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Atmospheric Chemistry and Physics Discussions

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 #2

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This manuscript applied a powerful radiocarbon source tracer to apportion fossil fuel and biomass/biofuel contributions to carbonaceous aerosols in ten cities of China. The method was well established. Although the sample numbers are limited for each city (two samples), the result contain new message for sources of organic carbon, elemental carbon, water soluble organic carbon, primary and secondary aerosols in Chinese cities. These carbonaceous aerosols are included as major concerns for climate changes and human health. The conclusion therefore is important for air pollution mitigation in China. Before publication on ACP, some technical improvements are suggested.

Line 46, "fossil fuels " changes to fossil fuel combustion.

Line 56, 2007b;Docherty et al., 2008;MayolâĂŘBracero et al., 2002;Weber et al.,

2007a); (Huang et al., 2014). Error.

Line 57, Several methods have been introduced to identify and quantify OC emission sources. Please show more methods for aerosol source apportionment; other methods like receptor models (PMF, CMB), and dispersion models.

Line 65 14C level (Szidat et al., 2009) Hence, 14C measurements can provide information about the. Full stop had been omitted.

Line 66: Numerous studies have been performed on the regional background of carbonaceous aerosols at urban sites. I prefer to change this sentence to: Numerous studies have been performed at urban sites to assess carbonaceous aerosol sources at the regional scale.

Line 68: contemporary carbon was the dominant pollutant in carbonaceous aerosols at a background site; The references should be cited for this conclusion at a background site (which one, it is better to detail the background site).

while a significant difference was found among seasons at urban sites (Yang et al., 2005;Chen et al., 2013;Liu et al., 2013a;Zhang et al., 2014b;Liu et al., 2014a). This is a new/independent sentence which suggests seasonal variations at urban sites. The conjunction word "while" is not suitable since the seasonal variations have no clear relationship with the previous result from a background site.

Line 72: aerosols (Gelencsér et al., 2007;Ding et al., 72 2008;Lee et al., 2010;Yttri et al., 2011). It is better to add one or two latest references. The combination of organic tracer and radiocarbon diagnosing is the main advantage of this research. Therefore, it should have one or two latest literatures to support the hot topic of this method.

Line 74: the beginning of the period of widespread hazes. Where? Probably it may be specified in China.

Line 75: carbon fractions such as WSOC, WINSOC and EC, along with water-soluble inorganic ions (F−, Cl−, SO42-, NO3-, NH4 , Na+, K+, Ca2+ and Mg2+) and an-

hydrosugars (levoglucosan, galactosan and mannosan). The details of water-soluble inorganic ions and anhydrosugars in brackets should not be showed in the introduction, while they should appear in method or result.

The last paragraph of Introduction, authors may include some information for the advantage of the combination of radiocarbon and anhydrosugar tracer. In introduction, authors should clarify what are target sources for organic tracer.

Fig.1, I suggest to include annual or winter aerosol optical depth to display the representative of the 10 cities for air pollution hotspots in China. Alternative, a literature for PM2.5 map in China may be helpful to show the relative high levels of the 10 cities. An example can be found in figure 1 of a publication: Light absorption enhancement of black carbon from urban haze in Northern China winter, Environ. Pollut., 221, 418-426, doi: http://dx.doi.org/10.1016/j.envpol.2016.12.004.

I am interesting on the thermal and FID signal of the EC isolation of radiocarbon analysis of this method. This method is similar to CTO-375, but different from SWISS-4 (i.e. Zhang et al.) and NIOSH870 protocols.

Line 308: PM2.5, OC and EC levels were highest in northern China, with maximum concentrations of 482 μg m-3, 75.9 μg m-3 and 19.3 μg m-3, respectively. Please show the detail site of these highest levels.

Line 309: OC and EC were the major components of PM2.5, accounting for 13 $\pm$ 8% and 2 $\pm$ 1%, of total PM2.5, respectively. This is not suitable conclusion of this study. Author did not analyze several major chemicals such as sulfate, nitrate. I do agree that OC and EC are very important species of particulate matter, considering the health and climate impacts of the carbonaceous aerosols.

Line 320: while SOC contributed more in cities in other regions of China. What is the meaning of other regions in China? Please specify the exact regions.

Line 321-322: however, the contribution of POC from both NF and NF increased sig-

nificantly in these periods. This sentence should be corrected and improved.

Final sentence: This indicates that synoptic conditions promote the accumulation of particles derived either from local or regional sources. This is not an informative conclusion for the scope of this research.

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