

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 is a quite sufficient measurement report, the amount of data from different parameters is quite large. Therefore, it is easy to mask the main idea of the story. The authors tried to reveal the source and atmospheric processes of fine aerosols in Tianjin region based on the measurements of chemical components and stable isotopes of carbon and nitrogen. However, in my opinion, it is still hard to easily capture the main idea of the story when reading through the whole MS in current version. After the revision, the MS has indeed been improved. However, I still think the writing and structure of the MS require further improvement to make it much easier and clearer for readers to understand. Detailed comments could be found as follows:

Specific Comments:

For the whole structure of the “Results and Discussion”, I think it might be better to show as the following orders?

(1) Meteorology and backward air mass trajectories; (2) Concentration and seasonal variations of $\text{PM}_{2.5}$; (3) Concentration and seasonal variations of carbonaceous components; (4) Implications for $\text{PM}_{2.5}$ sources through relationships and mass ratios of carbonaceous components. In this section, I do think the relationship between $\text{PM}_{2.5}$ concentrations and carbonaceous components should be added, because for example, the authors have explained that the “EC directly emits from incomplete combustion of fossil fuels and biomass burning”, therefore, the relationships between $\text{PM}_{2.5}$ concentrations and EC should be a clear indicator for the source of $\text{PM}_{2.5}$, but such kind of relationship is not shown in current version, so as the relationship with other carbonaceous components. And, I’m quite confusing with the relationship between WIOC and SOC in current version, why only the relationship between WIOC and SOC was shown? (5) Implications for $\text{PM}_{2.5}$ sources through $\delta^{13}\text{C}_{\text{TC}}$. In this section, would it be better to summarize the $\delta^{13}\text{C}$ of different sources (Fig. 11) into several types? There are too many different sources in current version, it is hard to compare; (6) Concentration and seasonal variations of nitrogenous components and other inorganic ions. In current version of MS, the authors introduced NH_4^+ and NO_3^- concentrations in section 3.4, while introduced water-soluble nitrogenous components in section of 3.5. This is confusing because the N- NH_4^+ and N- NO_3^- also belong to water-soluble nitrogen. (7) Implications for $\text{PM}_{2.5}$ sources through relationships of nitrogen components and other inorganic ions. (8) Implications for $\text{PM}_{2.5}$ sources through $\delta^{15}\text{N}_{\text{TN}}$. Summarize the $\delta^{15}\text{N}$ of different sources (Fig. 12) into several types?

The section of “Ionic balance” in current version is better to delete, cause I did not see any importance of this section on revealing the source and atmospheric processes of $\text{PM}_{2.5}$ in current description.

Technical corrections:

Lines 36-53: The authors introduced the EC, OC, SOC and WSOC in order, and then introduce EC and OC again, it is kind of circle, why don’t put the two sections of EC and OC together?

Lines 85-88: Better show the range of the sources.

Lines 88-90: Better explain how the isotopic fractionation affects the isotope values of carbon and nitrogen.

Line 92: Add reference after “.....are significant”.

Lines 92-101: Kind of confusing, better make it clear, especially how to use $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ to investigate the aging process.

Lines 107-108: I don't understand why there are two different area of forest in Tianjin (2039 and 1364)? Better shown in percentage instead.

Line 120: Add “ SO_4^{2-} , Ca^{2+} , Mg^{2+} ” after “inorganic ions”

Lines 147-148: I didn't buy it, cause the temperature could be more than $\sim 30^\circ\text{C}$ in summer, this will still have minor effects on the samples?

Line 184: Explain which ions?

Table 1: No units.

Lines 287-289: Seems this sentence belong to section 3.2.

Lines 438-439: Seems belong to section 3.4.3.

Line 466: Should be Fig. 8.

Lines 498-499: Why don't put the $\delta^{13}\text{C}_{\text{TC}}$ of fatty acids into Figure 11?