

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-230

Anonymous Referee #2

Referee comment on "Gas-particle partitioning of polyol tracers at a suburban site in Nanjing, east China: increased partitioning to the particle phase" by Chao Qin et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-230-RC2>, 2021

Review of "Gas-particle partitioning of polyol tracers in the western Yangtze River Delta, China: Absorptive or Henry's law partitioning?" by C. Qin et al.

This study presents the results of simultaneous gas- and particle-phase measurements of oxygenated organic compounds in Nanjing, China. Due to some potential measurement artifacts with some compounds, the results focus on C5-alkene triols, 2-methyltetrols, and levoglucosan. The major finding is that the particle-phase fraction of these compounds were on average orders of magnitude higher than can be explained by either absorptive partitioning theory or Henry's law. There is moderate evidence that sulfate caused a "salting in" effect, though more discussion and/or data are needed to support this point (comment detailed below). The writing and organization are generally good, and the topic is of interest to a broad audience. I recommend the manuscript for publication after the following comments are addressed.

Specific Comments

- How much does measurement uncertainty affect the partitioning coefficients? The stated acceptable threshold for breakthrough (< 33%) seems relatively high. How do the observed levels of breakthrough contribute to the uncertainty in the partitioning coefficients? Further, did breakthrough vary as a function of ambient temperature, OA loading, etc? Discussion of these points is needed.
- The assumption of LLPS should be discussed. Other studies, for example Pye et al. (2018), could be included in this discussion.
- I think that the title is somewhat misleading because the answer to the question is actually "neither" for most of the organic markers investigated. I suggest revising the title to reflect this.
- The comparisons to Denver, CO seem completely random given that meteorology, OA loadings, inorganic composition, and ALWC are quite different between the two locations. I understand that this research group made measurements in both locations, but some additional discussion is warranted to better connect the two locations.
- Several points in the manuscript, including in the 1st sentence of the abstract, the

discussion links gas-particle partitioning to source apportionment. However, gas-particle partitioning has importance in the atmosphere that extends way beyond source apportionment (e.g., it affects the PM mass concentration, the lifetime and distribution of organics in the atmosphere, among others). The study thus has broader relevance than is discussed in the manuscript.

Technical Corrections

- Line 55: "documented" is not the right word here
- Line 65-66: include "GC-MS" in parentheses after introducing the terms
- Line 80-83: I do not follow the logic of this sentence, please clarify
- Line 90: typo in this line
- Line 93: suggest changing "depict" to "describe"
- Line 101: delete "termed"
- Line 116: "unveils" is not the right word here
- Line 118-120: suggest deleting this sentence
- Line 134: change "was" to "were"
- Line 153: change "involving" to "using" or similar
- Line 221-222: specify that this is theoretical
- Line 244: edit sentence for grammar
- Line 317: edit sentence for grammar
- Line 331: delete "data"
- Line 333: suggest deleting "majorly" and revising the sentence accordingly
- Line 360: "prediction" should be plural
- Line 380: change "less stable" to "lower"
- Line 386-388: it is quite difficult to follow the discussion here
- Line 412: efflorescence RH is more relevant than DRH in this scenario
- Line 462-463: delete "barely" and revise sentence accordingly
- Line 465: not sure what exactly is a "concern"? clarification needed
- Line 478: delete "pre-"

References

Pye, H. O. T., Zuend, A., Fry, J. L., Isaacman-VanWertz, G., Capps, S. L., Appel, K. W., Foroutan, H., Xu, L., Ng, N. L., and Goldstein, A. H.: Coupling of organic and inorganic aerosol systems and the effect on gas-particle partitioning in the southeastern US, *Atmos. Chem. Phys.*, 18, 357–370, <https://doi.org/10.5194/acp-18-357-2018>, 2018.