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Comment on acp-2021-55

Yunhong Zhang (Referee)

Referee comment on "Impact of non-ideality on reconstructing spatial and temporal variations in aerosol acidity with multiphase buffer theory" by Guangjie Zheng et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-55-RC2>, 2021

This paper is significant work to understand the total contribution of NH_3 on the acid-base equilibrium of condensed phase of atmospheric particles. Especially for the case of concentrated aqueous phase at low RH, non-ideality correction factors are explored. This paper should be published with considering the two comments: (1) when it gives the definition of $\text{p}K_{\text{a},\text{NH}_3}^{*i}$, physical significant of $\text{p}K_{\text{a},\text{NH}_3}^{*i}$ should be more clear if the authors provide more description, i.e., both condensed chemical compositions and NH_3 content in gas phase determined the pH when chemical reactions in the particles change the pH of condensed phase, or other more better description easy understanding for readers. (2). line 80 in the equation, $[\text{NH}_3(\text{g})]$ is equivalent molarity of gaseous NH_3 in solution, its unit is $\text{molar}\cdot\text{Kg}^{-1}$. In this case $K_{\text{a},\text{NH}_3}^{*,I} = K_{\text{a},\text{NH}_3} (1 + 1/(\text{H}_{\text{NH}_3} \text{RTAWC}))$, water density should not appear in the equation. The same is in 8a and 8b.