Atmospheric Chemistry and Physics Discussions

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Comment on acp-2021-916

Anonymous Referee #1

Referee comment on "Measurement report: Source apportionment of carbonaceous aerosol using dual-carbon isotopes (^{13}C and ^{14}C) and levoglucosan in three northern Chinese cities during 2018–2019" by Huiyizhe Zhao et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-916-RC1, 2022

General Comment

This paper investigated the source apportionments of carbonaceous aerosols collected in three northern cities in China using the measurements of carbon isotopes (13C and 14C) and levoglucosan. I understand the sampling campaigns and the measurements are not easy and the presented dataset should be informative. However, to be honest, I cannot find exciting things in this study and there are many technical problems needed to be addressed.

Specific Comment

Line 32, Line 48 and Line 179: “stable carbon” ☐ “stable carbon isotope”

Line 68-70: Can you please simply tell readers why this tracer can accurately quantify the contribution of fossil and non-fossil sources?

Line 74: add “a” between “useful” and “geochemical marker”

Line 91: Can you provide the references to support “several decades”?

Line 129-130: I don’t think data from a TV news is appropriate for a scientific paper.

Fig.1 This map is boring and less informative. I suggest the authors to add the PM2.5 concentration at the map background.

Line 147-150: So, how long for the sampling of each sample? 24 hours?

Line 179 Section 2.5: Please provide the corresponding reference regarding this 13C analysis. Did you remove the carbonate fraction before 13C analysis?

Line 193-194: How to remove?

Line 214-215: need to eliminate the influence of nuclear bomb excess. This correction is associated with the sampling time.

Line 224: This equation is questionable. A large part of OC in the air is formed by the oxidation of gaseous compounds, while some OC would be decomposed. It is impossible to make a source apportionment for OC or TC using the measurements of stable carbon isotope due to the unavoidable occurrence of isotopic fractionation.

Line 239, Line 247: Two important issues need to be addressed when you try to employ Lev to calculate the contribution of biomass burning. 1) You need to eliminate the interference from the emission of non-biomass burning sources. Lev is not a unique tracer of biomass burning (Wu et al. 2021); 2) You need to consider the atmospheric degradation of Lev in the air (Li et al. 2021).

Wu et al. First High-Resolution Emission Inventory of Levoglucosan for Biomass Burning and Non-Biomass Burning Sources in China, Environ Sci Technol, 55, 3, 1497-1507, 2021

Li et al. Impacts of Chemical Degradation on the Global Budget of Atmospheric Levoglucosan and Its Use As a Biomass Burning Tracer, Environ. Sci. Technol, 55, 8, 5525-5536, 2021

Line 297-309: The problem is that the wood for burning may be 20-year-old or ever older, which means that you still need to correct the effect of nuclear bomb test.

Line 338-341: I would say the occurrence of biomass burning can lead to an enhanced OC/EC ratio as well.

Fig.2. Please improve the quality of this figure. We can't see the variations. Please add a Y-axis for EC and readjust Y-axis scales.

Fig.5. I think this comparison is inappropriate because only few samples were performed for 14C measurements in some studies of this figure. For example, Huang et al. (2014) only analyzed 6 samples collected in the 2013 winter season, however, this paper analyzed ~ 50 samples for all seasons in Xian city.

Line 537-538: The estimated contribution of biomass burning in EC for BJ is too low. I suggest the authors to compare this result with others using different methods (e.g., radiocarbon, bottom-up emission inventory, aethalometer). First, you need to consider the atmosphere degradation of Lev; Second, the ECbb/Lev endmember used in this study probably is wrong.