

## ***Interactive comment on “Dust aerosol optical properties over North China” by Shengjie Niu and Xiaofeng Xu***

**Anonymous Referee #1**

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### General Comments

The article presents two data sets of aerosol optical properties in a number of sites in North China. The differentiation between the two sets, apart from the different time periods they cover, is also the different instrumentation availability. The main authors attempt is to provide insight on the factors that provoke a certain seasonal variation and the different diurnal patterns. The data sets, even though not very large (actually only one year data are presented), refer to a rather interesting area by means of proximity to dust sources but also to a global hot spot, in a larger scale, by means of anthropogenic pollution. That makes the sets rather interesting taking additionally into account the importance of understanding the spatial and temporal variability of aerosols and their physical-optical-chemical properties. On the other hand, the paper approach presents

no novelty and it is poor in drawing any substantial conclusions. Moreover, the two data sets are not linked at all, and the only use of the earlier data set is to draw some obvious correlations without any deeper interpretation or analysis. Overall, I would not favor publication in ACP and certainly not without a major revision. Following are some comments that could help the authors improve the manuscript in case it is considered for revision by the editor or in case they choose to republish parts of it in another journal.

### Specific Comments

1. Abstract: The statement that AOD is more detailed and accurate to depict the strength change of dust compared to surface visibility, is too obvious and not substantial to be referred in the abstract. It should not be among the main findings of the paper keeping also in mind that we are talking about a scientific instrument and the observers' eyes.
2. Section 2: Please clarify that you refer to different instruments that measured simultaneously at the various sites.
3. Section 3.1, paragraph 4: The reference by MacTainsh et al., (1998) refers to Australia and not to North China. Unless the authors wanted to say that the mobilization of dust or its resuspension from the ground depends more drastically on soil humidity and vegetation type. The presence (concentration) of dust in the atmosphere is of course controlled by washout via precipitation.
4. Section 3.1, paragraph 5: Please provide some references or results from statistical analysis that "the activities of cold fronts were most frequent in spring ..."
5. Section 3.1, paragraph 5: In summer and in particular in August the authors attribute the resulting peak to intense solar radiation and subsequent dynamical processes. However, we have no information on the sites where measurements were performed to conclude on the possible contribution of manmade pollution and other

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chemical processes. It would be useful that each site is characterized as rural, remote, urban etc and give main information on the population, main anthropogenic activities and proximity to other sources of pollution.

6. Section 3.1, table 1: There are no dust weather days during May in Xinlinhaote while in Fig. 2 we observe a clear maximum attributed to dust. How can this be explained?

7. Section 3.2, paragraph 2: Is there any explanation why the most probable timing for dust weather is between noon and evening? I rather have in mind that dust events are spiky or episodic cases that could take place anytime.

8. Section 3.2, paragraph 2: There are two results from statistics concerning type B diurnal variability that seem contradictory. First the majority of dust weather days belong to type B and then the majority of type B occurs in autumn. But at the same time the maximum of dust occurrence is considered to be in spring. I suppose that sometimes when dealing with few cases over narrow time span it is unsafe to trust statistics for general conclusions.

9. Section 3.2, Fig. 3: Is it possible to draw error bars in Fig. 3 representing any statistical measure of uncertainty to the different types of diurnal cycles, so that it is clear that these patterns are not influenced by any occasional spikes?

10. Section 3.2: All types of diurnal cycles are mostly explained or discussed by means of atmospheric stability and meteorological records. It would be very useful to see in parallel with AODs, average diurnal cycles of certain meteorological parameters (e.g. temperature, humidity, wind speed etc) that would support the different explanations given for each type.

11. Section 3.2, paragraph 5: One explanation for high morning values (type A) has been anthropogenic activities like vehicles etc. Shouldn't these activities be responsible for certain signals on the time series almost everyday and not only during type A days?

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12. Section 3.2 paragraph 6: I do not see any clear point behind the discussion of hygroscopicity. Please be more specific.

13. Section 3.3, paragraph 2: It is mentioned that AOD during the dust storm maintained values above 1, even 2. However, in Fig. 4 values up to 4 and 5 are observed which gives the impression that non cloud-screened data were used. What level of AERONET data did the authors use?

14. Fig. 5. This event would rather be treated as more separate events rather than one. There is no information on the prevailing synoptic conditions to support whether it is one or more events.

15. Section 3.3, paragraph 5: The last paragraph of this section explaining the discrepancy between AOD and surface visibility is not supported by any data. Vertical profiles of aerosols during these days should be used to draw such a conclusion, which sound very logical, though only based on non-justified assumptions.

16. Sections 3.4 and 3.5 appear detached from the rest of the manuscript, present obvious findings like the validity of the Beer-Lambert law and the definitions of turbidity and angstrom coefficient, with no further attempt to go deeper into the physics or relate the two data sets.

#### Technical Corrections

1. Section 3, paragraph 2: Replace "continue" with "continuous" 2. Section 3.3: Please define BST 3. Section 3.5: Please replace "correlativity" with "correlation". 4. In Figs. 2 and 6 use the same axis so that comparisons are easier.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 17037, 2008.

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