

Dear Editor,

We thank you for taking the time to review our manuscript “**Influence of atmospheric conditions on the role of trifluoroacetic acid in atmospheric sulfuric acid-dimethylamine nucleation**” (MS No.: acp-2020-1186). We have carefully checked out the language of the manuscript and corrected some typos and grammatical issue in the revised manuscript accordingly. The point-by-point revisions are summarized below in blue text.

Comments to the Author:

The authors have addressed all the scientific issues raised by the referees in a sufficient detail. However, the text (especially the new one but also the original text) still contains some typos or minor grammatical issue. Therefore, the authors should carefully check out the language of the paper once more. After that, the paper will be acceptable for publication.

Editor

Responses:

Line 9: “The enhancement of particle formation rate by TFA ...” has been corrected as “The enhancement on particle formation rate by TFA ...” in Line 9 of the revised manuscript.

Line 10: “... can be up to as much as 227 times ...” has been corrected as “... can be up to 227 times ...” in Line 10 of the revised manuscript.

Lines 11-12: “... such as in winter or at relatively high atmospheric boundary layer and in megacities ...” has been corrected as “... such as in winter, at the relatively high atmospheric boundary layer, or in megacities ...” in Lines 11-12 of the revised manuscript.

Line 24: “... there were still a lot of species observed in the atmosphere but not be fully assigned ...” has been corrected as “... there are still a lot of species observed in the atmosphere but not fully assigned ...” in Line 24 of the revised manuscript.

Line 27: “... other possible species that may potentially enhance ...” has been corrected as “... other species that can potentially enhance ...” in Line 27 of the revised manuscript.

Line 33: “... envirnments ...” has been corrected as “... environments ...” in Line 33 of the revised manuscript.

Line 42: “... the role of TFA in SA-DMA-based NPF process ...” has been corrected

as "... the role of TFA in the SA-DMA-based NPF process ..." in Line 42 of the revised manuscript.

Lines 45-46: "Temperature can change with the variations of seasons, altitudes and climates, and nucleation precursor concentrations can vary with distances to corresponding sources and altitudes." has been corrected as "Not only can temperature change with the variations of seasons, altitudes, and climates, but also nucleation precursor concentrations can vary with altitudes and distances to corresponding sources." in Lines 45-46 of the revised manuscript.

Line 49: "... power plant or industry, but it is relatively low in the areas ..." has been corrected as "... power plants or industries, but it is relatively low in areas ..." in Line 49 of the revised manuscript.

Line 55: "... (Acid)_m·(Base)_n, where $0 \leq n \leq m \leq 3$..." has been corrected as "... (Acid)_m·(Base)_n ($0 \leq n \leq m \leq 3$) ..." in Line 55 of the revised manuscript.

Line 59: "... estimate thermochemistry..." has been corrected as "... estimate the thermochemistry ..." in Line 59 of the revised manuscript.

Line 62: "... were corrected using RI-CC2 method and aug-cc-pV(T+d)Z basis ..." has been corrected as "... were corrected using the RI-CC2 method and the aug-cc-pV(T+d)Z basis ..." in Line 62 of the revised manuscript.

Line 64: "... at RI-CC2/aug-cc-pV(T+d)Z level of theory ..." has been corrected as "... at the RI-CC2/aug-cc-pV(T+d)Z level of theory..." in Line 64 of the revised manuscript.

Line 65: "... at 280 K are taken from ..." has been corrected as "... at 280 K were taken from ..." in Lines 65-66 of the revised manuscript.

Line 69: "... by integrating numerically the birth-death equation ..." has been corrected as "... by integrating the birth-death equation numerically ..." in Line 69 of the revised manuscript.

Line 73: "... $\gamma_{i \rightarrow j}$ is the γ evaporation ..." has been corrected as "... $\gamma_{i \rightarrow j}$ is the evaporation ..." in Line 73 of the revised manuscript.

Line 80: "... the temperature and $\mu = \text{mimj}=(m_i + m_j)$..." has been corrected as "... the temperature, and $\mu = \text{mimj}=(m_i + m_j)$..." in Line 80 of the revised manuscript.

Line 81: "... most distant atoms in cluster ..." has been corrected as "... most distant atoms in the cluster ..." in Line 81 of the revised manuscript.

Line 94: "... a cluster with monomer molecule ..." has been corrected as "... a cluster with a monomer molecule ..." in Line 94 of the revised manuscript.

Line 99: "... temperatures as an example shown in Fig. 1 to study ..." has been corrected as "... temperatures shown in Fig. 1 as an example to study ..." in Line 99 of the revised manuscript.

Lines 107-108: "... formation kinetics of SA-DMA-TFA ..." has been corrected as "... formation kinetics of the SA-DMA-TFA ..." in Line 107 of the revised manuscript.

Line 109: "... effective collision and evaporation coefficients weighted average over the hydrate distributions (Paasonen et al., 2012) and ..." has been corrected as "... effective collision coefficients to evaporation coefficients weighted average over the hydrate distributions (Paasonen et al., 2012), and ..." in Lines 108-109 of the revised manuscript.

Line 113: "The boundary of ACDC simulaion ..." has been corrected as "The boundary of the ACDC simulation ..." in Line 113 of the revised manuscript.

Line 115: "... clusters are set to be boundary ..." has been corrected as "clusters are set to be the boundary ..." in Line 115 of the revised manuscript.

Lines 121-123: "... rates of SA-DMA-TFA system have been investigated, as described below." has been corrected as "... rates of the SA-DMA-TFA system have been investigated below." in Lines 121-123 of the revised manuscript.

Lines 127-128: "The lifetime of TFA and SA are relatively long enough to ensure their atmospheric concentration to be in the present studied concentration range." has been corrected as "The lifetime of TFA and SA is long enough to keep their atmospheric concentrations within the studied range." in Line 127 of the revised manuscript.

Line 133: "... have been simulated at the [DMA] of 5 times the corresponding predicted [DMA] ..." has been corrected as "... have been simulated at five times the corresponding predicted [DMA] ..." in Lines 132-133 of the revised manuscript.

Line 135: "... as an example (Fig. 2) ..." has been corrected as "... as examples (Fig. 2). ..." in Line 134 of the revised manuscript.

Line 137: "The [SA] and [TFA] were chosen to be relatively low ..." has been corrected as "The SA concentration ([SA]) and TFA concentration ([TFA]) were chosen to be relatively low ..." in Lines 136-137 of the revised manuscript.

Lines 142-143: "... and enhancement on particle formation rate by TFA of Beijing are almost all higher than those of the other three studied cities ..." has been corrected as "... and the enhancement on particle formation rate by TFA in Beijing are almost all higher than those in the other three studied cities ..." in Lines 142-143 of the revised manuscript.

Line 144: "... [DMA] and temperature in Beijing is relatively higher and lower than those of the other three studied cities..." has been corrected as "... [DMA] and temperature in Beijing are relatively higher and lower than those in the other three studied cities ..." in Line 144 of the revised manuscript.

Lines 146-147: "This can be attributed to the fact that the temperature in spring and in winter is relatively lower than in other seasons all the year round." has been corrected as "This can be attributed to the fact that the temperature in spring and winter is relatively lower than that in other seasons all the year round." in Lines 146-147 of the revised manuscript.

Lines 156-157: "... The common atmospheric concentrations of DMA monomer ([DMA]) are in the range of ..." has been corrected as "... The common [DMA] in the atmosphere is in the range of ..." in Lines 156-157 of the revised manuscript.

Line 159: "...atmospheric concentrations of SA ([SA]) and TFA ([TFA])." has been corrected as "... atmospheric [SA]) and [TFA]." in Line 159 of the revised manuscript.

Line 160: "... the enhancement of particle formation rate by TFA ..." has been corrected as "... the enhancement on particle formation rate by TFA ..." in Line 160 of the revised manuscript.

Lines 168-169: "... its main sources is the coal-fired power plant and the industry ..." has been corrected as "... its main sources are the coal-fired power plants and the industries ..." in Lines 168-169 of the revised manuscript.

Line 173: "... negative dependencies of particle formation rate ..." has been corrected as "... negative dependencies of the particle formation rate ..." in Line 173 of the revised manuscript.

Line 181: "... precursors except SA ..." has been corrected as "... precursors besides SA ..." in Line 181 of the revised manuscript.

Line 190: "... more than $17 \text{ cm}^{-3} \text{ s}^{-1}$ and the corresponding enhancement ..." has been corrected as "... more than $17 \text{ cm}^{-3} \text{ s}^{-1}$, and the corresponding enhancement ..." in Line 190 of the revised manuscript.

Line 198: "... nucleation precursor concentrations on them are the same." has been corrected as "... nucleation precursor concentrations on them at different CSs are the same." in Lines 198-199 of the revised manuscript.

Line 211-212: "... because of relatively low stability." has been corrected as "... because of their relatively low stability." in Lines 212-213 of the revised manuscript.

Line 245: "... the increase of [DMA] and [TFA], and decrease of [SA]." has been corrected as "... the increase of [DMA] and [TFA], and the decrease of [SA]." in Lines 246-247 of the revised manuscript.

Line 255: "... inspires on the potential underlying influence ..." has been corrected as "... inspires the potential influence ..." in Line 256 of the revised manuscript.

Supplement, Line 9: "... the analysis about the limiting step ..." has been corrected as "... the analysis on the limiting step ..." in Line 9 of the revised supplement.

Supplement, Line 14: "... evaporation of monomer from the larger cluster ..." has been corrected as "... evaporation of monomers from the larger clusters ..." in Line 14 of the revised supplement.

Supplement, Line 15-16: "... effective collision and evaporation coefficients (Table S7) as the weighted average over ..." has been corrected as "... effective collision coefficients and evaporation coefficients (Table S7) weighted average over ..." in Lines 15-16 of the revised supplement.

Supplement, Lines 29-30: The information of the theoretical method has been added as "... the studied clusters at different temperatures at the RI-CC2/aug-cc-pV(T + d)Z/M06-2X/6-311++G(3df,3pd) level of theory ..." in Lines 29-30 of the revised supplement.

Supplement, Line 57: The information of the theoretical method has been added as "... Cartesian coordinates of the most stable hydrated clusters in the present study at the M06-2X/6-311++G(3df,3pd) level of theory ..." in Lines 57-58 of the revised supplement.

Sincerely,

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