

Interactive comment on “Molecular distribution and compound-specific stable carbon isotopic composition of dicarboxylic acids, oxocarboxylic acids, and α -dicarbonyls in PM_{2.5} from Beijing, China” by Wanyu Zhao et al.

Anonymous Referee #1

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The manuscript presented the chemical characterization of a set of organics in PM_{2.5} from Beijing with information on compound-specific stable carbon isotopic ratios. The source identification or apportionment for particulate matters is a challenge task especially in highly polluted areas with complex primary and secondary sources. This study provided a year-round molecular distribution of organics with $\delta^{13}\text{C}$ information. Detailed discussion was presented on the concentrations, ratios, and correlations among the individual compounds and total WSOC. The authors concluded that primary emissions such as biomass burning, fossil fuel combustion, and plastic burning, are the

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major contributors to the organic acids and carbonyls. It is also concluded that the photochemical formation of these species in Beijing is insignificant. This study provides a set of valuable data on the particle phase organics, especially the compound-specific $\delta^{13}\text{C}$. The compound-specific $\delta^{13}\text{C}$ data are useful for the source identification and may have other implications atmospheric chemistry. This is valuable for publication. However, the discussion and the statements in the current form can be further improved. Please see the following comments which the authors may need to consider in the revision.

Comments:

1, P4, L89, It is suggested the authors to provide a bit more background on the implication of stable carbon isotope ratios in atmospheric chemistry. The discussion and analysis of the compound-specific $\delta^{13}\text{C}$ data can be further elaborated and compared to those at different geological locations if there is any.

2, P5, L129, What was the sampling time for each sample? How the sample was handled before analysis, this is critical for $\delta^{13}\text{C}$ measurements?

3, P6, L 146, The manuscript should provide more details on the method of compound-specific $\delta^{13}\text{C}$, at least should be included in the supplementary. Current description on the method and quality control is over simplified.

4, P7, L173, The manuscript provided the backward trajectories, but there is only one sentence really discussed these information on P21, L578. Please also indicate in the caption of Fig. 1 the meanings of the numbers and colored backward trajectories.

5. Please be consistent with terminologies and abbreviations. The abbreviations are switched back and forth, such as C2/Oxalic acid, C4/Malonic acid. The terminologies sometimes are confusing including the vehicular/vehicle emissions, biomass burning activities/biogenic burning emissions, automobile emission, motor exhaust. If there is a difference between two similar ones, please define first to avoid the confusion.

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6, Some statements or conclusions are not well justified. Here is a list of statements that the authors may need to elaborate or use different wording.

(1) P10, L267-268, the Ph concentration was higher in winter as compared to summer, but the contribution to the PM_{2.5} may be low. Also, how about the contribution of Ph from the photochemical oxidation and other fossil fuel burning other than vehicle emissions?

(2) P12, L330-331, The value of C₂/Tot is compared to the case of Central Himalayas, why this particular location is chosen, how about the other locations? How do you evaluate the oxidation capability between these two locations which will certainly affect the C₂/Tot ratios?

(3) P13, L345-354, the discussion in this paragraph is hard to follow. Simply base on the relationships among these species and drawing this conclusion (Line 353-354) is not convincing.

(4) P15, L405, The Ph/C₆ ratio was lower than 2.5 in other seasons and it is only 4.1 in winter, but why it is concluded that more emissions from diesel burning (ratio of 6.58) than gasoline fuel vehicles (2.05)?

7, P20, L454, It is not clear what is connection between the information in L545-547 and the statement in L547-549.

8, It is suggested to use the words of “significant” or “insignificant” in the statements carefully unless statistical data or solid evidence are provided.

9, As presented in the manuscript, if I understood it correctly, the authors concluded that primary emissions are the major contributors to the organic acids and carbonyls. It is also concluded that the photochemical formation of these species in Beijing is insignificant. Both of these two statements are very strong. Is there any source apportionment study in Beijing during the same period, are they consistent or controversial?

10, Figure 6, please describe the meanings of different symbols and percentages for

the box. It is suggested to use same scale for different seasons.

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