Comment on acp-2022-336
Anonymous Referee #1

Referee comment on "Fluorescence characteristics, absorption properties, and radiative effects of water-soluble organic carbon in seasonal snow across northeastern China" by Xiaoying Niu et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-336-RC1, 2022

This study presents detailed investigations on the fluorescence characteristics, absorption properties, and radiative effects of water-soluble organic carbon in seasonal snow across northeastern China, which plays a profound effect on snow albedo and solar radiation balance. They found that the WSOC mainly has mixed origins, including anthropogenic activity, microbial activity, and soil. The albedo reduction by WSOC (average concentration of 3.6 μg g⁻¹) was about 50% of the albedo reduction due to BC (average concentration of 0.6 μg g⁻¹) in the UV-vis (Ultraviolet-visible) band, and the radiative forcing was 3.8 (0.8) W m⁻² in old (fresh) snow, which was equal to 19% (17%) of the radiative forcing by BC. The manuscript is generally well-written and presents comprehensive high-quality data analysis, which will be of interest to the community. I believe the manuscript can be accepted after addressing the following comments.

- In page 2, Line 12, more references should be given, especially for organic carbon and biota aerosols on the principal LAPs in snow.
- I suggested that the first paragraph should be reconstructed; the author should primarily define LAPs and then illustrate their effects on snow albedo reduction.
- Page 3, line 8-12, the sentence should be divided into separate sentences. Moreover, Page 3, line 16, references also should be provided after illustrating new investigations.
- Page 3, line 18-29, Atmospheric particulate deposition is an important source of organic matter in snow. The author should expound the application and progress of EEM method in atmospheric particulate matter research. Such as chromophores type identification, origin analysis, atmospheric chemical processes.
- Page 6, line 11-12, the TSI technique was not found in the literature of Shi (2020) and Wang (2014b), please cite with Wang et al (2020), and also provide in the reference list.
- Page 8, line 22-25, the sentence is too long; please divide it into compact sentences. Also carefully revised all other long sentences throughout the manuscript.
- The authors should carefully revise the number of significant digits (e.g. Page 10, line 16-17).
- Page 10, line 25, the year of the citation should be given in brackets.
- Page 11, line 2-4, the sentence should be divided into individual sentences.
- Reference to previous studies to explain what HULIS-1 and HULIS-2 are, and clarify the advantages and disadvantages.
- In Figure 3f-g, there is a similar contribution to HULIS-2, but the explanation is still unclear. Please explain.
- It's better to provide the equations on radiative forcing than that only cited from other references in section 2.4.
- Compared with the integrated relative absorption from 280 to 400 nm in Fig. 7a, what does Fig. 7b used for? Please explain.
- In the conclusion section from Page 23, line 20-Page 24, line 27, parts of the contents were duplicated with the result section. Suggested reconstructed.