

Atmos. Chem. Phys. Discuss., referee comment RC1  
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## Comment on acp-2022-544

Anonymous Referee #1

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Referee comment on "Size-dependent hygroscopicity of levoglucosan and D-glucose aerosol nanoparticles" by Ting Lei et al., Atmos. Chem. Phys. Discuss.,  
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This manuscript presents hygroscopic properties of levoglucosan and D-glucose nanoparticles, mainly growth factors, through combined laboratory nano-HTDMA measurements and model predictions. Measurement data of hygroscopic properties of nanoparticles, especially for sizes down to 6 nm are scarcely lacking. The results from this study may make important contributions to improve our understanding of the hygroscopic properties of small nanoparticles and thus their important roles in new particle formation and growth, also in aerosol aging, in particular, the important roles of the two important biomass burning product in the above aerosol formation and aging processes. The following issues/concerns need to be fully resolved before the manuscript would be considered.

- Abstract: The abstract is not concise and not getting to the main ideas of the paper. L37-39, levoglucosan is mentioned in the sentence, however, the RH examples are for D-glucose, why?
- Introduction: What is the purpose for the authors to compare the availability of the thermodynamic data between highly supersaturated inorganic aqueous solutions and organic solutions such as levoglucosan and D-glucose (the paragraph in L88-97)? A clear connection and comparability between the inorganic and organic solutions is needed.
- Methodology: There are too many subsections in this part. Some of them are very short. It is not necessary to divide this part into so many subsections. Better rearrangement for this section is needed.
- In Fig.2, it is not clear where the observations are from, is it from this study or from Chan et al.? The authors ought to clarify the data source. If it is from this study, why to mention Chan et al.'s measurements. If it is from the latter, why a comparison between the two is not seen in the figure.
- L287-309, it is quite interesting to note that the levoglucosan nanoparticles become significantly evaporated below 20 nm. The authors attribute this trend to the Kelvin effect. However, if it is because of Kelvin effect, why it does not occur for other organic nanoparticles such as D-glucose?
- Conclusions: L408-415, it is abrupt to introduce the biomass burning and the mixing

state in the conclusion. What is the point to present them as illustrated at the end of the paper?

- Below are rather minor issues/concerns, mainly grammar problems etc
  
- L23, indicting? You mean "indicating"? L29, predicating?  
Predicted<sup>i</sup>¼□L57<sup>i</sup>¼□quantification of the biomass; L64-65, have focused on.
- L83-83, this sentence seems quite awkward and it is suggested to change to "It is not clear how the size effect influences the hygroscopic growth of organics, especially thos without DRH and ERH".
- L85, organic, not organics; L90, "are limiting" changed to "limit" <sup>i</sup>¼□L173-174, please revise the ill sentence; L183, there is no A in eq. 4, please double check; L188, ideal, not idea; L195, Growth factor predicted by ...; L202-203, no coma is needed after note that and "are to predict" here "are to" is redundant and should be deleted; L214, the equation (equation (8)) shows the relationship between...; L216, no capital for V of vapor.
- L228-230, no subject is found in this sentence; L237, become highly supersaturated and article "the" should not be added before highly; L261, those of this study.
- L243-261, are the notations between "deliquescence and efflorescence modes" and "hydration and dehydration modes" the same? Please clarify.
- L308, indicating, not indicting; L316, among them? L328, delete during.
- L342-344, this sentence is hard to understand, please revise it "To have a clear observation for size dependence of the hygroscopic growth factor of D-glucose aerosol nanoparticles with diameters down to 6 nm, Fig. 8b shows the change in the hygroscopic growth factor of D-glucose aerosol nanoparticles with diameters from 100 down to 6 nm. "
- L382, has been.