We would like to thank the reviewers for the recommendation and the helpful suggestion. Specific responses to each of the comments are provided below (review's comments in **black**, our responses in **bold font**).

RC1: 'Comment on egusphere-2023-379', Anonymous Referee #1,

This paper uses a set of synthetic black carbon-containing aerosol mixtures made from materials with known composition to assess the ability of four different techniues used to isolate the black carbon component for carbon isotope determination (13C and 14C). The advantage of this approach is that the 'true' results are known, and thereofre the reliability of th methods used can be assessed. This is an innovative approach to the long-standing issues around method specific analytical biases, and therefore I think represents a signficant step forward in achiveing more reliable source apportionment for aerosol samples. This is important because of the significant role that black carbon in aerosols plays in anthropogenic warming. The study fingd that the hypy technique out-performs the other techniques in its ability to produce reliable results across a range of BC compositions.

I think the paper is well and clearly written and the experimental and analytical components sound. I have no substantive issues with the interpretaion or conclusions of the study, but have made a number of grammatical suggestions, with some requests for clarification on the annotated pdf attached.

Response: We thank the reviewer for careful reading and valuable comments so much. The revision was carried out carefully according to the reviewer's suggestions. Following is our detailed response to the comments.

1. **Line 55-And the Hydropyrolysis (Hypy) method,**

Response: We have modified it to "The Hydropyrolysis (Hypy) method,".

2. **Line 58- was**

Response: We have modified it to "were".

3. **Line 73,74- The limited understanding of EC aerosol emissions causes poorly constrained estimates of their contribution to anthropogenic climate warming that globally may be second only to CO2 and regionally**

Response: We have modified it to "The limited understanding of EC aerosol emissions results in poorly constrained estimates of their contribution to anthropogenic climate warming that globally may be second only to CO_2 and regionally".

4. **Line 81- separation of OC**

Response: We have modified it to "isolation of organic carbon (OC)".

5. **Line 83- organic carbon (OC)**

Response: We have modified it to "OC".

6. **Line 91- Due to the**

Response: We have modified it to "Due to the application of the".

7. **Line 102- ^{14}C of EC**

Response: We have modified it to "^{14}C activity of EC".

8. **Line 120- the EC/TC**

Response: We have modified it to "the elemental carbon/total carbon (EC/TC)".

9. **Line 136- carbon isotopes**

Response: We have modified it to "a carbon isotope composition".

10. **Line 139- gasoline truck**

Response: We have modified it to "gasoline truck exhaust".

11. **Line 166- this is pretty low cataylst load - justification?**

Response: All the samples were collected on pre-combusted quartz filters (8 × 10 inch; Pall). The cataylst load is based on the carbon content in the sample, and exceed 20% of carbon weight. In order to make the readers better understand, we have modified it to "more than 20% of sample carbon weight".

12. **Line 176- analysisfor all samples**

Response: We have modified it to "analysis for all samples".

13. **Line 187- (TC)**

Response: Line 120 displayed TC defined as total carbon.

14. **Line 190- sufficient to use for**

Response: We have modified it to " therefore suitable for".

15. **Line 196,197- (Hypy, CTO-375, $EC_{He/O2-475}$ and EC_{LARA})**

Response: We have modified it to "(CTO-375, $EC_{He/O2-475}$, EC_{LARA} and Hypy)".

16. **Line 210- obtains**

Response: We have modified it to "isolates".

17. **Line 225- than in**

Response: We have modified it to "compared to".

18. **Line 231- worse**

Response: We have modified it to "lower".

19. **Line 235- EC separation following water**

Response: We have modified it to "EC isolation following the water extraction".

20. Line 240,242- compact

Response: We have modified it to "condensed".

21. Line 246- ~125%

Response: We have modified it to "~ +125%".

22. Line 260- the same as

Response: We have modified it to "very close with".

23. Line 280- is irregular to follow

Response: We have modified it to "is irregular".

24. Line 329- data of the literatures

Response: We have modified it to "data from the literature".

25. Line 344- of carbonaceous aerosols

Response: We have modified it to "in carbonaceous aerosols".

26. Line 359- This result can provide participation value for other separation methods.

Response: We have modified it to "These two isotope values was able to provide a valuable reference for other EC isolation methods".

RC2: 'Comment on egusphere-2023-379', Will Meredith, 18 Apr 2023

This short paper by Zhang et al is a nice attempt to explore some of the difficulties of quantifying and especially isotopically characterisation the "black carbon" fraction of a number of reference materials. Full disclosure – as one of the people responsible for developing the HyPy methodology I was delighted to see it applied here, and that it performed quite well against some of the other techniques. That said my main comment on the paper is that the authors need to get to grips with te terminology used.

Response: We thank Will Meredith for careful reading and valuable comments so much. The revision was carried out carefully according to the reviewer's suggestions. Following is the detailed response to the comments.

1. **They appear to use BC and EC interchangeably throughout and also OC and TC. I'm not sure TC is actually defined anywhere either. In both cases it would probably be better if you were consistent with terminology used throughout so that the reader is not confused.**

Response: The revision was carried out carefully according to the reviewer's suggestions. We have modified "BC" to "EC", and modified "TOC" to "TC".

2. **Generally I think I know what you intend, but it is not clear. As an example in line 210 you use both EC continuum and BC continuum in the same sentence.**

Response: We have modified it to "Each method only isolates a specific part of the EC

continuum, rather than all the components of the EC continuum".

3. **Likewise you talk about "separating" EC from OC, but they are part of the same thing so "isolating" may be better.**

Response: The revision was carried out carefully according to the reviewer's suggestions. We have modified "separating" to "isolating", and modified "separation" to "isolation".

4. **More minor comments. Don't use initials in citations in the text (e.g. line 76, 80, 97 and others). Do use dates in the list (unless not to is a weird requirement of the journal).**

Response: The revision was carried out carefully according to the reviewer's suggestions.

5. **Line 197 – sentence beginning "Compared with" currently does not make sense.**

Response: We have modified it to "The amount of EC obtained by the CTO-375 method is obviously lower than the results of the other three methods".

6. **Line 202 – "Black carbon isotopes" specifically or black carbon content?**

Response: We have modified it to "It indicates that the CTO-375 method has obvious defects in the quantitative analysis of EC content in aerosols. Therefore, this method is not suitable for isolating EC to isotopes analysis".

7. **Line 282 – "coking" should this read "charring"?**

Response: We have modified "coking" to "charring".

8. **NMR and SEM are brought into the discussion but not previously introduced into the methods section.**

Response: The revision was carried out carefully according to the reviewer's suggestions. We have added them into the methods section.

For the convenience of readers, we have added "Table 2. ^{14}C and ^{13}C analysis results in SRM 1649 a/b" to the main text.