

Comments:

This paper describes organic and elemental carbon concentration measured at one site using different sampling devices and flows and using different temperature protocols for analyzing TC, OC and EC. It tries to evaluate how well results are comparable, which is important as it is known that at least the used temperature protocol and used optical correction method have affect to the OC and EC concentrations. Also, different ways of correcting/uncorrecting gaseous artefact were studied. The paper has clear structure and objective and it is worth of publishing after revision. Detailed comments are described below. In addition to these comments, clarify much more clearly, which results are new and not presented before. Occasionally, it was not clear whose results were presented. Also, check that same tense are mainly used when presented your results. Consider to retitle the subtitles in Results and discussion chapter, some of them were not informative if the names of the network are known.

>> The authors appreciate the useful comments and suggestions from the referee, and we address all the comments accordingly.

**Abstract:**

Based on the suggested correction, modify the abstract.

>> This is addressed.

Lines 23-30: OK

Lines 30-32: Why not compared without normalizing the concentrations? Check comment further below. Otherwise this kind of information belongs here.

>> After some consideration and discussions among the co-authors, we agree to remove this section and focus on the absolute data inter-comparison section.

Lines 32-36: this is not the objective of this paper and not actually studied here. The discussion of the sources of OC and EC is presented in lines 417-425 and are based on other studies. No proves for forest fires occurrence were presented although speculated. Anyway this is not the scope of this study, if I understood correctly. Remove.

>> The authors have conducted some preliminary analysis and results suggested that forest fire could potentially influence the Egbert site and result in elevated EC concentration during summer time. Additional research is currently on going and the results are expected to be included in a separate manuscript. Considering this is preliminary results, we have now removed such content to the supporting material.

Lines 38-41: these lines are more like a conclusions not belong into the abstract.

>> These sentences are removed.

**Introduction**

Line 43. Modify the sentence to remove double parentheses e.g...carbonaceous aerosol, including elemental carbon (EC), often referred to black carbon (BC) and organic carbon (OC) make up a large fraction...

>> This is addressed.

Line 43-44: reference needed

>> A reference has been added.

Lines 120-127, Objective:

- be more specific of how many sites are compared in this study (in line 120-121). Now I got the feeling that multiple sites were compared (line 125)
  - remove the names of the networks or write them open
- >> This is addressed. We have made it clear that the comparison was not for multiple sites.

### Sampling and Measurements

General comments: overall it is slightly difficult to remember the name of the different networks and the used protocols. I need to check them constantly. In the Results and discussion, use other subtitles than the name of the network vs other network.

>> The authors apologize for the confusion. The protocol names throughout the paper have now been verified and modified to ensure they are consistent. The subtitles have also been revised to avoid confusion.

Line 151-153: Modify the sentence by replacing “The IMPROVE measurements... to Results of/from the IMPROVE measurements

>> We have improved the sentence.

Lines 140-155: Add information if they are sampled at the same day as at the IMPROVE network and add sample amount into Table 1.

>> The CAPMoN samples were indeed collected on the same day as the IMPROVE samples and this information is now mentioned in the manuscript. We have also included the total number of samples used in the analysis in Table 1.

Line 155. I do not understand the reference of IMPROVE. Is it a book, paper or internet page? Specify.

>> We have removed this reference.

Line 166: Re-locate the manufacture info of the quartz filters directly after quartz filters were mentioned.

>> This is addressed.

Lines 163-170: Add information of the sample amount for Sunset-TOT and DRI-TOR and both into table 1.

>> The number of samples are now added.

Line 171-172 Use reference not internet pages for Sunset instrument. Add also, information of the manufactory, and country.

>> Manufactory is Sunset Laboratory Inc. from the USA. This info is now added.

Line 176-178. This sentence is slightly confusing. Are you referring to results presented in Chow et al paper? Modify this sentence more clearly. Inform also what “small difference” means e.g. how much TC mass differs between IMPROVE\_A TOR and Sunset-TOT/ DRI-TOR.

>> Yes, we are referring to the results discussed in Chow et al. (2007) and the sentence is revised for clarity. The “small difference” refers to the temperature difference discussed in the previous sentence, which is the typical temperature difference between each ramping temperature used in the two protocol.

Line 179: the subtitle “the ECCC Canadian Aerosol Baseline Network” is slightly confusing as you used name of the CABM network later. Replace to CABM.

>> This is addressed.

Lines 189-191. Add the amount of the filters.

>> The total number of samples has been included in Table 1.

### **Differences in Sampling and Analysis among Networks**

Line 213: Modify the sentence so that network is added e.g. cyclones were used in IMPROVE and CABM networks whereas an impactor was used in CAPMoN network.

>> This information is included.

Line 215: bounce or bounce off. Check, which is correct?

>> We mean bounce off. When hit the impactor surface, some large solid particles may bounce and not be collected by the impactor plate and then re-enter the airstream and be collected by the filter downstream.

Line 225: Re-order the list so that IMPROVE is before CAPMoN, as it was first introduced in the manuscript.

>> This is addressed.

Lines 225-228: Specify how CAPMoN results (TC, OC, EC) are calculated especially when monthly mean values are presented. Did you use monthly mean value for vapor artifact or did you subtract vapor artifact for individual sample and then calculate the average.

>> For CAPMoN measurements, vapor adsorption artifact was applied to each individual 24-h samples. Then, all the artifact corrected samples within each month were used to compute the monthly average measurement. For IMPROVE measurements, the monthly median OC artifact derived from 13 sites were subtracted from all individual OC measurements in the same month before monthly averaged were derived. The above information is now added to the manuscript.

Line 229: References needed after the statement “multiple studies”

>> The “multiple studies” here were indeed referring to the references in line 231 (i.e., Chow et al., 2004; 2005; Watson et al., 2005). The sentence is now revised to include references.

### **NIST urban dust standard comparison (SRM 8785 & 1649a)**

Remove the NIST and (SRM 8785 and 1649a) from the subtitle

>> This is addressed.

This chapter need to be reorganized and clarified. I did not understand if the intercomparison is the same as the analysis of four replicates.

>> The word “inter-comparison” was used because this is a comparison exercise conducted by two labs even though there were just four replicates. It was realized that using “replicates” was not proper in description of those SRM 8785 filters since they are not the same in mass loading. This has been addressed in the revised version.

Reorganize:

Paragraph 1:

Start with the introduction of the urban dust sample (SRM 1649a) then describe how SRM 8785 is done and continue with the reference. After those, describe the intercomparison/analysis of four replicates.

Line 237: "OCEC measurements" is not right way to describe OC and EC analysis. Modify the sentence e.g. consistency between the ECT9 and the IMPROVE\_A TOR analytical methods were assessed by measuring four replicates of .....

>> This is addressed and the paragraph is now rearranged.

Line 239: replace IMPROVE\_A to IMPROVE\_A TOR

>> This is addressed.

Line 240: replace "measuring" to analysing

>> This is addressed.

Line 246-247: ECCC and DRI laboratory has not been presented. Could this information be added under the network presentation e.g. in line 151. Once sampled, filters were stored in freezer until they were ready to be analysed in the DRI laboratory in xx. Similarly the ECCC laboratory.

>> This is addressed.

Paragraph 2: Show first the results based on Figure 2, where analyzed results were compared to the reported one. Change then the numbering of the figures, if Fig. 2 is presented before Fig. 1.

>> This is addressed and Fig 1 and 2 are now in reversed order.

Paragraph 3: Compare TC, OC and EC results analyzed with ECT9 and IMPROVE\_A TOR protocols. Were there any test solution that were analyzed during the intercomparison that could indicate the reason of discrepancy (instrumental, inhomogeneous sample etc) of TC between two different protocols and instruments?

>> Unfortunately, no such solution was analyzed by both labs in this inter-comparison effort. The current analysis was not able to determine the reason for causing the difference observed during the inter-comparison. During the analysis, both labs analyzed the filters using their own standard operation procedure and therefore the regression results reflect any difference that would be caused by all reasons in combined.

Specify whether linear or orthogonal regressions were used in Fig 1. Orthogonal is better if either of the instrument is reference one (and concentrations are known).

>> We have specify the type of regressions to use in the revised version.

Line 251: ....Use correct protocol name "IMPROVE\_A TOR" and remove by DRI

>> This is corrected.

Line 251: "compared well" does not inform if the concentration is the same. Modify the sentence.

Paragraph 4

>> "Compared well" means the average values were within uncertainties and therefore they are not statistically different. The sentence is now modified by stating this explicitly.

Line 257: clarify what multiple SRM 1649a samples mean. Was it three samples as mentioned in line 266?

>> We literally means a few. In here, SRM 1649a (which is dust powder) were weighted and analyzed by the OCEC analyzer for TC, and then separately for OC and EC. The word "multiple" is removed to avoid confusion.

Line 267-269: EC to TC ratio of 0.425 measured with carbon isotopes should also be compared to the value analyzed with ECT9 protocol. Now it has been compared only for reference value and result derived from the IMPROVE\_A TOR protocol.

>> This is addressed.

Line 261: refer that the method is presented in the Supplement material section. You can also consider to present the calculation (Eq 1) and text describing it in the Supplement material section.

>> We prefer to leave a brief discussion of the method in the main text while all the technical details of the methodology will remain in the supplement material section.

### **Results and discussion**

Add one paragraph where you have presented how you have compared different samples having different sampling times. If you compare weekly samples to 24h-samples collected every third day, have you calculated average of 2-3 samples and how you have weighted the sampling times to match to the weekly samples as well as possible or have you only compared monthly values. Also, inform if exactly same days were sampled for IMPROVE and CAPMoN networks. Remind readers that Aug 16, 2006 – Oct 24, 2008 24h-sampling had different sampling times in IMPROVE network than after that. After this, you can continue with PSAP measurement, but maybe without any subtitle, which is confusing as you have compared PSAP results here. If subtitle is needed, maybe something about “comparability”

>> The corresponding paragraph is revised to include more information regarding how the comparison is done.

PSAP measurement need to be explain under the Sampling and Measurements chapter.

>> This is addressed.

Lines 272-276: Are these results and interpretation presented by Yang et al. or are they interpreted by the writers? Clarify.

>> The results (comparison between the integrated weekly and once every third day samples) are conclusions from Yang et al. This is clarified in the revised version.

Line 279-280: How have the correlation plot in Figure 3c done where weekly and every third day samples were compared? Are the third day samples averaged over 2-3 samples to cover the week samples or are they monthly averages? Clarify.

>> Results in Fig 3c represent the comparison between the two sets of monthly averages derived from the integrated weekly and once every third day samples. This is clarified in the revised version.

### **Vapor adsorption corrections**

Line 284-286: Why monthly averaged results were presented and not daily? If I understood correctly, artifact correction was made for daily samples. I do understand that it is difficult to present data over long-time period, but clarify how the monthly averages have been calculated. Were artifact subtraction made individually for each sample, which were then averaged over month or calculated first monthly averages of OC and monthly average of gaseous OC and then subtracted. Specify here or in the beginning of the “Results and discussion” chapter.

>> For the CAPMoN measurements, artifact correction was applied to the 24-hour samples. Then the artifact corrected data were averaged over the month to get the monthly average. For downloaded IMPROVE measurements were already artifact corrected. Average vapor adsorption in a monthly basis

was first determined from measurements from 13 sites (exclude Egbert). Then, such value was applied to all individual measurements before the monthly average is computed.

Monthly data is used here to assess the comparability among three networks. The original measurements from various networks have different sampling frequencies (every three day vs. weekly integrated) and it could cause complications. Thus, monthly averages are used to be consistent through the entire manuscript. In addition, monthly means are often considered as a reliable time resolution in comparisons between climate models and observations, due to the limitation of reported emission inventories (usually as annual values). Therefore, the analysis obtained here could be directly relevant to those comparisons. We have included a statement about how the measurements presented in this section were obtained.

Lines 285-286: Throughout the paper POC is discussed separately, although it is already included to OC. It is slightly confusing. If not presented/published before, I recommend that one section/paragraph is added where the contribution of POC (monthly averages) from TC for all protocols are presented and discussed. In addition, POC comparison between 24h TOT (Sunset-TOT) and TOR samples (IMPROVE\_A TOR) and between DRI-TOR and IMPROVE\_A TOR samples should be done. POC discussion, plots and statistics can be removed elsewhere in the Results and Discussion chapter.

>> POC from IMPROVE\_A TOR and DRI-TOR are simply a charring correction and this analysis also show that it is always proportional to OC. On the other hand, ECT9 POC is not a charring correction but appear to represent a different class of organics, likely the oxygenated organics. For the ECT9 method, POC is considered as a separate carbonaceous fraction from the measured OC although reported as part of "total OC". To a certain extent, the POC from various method were compared through the use of correlation coefficient.

Line 293-294: This sentence is quite loose if the readers have not information of the gaseous artefact of IMPROVE samples. Remove the information presented in lines 309-313 after the information of the CAPMoN samples (line 293). Explain to the readers what anchor IMPROVE sites are (Line 312). It may also be reasonable to remove the blank concentration discussion here after the gaseous artefact discussion.

>> The reason to include the artifact information for the IMPROVE samples is to verify the statement mentioned earlier that the lower filter face velocity of the CAPMoN measurements leads to higher filter artifact. We believe the content here provides readers a perspective of the relative magnitude of the artifact when dealing with the different measurements. Also, IMPROVE has changed their SOP and use blank correction to address the artifact correction for new measurements. Although this does not impact the measurements used in this manuscript, we thought it was a good idea to include such information. This paragraph is revised to avoid confusion. The filter blank concentration discussion is now removed.

Add field blank contribution for uncorrected OC values for all three networks. Now, only results of IMPROVE measurements were presented.

>> We decided to leave out the discussion of filter blank because this is not handled the same across different networks.

Line 296: add detection limit in the unit of  $\mu\text{gC}/\text{cm}^2$  in parentheses

>> This is addressed.

Line 299: Clarify, why vapor adsorption affects POC correction.

>> As seen in Figure 4 and Figure S2, the backup filter also possesses a small amount of POC and therefore artifact lowers the POC concentration slightly, however, the magnitude of the POC artifact has never come close to the artifact for OC.

Line 302: remove information in the parentheses (red open circles)

>> This is addressed.

Line 306: add reference after the sentence mentioned of POC to EC ratio. Correct also the mark EC/POC ratio as EC/POC already means a ratio of EC and POC. Discuss of the POC/EC using different protocols and their differences (shortly).

>> This is addressed. The authors did not intend to introduce another parameter (POC/EC). Although this was used in the reference Chen et al. (2004). What the authors intended to say here is that an optical correction using reflectance is a more consistent method than the optical correction using transmission under the situation when POC concentration is large compared to EC. We have revised the content here accordingly to avoid the confusion.

Figure 4: Rescale the y-axis for EC. Remove the POC plot as OC includes the POC.

>> Figure 4b has been rescaled. Although POC is part of OC (which is now mentioned in the text), the authors would like to retain Figure 4c in the text. This is to illustrate the point that although artifact influence the POC concentration and therefore impact EC concentration indirectly, the influence is small hand artifact affects only OC primarily.

Figure 5: In this plot, all data points (daily) can be easily presented instead of monthly (, if exactly the same days are sampled). Use daily data and add regression lines and equations for both data sets (DRI-TOR and Sunset-TOT). Use the same color for dots and line for DRI-TOR and another one for Sunset-TOT or color-coded the marks based on the time (or season) for DRI-TOR and Sunset-TOT. Use e.g. gray scale for Sunset-TOT and rainbow scale for DRI-TOR. If too messy, remove one of them to supplement (or make two plots). Also, specify why the linear regression should be go through the zero.

>> We have addressed this in the previous comment.

#### **CAPMoN vs.IMPROVE measurements**

Line 318: Instead of the used subtitle, could it be “comparison of daily sampling methods” or something which describes more illustratively what is compared, if the networks are not familiar for the readers.

>> The authors agree that this title may not be as appropriate. We have now combine the section “CAPMoN vs. IMPROVE measurements” and “CABM vs. IMPROVE measurements” to one paragraph titled “Comparison among IMPROVE, CAPMoN, and CABM Measurements”.

Lines 319-321: The discussion of summer peak should be removed to the chapter Seasonality in Carbon.

>> This is removed.

Lines 321-326: the correlation coefficients have been presented in the table 2, do not repeat the values in the text. Concise these lines e.g. better correlations of TC, EC and OC were found between the protocols that use same POC correction method (DRI-TOR and IMPROVE\_A TOR) than between Sunset-TOT, which use transmittance for POC correction and IMPROVE\_A TOR (Table 2). Especially correlation of EC between Sunset-TOT and IMPROVE\_A TOR was poor. Note, that Sunset-TOT and IMPROVE\_A TOR had slightly different sampling time.

>> We accept the suggestion and this has been addressed.

Figure 6: CAPMoN time series have been already presented in Fig 4. Remove this figure and plot correlation plot between IMPROVE and CAPMoN 24h-measurements (, if exactly the same days are sampled) instead of monthly mean. Color-code the marks based on season/time/or something else.

>> Figure 4 was create to explain the gas adsorption artifact. The CAPMoN time series were also included in Figure 6 as a direct visual comparison with IMPROVE and CABM measurements. The reason why using monthly means throughout the entire paper has been addressed in the previous comment.

Lines 327-331 and Table 2: Clarify what kind of regression (linear, orthogonal) has been used. Prefer orthogonal. Clarify also, are the regression calculated from monthly mean values? Remove slopes, which are already presented in Table2. Explain why Regression 1 was used. Is it correct to force through the zero?

>> The information on the type of regression fit has been included. Fitted parameters are included in a few places just to provide a quick reference to the readers. Even though all fitted parameters are included in Table 2, having to look up values during reading can take some time. The choice of linear regression fit is totally subject to the reader what method the reader may prefer. Fitting the data through the zero is physically reasonable in many cases when we know an offset should not be present and the slope gives the best estimate of the relationship between the two sets of measurements. In some situations, a non-zero intercept may also make sense as it may be physically be explained by over or under correction, or having a systematic bias. That's why here we provide both sets of linear regression fit results so that readers can obtain the information they needed depending on what the reader may prefer to look for.

Lines 332-336: remove this paragraph to the new POC section.

>> We do not think a separate paragraph for POC is suitable. As the reviewer suggested, POC is part of OC and we prefer to include POC discussion with other carbonaceous measurements. In addition, POC is a charring correction under the IMPROVE or IMPROVE\_A methods. The ECT9 POC however is not a charring correction. So we prefer not to directly compare the POC concentration from different protocol but just to point out their differences from the analysis.

### **CABM vs. IMPROVE measurements**

Line 337: Change the subtitle e.g. Monthly comparison or something else

>> The subtitle has been removed as this section has been combined with the previous section.

As CABM measurements does not subtract the gaseous artefact, the writers may consider to plot figures 6 and 7 with uncorrected data.

>> The purpose of this analysis is to understand the difference in measurements among the various networks despite the unique differences in their sampling and analysis, which artifact correction is considered one of them. By plotting the CABM measurements with the uncorrected CAPMoN measurements will only provide the relationship between the two data set. But it does not provide the information how the CABM measurements are compared with other measurements.

Figure 6: remove 6a-c to Supplement and delete 6d. Modify Fig 6a-c so that common x-axis is used to save space. Refer also to Figure 7 that should be presented against (x-axis) to CABM network that has the different sampling time compared to other networks.

>> Although it seems that the CAPMoN results are being shown twice (in Figure 4 and 6), the presence of the CAPMoN data are for different objectives. In Figure 4 the data is shown for illustrating the magnitude of the gas adsorption artifact, whereas in Figure 6, we include the CAPMoN data for the completeness because that will give the reader a direct visual comparison of all the data from different



network. We have considered the suggestion to modify the x-axis of these time series graphs to save space but the results were not ideal. We have adjusted the size of the graph and try our best to make the graph clear.

Line 340-341: after “comparable” should be present correlation coefficient. The percentage shows the similarity of the concentrations. Also, if it is said that concentrations are higher, the writers should said where to compare “higher than”. Modify this sentence.

>> The word “comparable” is removed and the sentence is modified.

Lines 342-346: Again, I do not understand why both regressions are presented. Why fits are forced through the origin? I recommend to use only regression with intercept unless there is a clear reason for forcing through the zero. Again if comparative is used, there have to be the other party.

>> The type of linear regression fit to use is really subjected to the reader preference. The authors believe the regression fit results forcing through zero is a good start of the analysis assuming there is no systematic bias or offset among the various data sets. In a few cases, we also extend our analysis to discuss results when not forcing the fit through zero. Tables 2 and 4 summarize all the linear regression fit results by forcing through zero and allowing an intercept.

Lines 351-352: CABM network did not see any short-term variation as it has week-long sampling time. Anyway the Fig. S3 shows monthly mean values that is even longer time than week. Modify the sentence.

>> The sentence is modified. Short-term variations are replaced by seasonal variations.

Line 353-359: POC discussion should be remove to its own section/paragraph. In line 356, Table 3 has not been presented yet. Why not use table 2? Remove the regression discussion with forced intercept

>> Table 3 summarizes the correlation coefficients among different variables (e.g., OC, EC, TC, etc.) and results have been used in various locations although we may not have explicitly mentioned in the manuscript. There are more discussion of the results summarized in Table 3 in the “normalized time series” section. However, since we are removing the normalized data analysis section, we moved Table 3 to the supplementary information.

### **Comparison of the Normalized Time Series**

I do not understand this chapter. Why the data should be normalized to Jan 2008 data? This can be removed or explained better the meaning of this chapter.

>> We have removed the normalized analysis section and recombine some of the analysis to the ordinary inter-comparison section. Because of this, Figure 8 and 9 are also removed from the manuscript.

### **Seasonality in Carbon**

Although this chapter if very interesting, it is not part of the objective. To stay with the objective, it would be interesting to see how the gaseous artefact correction varies between the season/temperature for DRI-TOR, Sunset-TOT and IMPROVE\_A TOR. The writers can use the Sigmoid function if wanted but concentrate on the contribution of gaseous artefact. Also comparison of TC, OC and EC during different season between different networks is interesting. Is there any differences between different networks based on the season?

>> The authors think that the observed seasonality in carbon is an important observation that is result from the inter-comparison analysis. Therefore, the authors prefer to keep this section but has shorten it slightly. The authors have done separate analysis and it was observed that the POC from IMPROVE\_A

TOR and DRI-TOR are always proportional to the OC because POC defined in this protocol is a charred OC correction. Therefore, the seasonality observation for the IMPROVE\_A TOR POC does not mean much as this, to certain extent, resemble the relationship seen in IMPROVE\_A TOR OC. The ECT9 POC, however, is different because our analysis and past research have shown that ECT9 POC represents separate category of OC compounds and therefore the seasonality relationship of the ECT9 POC actually provide additional insight that do not provide by OC and EC observations.

In the beginning of the Results and Discussion, the writers can present general overview of the results (yearly concentrations of TC, OC and EC). In addition, wind roses and footprints, if wanted, can be presented shortly here and put the plots in the Supplement.

>> The authors have removed the majority content regarding the wind rose and transport model results to the supporting materials.

### **Conclusions:**

Based on the modification and comments, modify this chapter. In addition

Line 443-444: the filter face velocity does not affect for the field blank concentration. Now the readers may get wrong message. Modify. Add also information of the other field blanks e.g. field blanks accounted xx-xx% (xx-xx ugC/cm<sup>2</sup>) of the measured OC.

>> The sentence is modified to avoid confusion.

Lines 445-446: I am not sure if this statement was proved in this manuscript, although true. Modify this sentence e.g. Start with the information that CABM network did not correct gaseous artefact and its OC has xx% higher concentration than with two other networks that had the correction done.

>> This is addressed.

Lines 446-448: I do not understand this statement or its purpose. Too long story and too much details (like values of r). Describe the contribution of POC of TC /OC.

>> This is addressed.

Lines 451-452: SRM 8785 samples demonstrate the consistency of the different protocols not long-term carbon measurements. Correct.

>> This is addressed.

Line 457: "North American harmonized carbonaceous concentration map" is new for me and may be to other readers. Clarify shortly

>> The authors apologize for the confusion. We have modified the sentence to better represent our true meaning.

### **Supplement:**

Line 69-70. Actually internal signal is used to correct slight variation during each analysis. TC, OC and EC concentrations are calculated based on the calibration value calculated from external calibration.

>> The sentence is modified to improve clarity.

Correct. Line 79: There were no IMPROVE protocol. It was named to DRI-TOR and Sunset-TOT. Correct Table S1: Use the protocols names you have chosen to use (Sunset-TOT and DRI-TOR). First column IMPROVE\_A TOR, second column both Sunset-TOT and DRI-TOR and third column ECT9

>> The name “IMPROVE” and “IMPROVE\_A” are the original name of the two protocols. In this manuscript we have The paragraph has been modified to improve clarity. Table S1 has also been updated to avoid confusion.

FigureS1: protocol name IMPROVE has been used, although not mentioned in the manuscript. Either rename that or add to the manuscript that the temperature steps used in analyzing particulate carbon in CAPMoN network are called IMPROVE although different optical correction used.

>> Figure S1 captions and figure content have been modified to be consistent with the rest of the manuscript.

Table S1 and Figure S1: Replace IMPROVE\_A to IMPROVE\_A TOR

>> This is addressed.

Figure S3: Add information that results are monthly averages.

>> This is addressed.