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Comment on acp-2022-291

Anonymous Referee #2

Referee comment on "Measurement report: Chemical components and ^{13}C and ^{15}N isotope ratios of fine aerosols over Tianjin, North China: year-round observations" by Zhichao Dong et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-291-RC1>, 2022

Title: Measurement Report: Chemical components and ^{13}C and ^{15}N isotope ratios of fine aerosols over Tianjin, North China: Year-round observations

Author(s): Zhichao Dong et al.

MS No.: acp-2022-291

MS type: Measurement report

General comments:

This manuscript shows a detailed study on $\text{PM}_{2.5}$ in urban and suburban site of North China city (Tianjin). The study focused on the concentrations of different chemical components including carbonaceous (EC, OC, SOC, WSOC, WIOC, TC), nitrogenous (WSTN, IN, WSON) and other inorganic ions. Additionally, stable isotopes of total carbon and nitrogen in $\text{PM}_{2.5}$ were also shown. This sufficient and comprehensive study can help us further understand the source and atmospheric processes of fine aerosols in regional scale, and the data could help to promote scientific progress within the scope of Atmospheric Chemistry and Physics. However, quite a lot of necessary information that needed to help understanding the whole manuscript is lacking, and the paper is poorly written, the language and expressions need to be further improved. Detailed comments could be found as follows:

Specific Comments:

1. Major comments on introduction. The study aimed to explore the origins and atmospheric processes of fine particles through seasonal variations of carbonaceous (EC, OC, SOC, WSOC, WIOC, TC), nitrogenous (WSTN, IN, WSON), other inorganic ions and stable isotopes of TC and TN in urban and suburban site of Tianjin. Therefore, the background in introduction should include: why choose to study PM_{2.5}? why EC, OC, SOC, WSOC, WIOC, TC, WSTN, IN, WSON and stable isotopes are important in understanding the source and atmospheric process of aerosols? Why choose to study urban and suburban aerosols in Tianjin? Some of the information is presented in current version of the manuscript, however, more information needs to be added in introduction section. For example, the authors studied EC, OC, SOC, WSOC, WIOC, TC in the PM_{2.5}, however, there is only a simple introduction of EC and OC in the second paragraph, then why the authors also explored the seasonal variation of SOC, WSOC, WIOC? Are they important in understanding the source and atmospheric process of fine aerosols? Why? Similar problem also happens in nitrogenous components and other inorganic ions in introduction section. In addition, $\delta^{13}\text{C}_{\text{TC}}$ and $\delta^{15}\text{N}_{\text{TN}}$ of aerosols can be used to trace the emission source of aerosols, however, fractionation effects during the formation and transportation might modify the initial value of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ from sources, which might lead to the uncertainties of directly using $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in aerosols to trace source contributions. Therefore, the background about the role of fractionation effects in affecting the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ in aerosols is important to understand the related result and its implications. However, no such information was found in current introduction section.

2. Major comments on Materials and methods. (1) Locations of the urban and suburban site needs to be indicated in a map to help better understanding of the results; (2) There are results of meteorology and backward air mass trajectories, however, no related information was found in Materials and methods section; (3) Necessary information is lacking. For example, what's the flow rate of the air sampler during sampling period? This is important, cause the authors continuously sampling for 72-h each time, if the flow rate is high, then I'm wondering whether the filter will be saturated or not, especially in winter when PM_{2.5} is high; (3) Further explanation needs to be added to support the feasibility of the method. For example, the authors described "OC and EC were measured using OC/EC analyzer....., based on thermal light transmissionand assuming the carbonate carbon was negligible." Why the carbonate carbon is negligible, is it really negligible in aerosols of Tianjin? In addition, the authors described that "The N contents of NO_2^- , NO_3^- and NH_4^+ were calculated from their concentrations." but how? the authors need to explain more. Lastly, there are quite large uncertainties in WSTN, WSON etc., however, the authors consider ".....such errors do not influence the conclusions drawn from this study.", why? explain more.

3. Major comments on Results and discussion. The prominent problems in results and discussion are that (1) no statistic analysis of the results; (2) no literatures or data are provided to support the some of the explanations of the results. For example, in section 3.2, the authors expressed that "Furthermore, the average concentration of PM_{2.5} found to be higher in spring than in autumn (Table 1), probably due to enhanced eruption of dust

from open lands, due to gradual increase in wind speed in spring (Fig. 1).". First of all, the concentration of PM_{2.5} is higher in spring than in autumn, is there any significant difference? Secondly, the authors owe this to "enhanced eruption of dust from open lands", is there any reference to support this idea? For the other example, from lines 260-265, the authors said "..... the secondary formation of OC might be significant via adsorption and/or NO₃ radical driven oxidation reactions of VOCs." Are there any citations?? "..... the frequent precipitation events might result the enhanced wet deposition of....." Do you have any data about seasonal precipitation amount or reference to support this? These are only some examples chosen from the results and discussion section, in fact, there are quite a lot of sentences that need to be supported by reference. The authors need to carefully double check each sentence and complete with appropriate reference to confirm your conclusions.

Technical corrections:

Line 42: Move "(2127 and 1356 Gg, respectively)" after "2000"; In addition, there are so many "respectively" through the whole manuscript, quite annoying and makes the sentences hard to understand. Generally, "respectively" is always used when to distinguish three or more different items, please double check and change the expressions through the manuscript.

Line 59, Please delete the "," after "thus".

Line 73, Change "theier" to "their".

Lines 90-91, Better give the area percentage of "agricultural fields and forests" around Tianjin.

Lines 93-94, Still have no idea why Tianjin is the "ideal location".

Line 104, Change "measurement of its mass" to "mass measurement".

Line 131, Please explain "TIC, acidizing" and "wet oxidation".

Line 173, There is a ", was 0.83"? What's that mean?

Lines 177-179, Such a long sentence, better break it into two or three sentences.

Lines 180-185, The final $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ is relative to VPDB and atmospheric N_2 ? Better make it clear.

Line 202, "..... a small portion of...."? How much?

Lines 289-290, So the wood combustion is not belonging to biomass burning?

Lines 291, 322 ".....several times....." ".....several times abundant..." How much?

Line 408, ".....the NO_3^- is more susceptible for decomposition at higher temperatures....."
so the NO_3^- decomposed to what? Which process?