

In this manuscript, several methods were used for comparing the effect of noise reduction and negative value mitigation of the data from the microAeth® MA200. This topic of this manuscript is very interesting for the atmospheric limb measurements. However, I not only find many problems in this manuscript, but the methods used in this manuscript have been widely applied in other researches. Now, it seems there is no innovative in your manuscript. Therefore, I recommend reconsideration of your manuscript following **MAJOR** revision.

### **<General Comments>**

#### **Scientific Significance and Quality:**

This manuscript applies a series of data post - processing steps to microAeth® MA200 time series data to compare different method based on (1) the relative number of negative values; (2) more detailed microenvironmental change information retained after noise reduction; (3) the reduction of the peak values and number of peak samples; (4) more detailed microenvironmental change retained after the background correction. These methods can be important to properly characterize pollutant concentration data from mobile monitoring and demonstrate good practice for such applications. However, the authors are recommended to systematically compare the method and demonstrate the impact of various approaches and parameter settings.

Black carbon is a key indicator in air monitoring. Accurate measurement of black carbon is of great practical significance for the optimization of air quality. This manuscript compared the performance of various methods (e.g., LPR, ONA, and CMA) in noise reduction and negative value mitigation. It has high application value for users of the instrument. However, there are some issues that require serious consideration by the author.

1. These noise reduction methods are very common. Has the author considered the latest method or developed a more applicable method by himself?
2. MA200 is just one of many instruments. How valuable is your research for readers who do not use this instrument?
3. In the section "Results and discussion", I think the discussion part is relatively weak.

#### **Presentation Quality:**

I have to say that the presentation of the manuscript is very poor. There are many long sentences in

the text, which brings great dyslexia to readers. There are also many unreasonable expressions in paragraph structure and grammar. I suggest the author invite a native English speaker to rewrite the manuscript.

Some technical comments:

1. Consider using the latest references. References in the past three years only account for less than 30% of all your references.
2. Describe a full name and then its abbreviation throughout the manuscript.
3. The form of the pictures in the article is relatively simple. I suggest that you carefully modify the titles of the figures and tables.
4. Throughout the manuscript, the citation format of the figures is inconsistent, e.g., "Figure 4", "Fig. 3". You should keep them in the same format.

<Specific comments>

Line 25-28: "Noise reduction and negative value mitigation were explored via different data processing methods (e.g., local polynomial regression (LPR), optimized noise reduction averaging (ONA), and centered moving average (CMA)) under different interval time (i.e., 5s, 10s, and 30s)".

Line 30: "after noise reduction" repeated.

Line 31-33: I suggest this sentence "Our results showed that CMA showed a good prospect to analyze the raw BC concentration data in terms of the interval time due to its proportions of negative values and the detail microenvironmental change." should be split into several short sentences.

Line 34-35: I don't know what you want to express, please explain.

Line 35: "after background correction" appeared here. It also appeared in line 31, please carefully optimize the structure of the paragraph.

Line 39: BC instruments? I only saw MA200 in your manuscript.

Section 1 Unfortunately, I did not see you have a more detailed summary of the previous research. You only introduced the importance of black carbon measurement and the instruments you used. You should reflect the current research progress and deficiencies in this field in this section. Meanwhile, I suggest you cite some latest references.

Line 53-54: When is the specific development and market investment time of MA200?

Line 59-60: such as fossil fuel (e.g., diesel), biomass, and tobacco combustion

Line 60: "The instruments" or "This instrument"? Please check!

Line 63-64: There is a huge jump.

Line 65-66: "This is due to the use of an incremental optical attenuation value (ATN) to calculate the BC value." is not a correct sentence.

Line 77-86: Two references are not enough to explain the research progress of these contents, please consider adding references.

Line 110: What is your motivation for mentioning AE15 in this manuscript?

Line 123: "significant" is not a colloquial vocabulary. Its appearance usually requires standardized calculations. How did you get this conclusion?

Section 2.2: These redundant words make it difficult for me to understand your true intentions. It would be better if you could provide a framework figure.

Line 138: What does "relative patterns in environmental exposures" stand for?

Section 2.4: The introduction of the three methods is not sufficient. Who are their developers? What research field is it used for? What are the advantages and disadvantages? Specific formula? Since the comparison of three methods is the highlight of this article? You should give full attention instead of spending text in unimportant places.

Line 159: "the optical attenuation (ATN)", Line 65: "an incremental optical attenuation value (ATN)". This is a very irregular expression. I hope you can determine a correct expression about "ATN". This will bring greater difficulties to readers.

Line 174: "2.4.3. CMA (centered moving average)" should be changed to "2.4.3 CMA (centered moving average)"

Line 185: How did you define "more detailed"?

Line 191: Do you think the research 7 years ago (Brantley et al., (2014)) is the latest paper? This expression is inaccurate. I hope you can refer to the latest article. And the citation format of the references is also wrong. The correct one should look like this: A recent paper by Brantley et al. (2014) compared several methods for detecting and eliminating peak-value samples in mobile air pollution measurements.

Line 200: This passage is an explanation of the above formula. It does not belong to an independent sentence. Therefore, the first letter should be lowercase. "Where" to "where".

Line 200-201: The line spacing does not match the full manuscript.

Section 3: The discussion part is not sufficient.

Section 3.1: The author did not perform a significance test after data processing. This is a huge flaw. In addition, there are problems with the structure of many sentences.

Line 223: I suggest changing "three" to "3". In an article, the number format should be consistent. Please check the numbers that appear in the full manuscript.

Line 226: "Figs. 1b, 1c and 1d" is only part of Figure 1. "Fig. 1b, 1c, and 1d" is a more accurate way of expression.

Line 249-251: "The analysis based on data from measurements 5, 6, and 7, that were one run with three MA200 measuring parallel." is not a complete sentence.

Section 3.2: The results of this section is very interesting.

Section 3.3: "Comparison of background estimation and correction after noise reduction methods" should be replaced by "Comparison of background estimation and correction after noise reduction".

Line 294-296: This sentence should be simplified.

Line 299-301: "However, after different noise reduction approaches, the background correction concentration is different, therefore, further evaluation on their background correction concentration was necessary for this study." should be replaced by "However, the background correction concentration is different via different noise reduction approaches. Therefore, further evaluation on their background correction concentration was necessary for this study."

Line 302: Delete the first "methods".

Line 302-303: The structure of this sentence is so improper.

Line 317-320: Change this sentence to several short sentences.

Line 363: Delete "the centered moving average".

It seems to me that the whole manuscript does not have a decent map of the study area. In addition, lots of number expressions, made me lost in the jungle of numbers. Discover the hidden meaning of the numbers as much as you can.

Supporting information: You need to ensure the relative consistency of the font size in these figures.

Table S1: You need to give more detailed information, e.g., maximum, minimum, median, observation period, etc.

Table S2: Why does the “Measurement number” jump?

Figure S3: In order to improve the visibility of the curve, you can consider reducing the thickness of the curve.