher SSA values, – but reason(s) for such is (are) not given. In addition, evidence for secondary aerosol formation is not provided.

   Could it be that the nephelometer is reading too high an aerosol scattering coef-

ficient value?

2. Explain why BC aerosol is of particular importance with respect to the hydrological cycle (Introduction , line (L) 8)

3. Explain the basis for the wavelength correction for aerosol absorption coefficient (page 7), and give details of how it is applied

4. "scattering coefficients are more variable than absorption coefficients, which reflect the different sources and formation processes in these regions" [p 7]: Surely will not the sources be the same? 'More variable scattering' needs to be clarified and a better explanation is required to explain the differences between scattering and absorption coefficient

5. One could question the appropriateness of presenting seasonal characteristics of aerosol parameters based on just 5/6 full seasons of data. Due comment should be made on this in view of likely variability of seasonal characteristics from one year to another

6. Statement (p 8) that for the spring period there is enhancement of absorption and scattering is not the case. Greater values prevail for the summer season (Table 4) and for the fall season in the case of aerosol scattering. This statement needs to be modified and clarified

7. Section 3.2, p 9, L 11: heterogenic ? or is it meant to be 'heterogeneous'? – if so, how do you know that heterogeneous aerosol production is occurring during transport?

8. 3.3 Explanation/clarification needed for why does turbulent dilution give rise to the highest values of absorption coefficient at night ? – if this is the reason, why is it that highest values of aerosol scattering coefficient do not also occur over the same period?

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9. The winter season seems to me [I may have mis-interpreted their choice] to have been chosen from months January, February of 2004 and from December 2004. Surely should not the 3 contiguous months have been chosen: that of December 2003, and January & February 2004? The authors apparent choice of months January, February of 2004 and from December 2004, may well lead to different results from that of the more orthodox sequence. If this is the case, at the very least additional analysis should be undertaken to compare results from the 2 different 3-month combinations.

10. No account is given of the filter sampling results for the winter period [Feb 2 – 20] – I am curious why reference to aerosol filter sampling results for this period is not made in the paper?

11. No serious reference is made in the paper to organic carbonaceous (OC) aerosol, and what effect OC could have on SSA for example. Lack of measurement of OC could be construed as a relatively major gap in this work. Comment on OC should be included at least in the Conclusions section of the paper.

Typographical errors or other amendments/queries

Page (P) 1

Line (L) 4; Meteorological

Abstract

L 5 mean values (delete 'the') of aerosol scattering. . . .

L7 are approximately. . .

L9 which is about

Last line mean aerosol scattering. . . .

P2

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Paragraph (Par) 1

L4 delete ‘the’ before ‘trajectories’

L6 during transport

1. Introduction

L5 composition (also in L6)

L7 is particularly important

L9 greenhouse L12 of radiative

L13 concentration distribution

Last line climatic

Par 2

L2 reveal L3 are similar

L5 and increases L6 in a rather

(P3) L2 of global L3 in estimations L7 concentration

L9 et al., 2002, 2004).

New par L1 a 16-21 month L2 variations last line through trajectory

2.1 Site description

L2 Beijing greater metropolis

L4 hills . . . .is Shangdianzi. . . L7 Preservation

Last par L1 the SDZ

L2 ‘As the map indicates’ the map does not by itself indicate the major sources of pollution. The map will need to include additional information – such as an asterisk along-

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side major sources (cities) of pollution. Figure 1 should include the regions, places named in the last sentence of page 3.

P4

Par 2 L2 aerosol scattering (õ etc) with an integrating . . .

L13 volatile inorganic species. . . .and volatile organic. . .

L15 for pure nitrate aerosol.

Final par

L1 with an Aethalometer

Last line manufacturer (Aethalometer manual, . . .

P5

L2 $\tilde{o}_{abs}$

L3 All of the scattering . . . . . .coefficient data. . .

L6 was taken only

L8 'species' to replace 'compositions'. . . .organic carbon (OC) and elemental carbon (EC)

L10 in previous work (Bergin. . . .

2.3 Method for Aerosol Absorption. . . .

L1 Aerosol light. . . .by the

L4 of aerosol light absorption

Line 5/6 from end of page R is equated to unity

3.1

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L1 BC mass concentration

L2 mean (standard deviation)

L3 aerosol absorption L7 the aerosol absorption

Last line to that. . . .

P7

L1 at Cape

L3 in the Gobi. . . The aerosol scattering. . .

Par 1 L6 The results. . . .L8 the northern. . .

L12 in climate modelling simulations for. . . .

Par 2 L2 delete ‘ each. . . area’ . . . . . that aerosol scattering

L3 delete ‘of aerosols’ than aerosol absorption . . . .

L7 from end North America. . . .mean aerosol absorption

L6 from end SDZ is about. . .

L3 from end mean aerosol scattering coefficient is three. . . .

L2 from end of page is about. . .

P8

L1/2 variation (based on daily averages) of aerosol absorption. . . and SA for. . .

L7 delete’Corresponding. . . ,the’ L8 Calculated SSA. . .

L9 Sheridan et al (2001) reported. . . . L19 from the wind rose

Par 2 ‘In spring’:

L5/6 delete ‘significant’ and replace with ‘ an equal’ delete ‘There was frequently the

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occurrence of' Replace with ' Crop residue burning frequently occurred after. . . ..

L3/2 from end of page and cleaner air. . . in lowest levels . . .

P9

L1 mean aerosol absorption. . . .summer and spring. . .

Par 1 L1 however, in contrast. . . coefficient, the . . .

L3 wind direction L6 poorer visibility. . . . Table 5 shows

L7 fog (visual range $<$ 1 km) . . . range ($<$ 10 km)

L8 of 2003, and 26 foggy days in 2004

L9 foggy weather . . . heterogenic ? [heterogeneous?]

L10 enhance aerosol scattering. . .

3.3

Caption: variation

L4 1300 L7 0800 L9 from midnight . . . (from 0000 to 0500)

L10 deposition : should elaborate: is it wet or dry deposion?...aerosol scattering

L11 0800 L12 to local. . . L13 1400 L14 to a minimum. . . 0700

L4 from end reflect secondary. . . . . through photochemical. . . .

Last line station in the eastern part of China

P10

L1/2 of the variables. . . also indicates strong. . .

3.4 par 1 L 3 (RMS) of all. . . L7 at which point. . .

Par 2 L2 / 3 ARL FNL archived dataset with a time. . . .

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Par 3 L2 is composed L4 move ‘(3)’ more to right of the page

L4 from end southern sector

L2 from end pattern of the site in the summer,

P11

L2 for cluster #2

L10 extended a longer

Par1 L1 represented air masses. . . .from south . . . . . Along the

L3 a 200 km. . . site. The 36-h backward trajectory also suggested. . .

L7 with a cluster . . . absorption coefficient, ...

Par 2 L2 wind speed L3 in regions L8 with air

L10 the relatively cleaner clusters

last line to mean

P12

Par 2 L3 for cluster

L6 from south/southwest and. . .

L7 map of pollution sources are not really indicated in Figure 1 (see earlier comment as well)

L8 reflect the relatively cleaner air. . . . . .#8 indicate

L10 demonstrated measured. . . .

P13

L2 in relatively. . . .

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EGU

Par 1 L2 with polluted L3 cleaner

Par 2 L 4 the relatively “clean” L6 cleaner L10 cleaner

L12 that air mass transport . . . L13 increase aerosol. . . .

4. Conclusions

L1 Mean values and (standard deviations) of. . . L3 reported values

L6 Bergin et al (2001). . . . . ..in climate

L7 simulations L2 from end for the absorption

P 14

L 5 regions. This L6 aerosol L7 regions. Aerosol. . . ..

L8 (last line) serve as a basis for . . . .estimation and climate modeling for the region.

Acknowledgements

L1 staff of the SDZ. . . for their cooperation during. . . .

References

Bergin et al L3 during

Ramanathan et al.. Kiehl, J.T.: Aerosols

Tables

Table 1 The measurements and instruementation

L3 (Modell

L3 from end composition

Table 2 The statistical . . . .

L2 measurements at SDZ, from September April 2003 to January 2005.

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Specify the wavelength(s) for the SSA determination

Aerosol absorption coefficient should be written as o'_{abs} - this needs to be corrected in Tables 3, 4, 6 and 7 as well.

Table 3

Illinois Great Plains

Table 5

Under 'fog/heavy fog' should add 'visual range $<$ 1 km'

Table 8

L1 concentration

L2 during the summer period (July 17 – August 2, 2004)at SDZ site.

Figures

Figure 2 L1 BC mass concentration

Figure 3

Would be more informative to add each season (with months) above or below each of the 4 Figures – example: SPRING [Mar – May] etc.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 13001, 2007.