(1) Lines 67-70 - one does not understand the implication of the acetone-extraction diminution of the wavelength dependence. Please elaborate on the subject. Why is it important?

Our response: Kirchstetter et al. (2004) was cited to demonstrate that a fraction of organic carbon also contributes to light absorption by aerosol. The sentence was rewritten as: "Kirchstetter et al. (2004) found that the wavelength dependence of light absorption by biomass smoke aerosols was largely reduced when much of the organic carbon was extracted with acetone, indicating that organic carbon in the biomass smoke aerosols may appreciably absorb solar radiation".

(2) Lines 113-116: in this discussion on the levoglucosan to OC ratio, a reference is missing for Europe, see C. Gonçalves, C. Alves, M. Evtyugina, F. Mirante, C. Pio, A. Caseiro, C. Schmidl, H. Bauer and F. Carvalho, Atmos. Environ., 2010, 44, 4474–4480.

Our response: The reference was added as suggested, and was also used to demonstrate the large differences in the PM to levoglucosan ratio among different types of biomass fuels.

(3) Lines 116-126: besides the high degree of variation in the levoglucosan to OC ratio, another problem is the fact that the OC mass between the different phases is dynamic (the implications of this fact for the SOA production was treated in the lines 42-64), see Evolution of organic aerosols in the atmosphere JL Jimenez, MR Canagaratna, NM Donahue… - Science, 2009

Our response: Influences of semivolatile organics on the OC to levoglucosan ratio of biomass burning emissions were discussed: "In addition, the OC to levoglucosan ratio of biomass burning emissions is expected to be complicated by the semi-volatile organic compounds which might evaporate with increasing dilution".

(4) Lines 127-135: in this discussion, principal components analysis is missing.

Our response: We agree with the reviewer that there are other source apportionment approaches in addition to PMF and CMB. However, PMF and CMB are most frequently used, and we mainly focused on the advantage of introducing levoglucosan to the PMF model in this paragraph. Therefore, we prefer not to discuss the principal components analysis separately.

(5) Lines 155-156: the assumption that pollutants' emission in China is higher than in other countries should be based on a source.

Our response: The sentence was rewritten as: "Compared with developed countries, the emission of pollutants (including both primary components such as black carbon and the gaseous precursors such as SO_2) are substantially higher in China and the emission sources are much more complex".

(6) Line 164: reword yeas to years.

Our response: The test was revised as suggested.

(7) Lines 169-176: in this comparison of previous attempts to quantify the sources of PM in Beijing, the differences in methodologies should also be discussed.

Our response: When introducing previous attempts to estimate the biomass burning contributions to $PM_{2.5}$ in Beijing, four studies were included. Two of them were based on the PMF model, while the other two studies relied on CMB. The main differences in methodologies are that K^+ and levoglucosan was used as biomass burning tracer in the PMF and CMB analysis, respectively. This point was clarified.

(8) Lines 219-226: see Caseiro and Oliveira, JEM 2012 for a discussion on the presence of levoglucosan in the coarse mode.

Our response: In this paragraph, we focused on the size distribution of levoglucosan in biomass burning source emissions. Though Caseiro and Oliveira (2012) also discussed the size distribution of levoglucosan, their discussions were based on ambient samples. Therefore, Caseiro and Oliveira (2012) was not cited here.

(9) Line 296: reword Caseiro and oliveirac to Caseiro and Oliveira. Please note that the results reported in that study "must be seen as a lower limit", since no recovery factor was applied to the GC-MS methodology.

Our response: The test was revised as suggested. (**See Line 304**)

(10) Line 380: the section title is hard to understand.

Our response: The section tile was changed to "Comparison of levoglucosan and mannosan", which should be easier to understand. (**See Line 388**)

(11) Line 395-406: shouldn't the variables entering the PMF analysis be independent? Since WSOC and levoglucosan overlap to some extent (Levoglucosan-C is part of

WSOC), these are not independent. Please justify.

Our response: We agree with the reviewer that levoglucosan-C is part of WSOC. But previous studies suggested that both levoglucosan and WSOC could be used as the input data for the PMF analysis. For example, both WSOC and levoglucosan were included in the PMF modeling in a study conducted in the southeastern US (Zhang et al., Atmos. Chem. Phys., 10, 6839-6853, 2010). Moreover, though OC and organic tracers overlap to some extent, they have been used to run the PMF model in several previous studies (e.g., Jaeckels et al., Environ. Sci. Technol., 41, 5763-5769, 2007). In addition, as shown in the User Guide of PMF (US EPA, 2008), both OC and OM (organic matter) could be used as the input data for PMF. Therefore, we think WSOC should not be eliminated from use in the PMF analysis.

(12) Line 619: section 3.3.3. is not really needed. Please shorten.

Our response: The new source-identification method, which was developed based on the comparison of the levoglucosan to K^+ ratio and the levoglucosan to mannosan ratio among different types of biomass, is a key point in our manuscript. We want to demonstrate that the new method could be used to aerosol samples from not only Beijing (section 3.3.2) but also other locations (section 3.3.3).

We agree with the reviewer that major sources of biomass burning aerosol at other locations are not the focus of the present study. In the revised manuscript, section 3.3.3 was presented more briefly as suggested.

(13) K^+ also originates from other sources besides fireworks (e.g. biogenic sources, sea salt, ...) it is difficult to say that the discrepancy between the levoglucosan and K^+ trends is due to fireworks.

Our response: We agree with the reviewer that K^+ also originates from other sources besides fireworks. However, the high K^+ concentrations observed during the Chinese New Year period were attributed to fireworks due to the following reasons:

① The Chinese New Year is the most important national festival in China. People usually start to set off fireworks several days before the New Year's Eve and the fireworks typically last for two weeks after the beginning of the New Year.

② Previous studies have shown that firework aerosols are rich in K^+.

③ The K^+ concentrations peaked at 45.76 μg/m^3 in the sample collected from 22 to

23 January, 2012, which coincided with the Chinese New Year and New Year's Eve on 23 January and 22 January, respectively.

(14) There are no statistical tests throughout the study, thou standard deviations are presented. Confidence intervals should be reported for linear regression assessments, and hypotheses testing should be conducted when comparing average values, at least for the most significant comparisons, those leading to assumptions.

Our response: Statistical tests were performed as suggested. The results were summarized as a separate section in the supplementary material.

① We present the statistical results (including the minimum, lower quartile, median, upper quartile and maximum value) of the concentrations of the $PM_{2.5}$ components as well as the levoglucosan to K^+ and levoglucosan to mannosan ratios of the ambient samples. Consequently, the minimum and maximum values shown in Table 1 were removed.

② We present the statistical results of the linear regression analysis (including the confidence intervals of the slope and intercept).

③ We present the statistical results from the Independent-Samples T Test which was performed between the levoglucosan to K+ ratios among different types of biomass.

④ We present the statistical results from the Independent-Samples T Test which was performed between the levoglucosan to mannosan ratios among different types of biomass.