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Interactive comment on "Characterization of the light absorbing properties, chromophores composition and sources of brown carbon aerosol in Xi'an, Northwest China" *by* Wei Yuan et al.

Anonymous Referee #3

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This manuscript describes how different organic compounds contribute to the absorption properties of ambient aerosols in Xi'an (Northwest China). PM2.5 samples were collected during all four seasons and analyzed for optical properties (spectrophotometer measurements), total organic carbon (TOC), 12 polycyclic aromatic hydrocarbons (PAHs), 10 nitrated aromatic compounds (NAC), 3 methoxyphenols, and 4 hopanes. Prior to the analyses, the filters were extracted with water and methanol. The aim of this study was to estimate the contribution of BrC species to the optical properties of ambient PM2.5. This study is scientifically important. The manuscript is well organized and well written. However, there are four major comments.

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Discussion paper

Major comments:

1. The author extracted and analyzed many non-polar organic compounds (PAHs, hopanes, etc.). However, for the extraction, solvents with high polarity indexes were used (water and methanol). By using these solvents, the author would not be able to extract non-polar compounds and estimate their contribution to the non-polar BrC fraction of the collected PM2.5. Sengupta et al. (2018) highlighted the importance of the non-polar fraction of BrC aerosols. Plus, the reference to this study is missing.

2. Many organic species from different glasses and with different volatility levels were measured. However, only one deuterated internal standard (4-nitrophenol-d4) was used to account for potential losses of analytes during the extraction and pre-concentration procedures. How were losses of other organic species (besides 4-nitrophenol) taken into account?

3. It was highlighted that different sources make different contributions to the chemical composition of PM2.5 collected in Xi'an. At the same time, the discussion (description) of these sources (how far they are from the sampling site, meteorological conditions, transport, types of biomass-burning fuels, etc.) is missing. Therefore, it is very hard to evaluate what composition of PM2.5 should be expected.

4. Lines 304–310. References and data are missing on four used factors of the source apportionment.

Some minor comments:

Line 55. References are needed on adverse health effects of PAHs.

Lines 99, 108, 112, 139. Company name (+city, state, country) of material and instruments is missing.

Line 149. What is the company (+city, country, etc.) of the GC column?

Line 204. References on absorption properties (above 300 nm) of PAHs are needed.

Line 215. It should be specified that "such large seasonal differences indicate seasonal difference in BrC sources" for the Xi'an area (Northwest China). Again, a good description of these sources is needed in the manuscript.

In summary, I recommend this manuscript for publication after the author addresses the major questions.