

1. It looks like the title of the paper does not relate the content of the paper well.

Thanks for the comment. As mentioned by the reviewer, the sources apportioned by the paper are not only biomass burning but also coal combustion, vehicle emission and so on. We use the title “Biomass burning contribution to regional PM<sub>2.5</sub> during winter in the North China” in order to highlight the important of biomass burning, which is often underestimated or ignored in some areas in China (Gao et al., 2016). However, we agree with the opinion of the reviewer, and change the title as “Radiocarbon and PMF based the source apportionment of regional PM<sub>2.5</sub> in North China: insight into the contribution of biomass burning ”.

2. If one site represents the whole North China?

Thanks for the comment. Background site is usually adopted to determine the regional-scale concentration burden and the source apportionment of aerosols (Moon et al., 2008; Sheesley et al., 2012; Waked et al., 2014; Yao et al., 2016; Yin et al., 2010; Yttri et al., 2011). The sampling point in our study is a regional background site in North China, where no obvious emission source nearby. Besides, the back trajectory clusters indicated that more than half of the air masses (54%) during the sampling period were from the Beijing-Tianjin-Hebei region, followed by the air masses from the Mongolia (35%), and Shandong Peninsula (11%), suggesting the area air mass passed through in this paper included the whole North China. This proved the significance of our sampling site for the source apportionment of aerosol in North China in winter. Similar methods were applied frequently, for example, Liu conducted the source apportionment of carbonaceous aerosol in East China based on Ningbo, a background site in Zhejiang Province, China (Liu et al., 2013); Also, Zhang analyzed the carbon species in Mt. Jianfeng, a regional background site on Hainan Island, for the carbonaceous source in South China (Zhang et al., 2014).

Thanks again.

## Reference

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