

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2021-945-RC2>, 2022
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Comment on acp-2021-945

Anonymous Referee #2

Referee comment on "The optical properties and in-situ observational evidence for the formation of brown carbon in clouds" by Ziyong Guo et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-945-RC2>, 2022

This study presents the results of brown carbon measurements in cloud, including cloud droplet residuals, cloud interstitial particles, and cloud water. The authors attempted to demonstrate the role of cloud processing in the formation of brown carbon. The dataset covers both the collected cloud water and cloud residuals, and thus may offer new insight into cloud processing of brown carbon, which has been rarely investigated. The topic is appropriate for Atmospheric Chemistry and Physics, but there are some issues that need to be addressed before publication.

- Introduction: Generally, what are the major fractions contributing to the light-absorption of cloud water? The authors indicate that nitrophenols and aromatic carbonyls were the major fraction contributing to the light-absorption (~50%) of cloud water at Mt. Tai, but what about in other regions? Also, those related results for aerosol particles should be summarized herein.
- Section 3.1 Line 172: The discussions related to the influence of aromaticity and molecular weight of WSOC in the light-absorption capacity should be improved. What is the real meaning for a medium negative correlation ($r > 0.43$, $p < 0.05$) with E250/E365? Is such evidence consistent with those obtained by the EEMs measurements in section 3.2?
- Section 3.2: The authors came to the conclusion that NO_x may enhance the formation of nitrogen-containing organics, based on the correlation analysis. I suggest including a discussion on the detailed mechanisms related to such a conclusion. Also, is there any evidence to exclude other pathways as indicated in the introduction?
- Section 3.2: PMF model indicates a possible influence of biomass burning on the formation of secondary brown carbon. It would be much better to include and compare with those found for aerosol particles. The paper needs to provide more discussion on this issue.