

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-460

Xiao He (Referee)

Referee comment on "Potential underestimation of ambient brown carbon absorption based on the methanol extraction method and its impacts on source analysis" by Zhenqi Xu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-460-RC2>, 2022

This study compares the extraction of ambient PM_{2.5} samples applying different solvents and the subsequent light absorption and determination of brown carbon (BrC). Authors find that the traditional approaches using MeOH or water extraction underestimate BrC absorption due to the insolubility of OC possessing larger chromophores and DMF exhibits the highest extraction efficiency among all the tested solvents. They suggest that using DMF instead of MeOH for BrC extraction and incorporate the results into receptor model will generate distinct source apportionment results. After PMF analysis, they conclude that the contributions of BrC from unburned fossil fuels and polymerization of aerosol organics are underestimated particularly. I do appreciate the interesting work and the information provides new insights into the radiative forcing of BrC. The work is well drafted, and I recommend publication in ACP before a few comments to be addressed as below.

Line 146-147. In the sampling setup, PUF is attached after two quartz filters to collect the gas phase polar and non-polar organic compounds. However, we do not see the subsequent treatment of the gas phase samples. Also, the absorption of vapors to quartz filter is substantial. In this regard, the sampling artifacts of this experimental design may be great concern and should be addressed.

Session 3.3 PMF analysis. Current discussion about the PMF is brief, and the following key information should be included, either in the main text or the SI. (1) the stability test of the final solution, as it indicates the robustness of the solution. A solution fails the robustness test is meaningless. (2) The change of the $Q_{\text{robust}}/Q_{\text{exp}}$ with factor numbers should be examined.

Figure S5 UV-VIS spectra of 4-nitrophenol and 4-nitrocatechol. There is a strong light absorption at around 450 nm using DMF, which is not observed in other samples. It looks

that unknown reactions occur, and the products introduce the unexpected light absorption. Considering that 4-nitrophenol and 4-nitrocatechol are representative tracers for biomass burning, readers may concern that DMF extracts would cause significant bias when investigate the BB BrC.

Line 317-318. The authors propose that the low-volatility OC fractions are possibly featured with PAH skeleton and DMF has higher dissolubility for those compounds than MeOH. Nevertheless, no light absorbance difference is observed in Figure S5 g-l. What are the 25 PAHs in the mixture solution and can you give some example structures that DMF have higher solubility than MeOH.

Line 283-284. As the author put it, the lower capability of MeOH in dissolving low-volatility OC fractions (OC3 and OC4) would lead to an underestimation of BrC absorption. Can you give an estimation of the underestimation so that the readers have intuitive knowledge?

Line 132. There should be a space before and after multiple sign.