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Comment on acp-2022-192

Anonymous Referee #2

Referee comment on "Parameterizations of size distribution and refractive index of biomass burning organic aerosol with black carbon content" by Biao Luo et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-192-RC2, 2022

This study represents a good effort with the aim of improving parametrizations of Biomass Burning Organic Aerosol (BBOA) size distribution and refractive index, which have possible important implications for climate modeling and so are of possible interest for a large audience studying BrC climate effects. However, the text results quite hard to read and it is not completely clear in some parts because of a low-quality presentation. Moreover, the significance of the improvement provided by the new parametrizations should be clarified better.

For this reason, my suggestion is to accept the paper only after a strong re-organization of the text and after the consideration of some minor-to-major issues listed below.

General comment

-Abstract is too detailed and technical. I strongly recommend to re-organize the abstract, summarizing the most fundamental findings and leaving details for main text and conclusions.

- The application of PMF to AMS data should be better described: neither in the main text nor in the supplementary it is described in any way other than by presenting its resulting chosen solution (profiles and time-series of the factors). Not even in the manuscript already published (referred to in P7, L185-186) there is a detailed description of the procedure used to determine the PMF solution presented (no info on choosing the best number of factors, on diagnostics of the statistical model, on the interpretation of the

factors, etc.). Considering that all the other elaborations made in the present manuscript are based on the determination of the BBOA factor, I believe that a broader discussion of the PMF approach and of the robustness of the solution is necessary.

Technical comments

-P6, L154-155: unclear and perhaps grammatically incorrect sentence, please rephrase.

-P6, L158: "babs" in the equation should be subscript.

Consistency between main text and supplementary should be better checked and the Supplementary should be reorganized accordingly. In particular:

-the order of the supplementary sections should follow the main text order: for instance, SP-AMS PMF results (in Sect. S2) should go before the modelling methods (Sect. S1).

-Some Supplementary Figures are not well presented: for instance, in the legend of Fig. S1b is not possible to differentiate the dashed lines and so to understand what the different lines in the graph are representing.

-In the text of Supplementary (at L116) there is a figure referenced as Fig.Sx.

More inconsistencies can be present and should be checked.