

## ***Interactive comment on “Different trends between extreme and median surface aerosol extinction coefficients over China inferred from quality controlled visibility data” by Jing Li et al.***

### **Anonymous Referee #2**

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#### GENERAL

The paper presents trend analyses of aerosol extinction coefficient at numerous measurement sites in China. Different methods for calculating trends are compared. The analysis also compares trends in major areas of China. The paper is very interesting, I can definitely recommend publishing it in ACP. I did not find any very big errors in the paper. However, there are some points that need to be explained in more detail and some points that should be changed. The changes I am suggesting are minor, mainly clarifications.

#### DETAILED COMMENTS

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The most important point that should be changed is this: the Aerosol Extinction Coefficient (AEC) that is used for the analyses is not unitless like it is presented all over the paper and the supplement. AEC comes from the Koschmieder formula ( $\text{visibility} = 3.912/\text{AEC}$ ) and visibility is given in units of length. So, the unit of AEC is inverse units of length, for instance inverse meters or inverse kilometers or inverse megameters. In polluted areas of China extinction coefficient is typically in the range of some hundreds of inverse megameters. Go through the paper and the supplement and present the units of AEC everywhere both in the text and the figures. This is important also since the AEC values are something that link the paper's values better to the rest of the world.

There are no tables. Give the main results in 1 or 2 tables. For instance trends within each major region obtained with the different methods. Tables give you also more references because they can easily be compared with by other authors.

In the figures, give units for the color bars, if they have a unit. And if they are unitless, give an explanation of the color scales in the captions. Now there are no explanations of the colorbars in any figure.

L108 " ... annual or seasonal time series of the 95th percentile of the extinction coefficients ..." There is nowhere mentioned, what is time resolution of the data. So, does this mean the 95th percentile of one-minute or hourly or daily averaged AEC in any given year? How do you define each season?

L111. In eq (1) there is  $X_i$  and  $X_j$ . They must be the AEC values at  $i$  and  $j$ . Then  $b$  has the same unit as AEC. Or is it - as I would assume - that  $b$  has the units of AEC divided by the units of time, for instance inverse meters in a year if  $i - j$  in eq. (1) means time step. Does it?

The quantile regression has the formula (9). Is the beta in formula 9 the trend? If it is, write it explicitly out. If it is not, in which formula is it? And further, does it also have units? It should if it is to be compared with  $b$  of eq. (1).

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Figure 2 shows the probability density functions of AEC in different regions. It is very interesting. But the same issue applies to this plot also: units. AEC has units of inverse length, e.g., inverse megameters. So, I would recommend presenting the picture so that you simply show the x-axis as inverse megameters but use a logarithmic scale. That would also help in comparing the data with the rest of the world. Another issue in this figure is the values of the pdfs. The integral of a pdf should equal 1. Now there are values larger than 1 so the integrals are definitely  $> 1$ . Explain in detail what the y axes mean. And do corrections if needed. Further in the same figure: if you calculate a pdf like that, the data are divided into bins of AEC and then you present how large a fraction of data is in each bin. What is the bin division you used?

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