

## ***Interactive comment on “Sources of non-fossil fuel emissions in carbonaceous aerosols during early winter in Chinese cities” by Di Liu et al.***

**Anonymous Referee #1**

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This study attempts to elucidate sources of OC (WSOC, WINSOC) and EC using  $^{14}\text{C}$  and molecular organic tracers. Such methods have already been successfully applied in many regions around the world. This study found non-fossil fuel (NF) emissions were predominant in total carbon. Primary organic carbon was very important in North China. Given that the powerful property of radiocarbon in determining the sources of fossil and nonfossil and board implications present in this study, I recommend it for a publication in ACP after some revisions required below.

Source apportionment of POC (NF+FF) and SOC (NF+FF) is based on several assumptions, which should be carefully evaluated and clearly indicated in the paper. If POC and SOC numbers are shown in the abstract and conclusions, the authors should also point out assumptions and limitations in POC and SOC estimations in the abstract

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and conclusions as comments provided below.

Specifics

Line 39: “dominant” is too strong to be used here. Line 46-49: to include coal combustion in fossil fuel emissions. Line 51: to add references? Lines 52-56: the sentence should be reworded. a large fraction of SOA can be water insoluble as well. Line 72-74: references related to recent studies in China should be included here.

Method part: sample numbers for all measurements should be clearly shown in the text and tables/Figure captions.

Line 107-108: more details should be provided. Line 106: What are the uncertainties of fNF (and fM) in WSOC, WINSOC, OC and EC? Lines 138-140: should be removed because no evidence was provided. Lines 150-170: please compare your data with published results (e.g. Beijing)? Why the biomass burning contribution to EC in Beijing was  $\sim 50\%$ , which was much higher than those from other studies in the same city? Since only 2 samples were selected for each city, did these two samples can represent the winter? I suggest limitations should be pointed out clearly. 171-175: to add comparisons with published results in China and also other sites in Asia. Line 203: why  $7.76 \pm 1.47$  ((OC/Lev) bb )? This can be estimated by  $\text{OCBB} = (\text{OC}/\text{EC})\text{BB} * \text{ECBB}$  as well. Line 206:  $\text{SOC}_{\text{nf}} = \text{OC}_{\text{nf}} - \text{POC}_{\text{bb}}$  is not correct. Non-fossil source should at least include BB, SOC as well biogenic emissions and cooking, Line 208:  $\text{POC}_{\text{f}} = \text{WINSOC} \times (1 - f_{\text{c}})$  is not correct. A large fraction WINSOC can be from secondary organic aerosol as well. So  $\text{POC}_{\text{f}}$  is an upper limit of  $\text{POCF}$ . This should be carefully pointed out and discussed. And please add references after Eq 3-6. Lines 236-246: Please discuss the possible biased in SOC estimations based on Eq 3-6. Line 227-230: How do you exclude contribution from residential coal combustion? I suggest removing the discussion if no other evidence can be found.

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