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Comment on acp-2021-368

Anonymous Referee #1

Referee comment on "Urban aerosol chemistry at a land–water transition site during summer – Part 2: Aerosol pH and liquid water content" by Michael A. Battaglia Jr. et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-368-RC1, 2021

In the manuscript, the authors analyzed the pH of particles and accompanied parameters collected in a field campaign located in the East American. The sensitivities of pH to temperature, ALWC and NHx are discussed. The influence of NVC is also studied in detail. The pH responses are analyzed quantitatively, which are comparable to other relevant studies and also provide unique features in that local region. In all, the quality of the study is high and fits the scope of ACP. The paper is recommended for publication after addressing the following issues:

Major:

The authors chose to calculate the pH in different ways and make some comparisons in discussion. Based on the method description, the calculation was mainly based on the 20 minutes integrated sampling, which means the analyte could in small mass loadings. Based on Figure 2, it can be seen that particulate ammonium salts should be of low concentrations. It looks necessary to quantify the impact of measurement uncertainties to these two pH calculation methods. The authors should also provide the QA/QC information, not only limited to concentrations, but also the impact on possible ranges of pH calculated.

Line 107-108: Is it because how pH was defined (e.g. pHc or pHm in Jia et al. (2018))? It’s better to clarify how the pH was defined in the first place.

Line 153: Looks like the authors intend to make comparisons of pH in different locations and discuss the influence from RH and T, but I did not see such discussions in the following discussion. I think the authors should clarify what "strong implications" they are referring to.

Line 162-171: NH3 phase partitioning also strongly depends on the availability of accompanied acids. Without balance ions, NH3 alone cannot form particles. On the other hand, for pure ammonium sulfate, the evaporation tendency of NH3 is also quite limited. Low concentrations of particulate acids could also lead to ammonia-rich atmosphere.

Figure 4 &5: These two figures provide valuable local information about pH response and of high importance for similar studies comparison. As a result, the authors should provide a more complete description about how the data points are chosen, averaged or processed. The authors have 20-minutes resolution data, while only 8 points are plotted. How were the bins chosen and why not just use all the measured data?

Line 225-231: Either high RH or high particle mass loading can be responsible for high ALWC, while it's hard to say the later case corresponds to the dilution effect. Could the authors distinguish which one dominates the ALWC? In the latter discussion, the authors mentioned the particles were likely externally mixed, so that the ALWC involved in the NH3 phase partitioning processes should be, more or less, overestimated. Should that be considered here as well?

Minor:

Introduction part: it’s better to mention some current existing methods of pH direct measurement.

Line 49: I do not follow the logic here, how does the previous sentence explain the later?

Figure 7: Should the relative concentrations of nitrate be more reflective to the Cl displacement extent than absolute concentrations? And on this Figure, about half the data points have Cl:Na >1, what’s the possible explanation?

Jia, S., Wang, X., Zhang, Q., Sarkar, S., Wu, L., Huang, M., Zhang, J., and Yang, L.: Technical note: Comparison and interconversion of pH based on different standard states for aerosol acidity characterization, Atmospheric Chemistry and Physics, 18, 11125-11133, 10.5194/acp-18-11125-2018, 2018.