

This study simulated new particle formation (NPF) and growth events in Beijing with a discrete-sectional model that couples cluster dynamics and multicomponent particle growth. Through comparison with the field observations, the study have done a comprehensively assessment on the simulation-observation agreement. Further sensitivity analysis with the model also quantified how NPF respond to model input variations. The topic of this study fits the scope of Atmospheric Chemistry and Physics, and such study are quite valuable to improve our understanding on new particle formation and growth processes. I recommend it can be accepted after the following revisions.

Major issues:

In this study, new particle formation is considered from sulfuric acid (SA) and dimethylamine (DMA), is this only one mechanism caused nucleation events during the observation period? Do you think any other nucleation schemes (e.g. binary, ternary) or any other species such as NH_3 may contribute to the observed NPF in Beijing?

Minor issues:

Line 48. The authors stated that temperature critically influenced NPF events. But in other measurements, the mean temperature in NPF and non-NPF days was almost identical (Yan et al., 2021). Can you talk about this inconsistency?

Line 151-154: ‘Since this work focuses on new particle formation and growth, we apply a variable simulation domain in the particle size space as a function of time to exclude simulating particles that apparently do not originate from the occurring NPF event. This is done by visually examining the measured PSD and setting an upper simulation boundary that encloses the particles formed during NPF with margins (see Fig. 2 for examples of simulation domains)’. This is key technique point, suggest use Fig as example to provide more details or explanations on how to do this variable simulation domain?

Figure 3. can you also plot the simulated Amine concentration and compare with measurements?

Figure 4. I suggest to use ‘n’ to represent the average >5 nm particle number concentrations, rather than ‘r’

Figure 6. please clearly state what are these compositions shown in the figures, the authors only give SAxDMA_y and the organic species with $C^* \leq 10^{-6} \mu\text{g}/\text{m}^3$, what are other colors?

Line 258. Should Figures 3e be Figures 3f?

Line 345. Can you explain why the OOMs concentrations were scaled by factor of 1.35, 4 and 1.8 in events 1-3? Are these numbers the typical OOMs concentrations from measurements in polluted areas?

Line 704. Should rp_{2-5} be rp_{3-5} ?