Comment on acp-2021-916

Anonymous Referee #2

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-RC2, 2022

Measurement report: Source apportionment of carbonaceous aerosol using dual-carbon isotpose (13C and 14C) and levoglucosan in three northern Chinese cities during 2018-2019

Summary:

The authors have conducted a yearlong study characterizing filter samples for elemental carbon, organic carbon, levoglucosan, 13C and 14C carbon isotopes in three major cities in Northeastern China. They conclude from the collected data that the Action Plan for Air Pollution Prevention Control implemented in 2013 was effective in reducing the use of fossil fuels. Overall, ambient measurements and the filter analysis they conducted was thorough, and are difficult to achieve. My only concern is the interpretation of the data and the conclusions drawn. More technical detail and deeper analysis will highlight the importance of this measurement data.

Specific comments:

Levoglucosan is considered a marker for biomass burning, but it does have other sources. This should be taken into consideration in the analysis (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)

Some references to consider/include in the variability of Δ 13 C of sources.

(1)Pugliese, S. C.; Vogel, F.; Murphy, J. G.; Moran, M.; Stroud, C.; Ren, S.; Zhang, J.; Zheng, Q.; Worthy, D.; Huang, L.; Broquet, G. Towards Understanding The Variability In Source Contribution Of Co2 Using High-Resolution Simulations Of Atmospheric Δ13Co2 Signatures In The Greater Toronto Area, Canada.

(2)Pugliese, S. C.; Murphy, J. G.; Vogel, F.; Worthy, D. Characterization Of The Δ 13 C Signatures Of Anthropogenic Co 2 Emissions In The Greater Toronto Area, Canada. Applied Geochemistry 2017, 83, 171 - 180.

Figure 1 could be emissions inventory map, highlighting the cities where measurements were taken. To compare what is accounted for and what the authors measure can be a valuable comparison.

Were samples taken weekly? this wasn't clear.

More detail in the PM2.5 sampling setup is needed to describe the type of sample obtained. How was PM2.5 sampled specifically from ambient air (presumably in the presence of PM10 and larger particles)? Were there a denuder scrubbing out gasses (O3, VOCs, NOx, etc) that could react with or condense on the particles collected on the filter? If there was any chemistry happening on the filter, it would be difficult to interpret TC/OC since oxidant concentrations have also changed over the years.

This is a suggestion, not a needed comment. The use of the acronym AMS may be confusing since it's commonly used to describe the aerosol mass spectrometer. To abbreviate the accelerator mass spectrometer (AccMS? of ACLMS?)

Minor clarification in line 203: what does MV stand for? I assume it means mV?

Figure 3 it would be helpful to have 50% line to see when the dominant fraction shifts.

In section 3.2, where there any reported data representing LF? is not, please highlight.

Line 444: "topographic problems" can change to "due to the local topography"

Figure 6 could have a cleaner x-axis, with datetime on a weekly scale.

Figure 7 isn't black/white friendly. Can you change just one variable (instead of a solid color) something with hashed lines?

Line 612-613: Was not clear the conclusion here since the distribution of allocated C sources for BJ in winter and summer appear the same. I think you meant Figure 9, since this discussion is about OCother.

Overall, to assess whether the government led Action plan to reduce pollution was effective is important and long-term sampling is needed. The authors are doing valuable research, they just have to extend their analysis more.