

Interactive comment on “Global-regional nested simulation of particle number concentration by combing microphysical processes with an evolving organic aerosol module” by Xueshun Chen et al.

Anonymous Referee #1

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The microphysical processes of organic aerosol have not yet been well represented, which lead to large uncertainties in current simulation studies. In this article, authors used a new global-regional nested aerosol model combined a particle microphysics module and a volatility basis-set organic aerosol module to simulate microphysical processes of organic aerosol. The model can reproduce the organic aerosol components and the particle number size distribution in Beijing, and spatial distributions of organic carbon and number concentrations of particles condensation larger than 10 nm. They further explored the model's sensitivity to the size distribution of primary emission and

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volatility distribution of primary organic aerosol. I am glad to see the amount of work presented in the manuscript. This reviewer doesn't find apparent flaw in the method and data the manuscript shows. I think the manuscript can be accepted after the following concerns are addressed. General Comments: 1. The writing is a bit difficult to understanding in many places, which leaves itself open to misinterpretations or confusion, and so the paper could really use a thorough edit from a native English speaker. 2. To provide a reliable foundation for further analysis, a comprehensive model evaluation including aerosol optical depth, PM_{2.5} is recommended.

Special Comments: 1. Line 85, “also” may be deleted. 2. Line 92-93, “the complication of processes and the mechanisms not well understood” may be replaced with “the unclear complication of processes and the mechanisms”. 3. Line 96, “find” should be “found”. 4. Line 158, “indicate” should be “indicated”. 5. Line 266, “primary OA (POA)” should be “POA”. 6. Line 306, “When necessary, SP-LV is redistributed to size-bins ...”, please clarify the specific situations. 7. Please provide the full name for “LV-OA” and “POC” at the first appearance. 8. Line 378, “More details on the observation can be found in the published paper (Du et al., 2017)” may be “More details on the observation can be found in Du et al.(2017)”. 9. Please also provide the correlation coefficients between the observed and simulated BC and simulated POA and observed HOA. 10. For figure 4 and 7, the shaded circles are difficult to observe. And the concentrations of secondary organic aerosol and CN₁₀ are recommended to display. 11. Line 515-516, “The higher concentrations of ASOA than BSOA are also demonstrated by other studies”, please some references there. 12. Please give some potential reasons for the differences between spatial distributions of SV-SOA and LV-SOA. 13. Line 563, the authors did not provide “Table 3” and “observed values in Fig.6a”. Please modify. 14. Figure 7d shows that the high value CN₁₀ is mainly primary over Northeast China where the concentration of secondary organic aerosol is relative high shown in Figure 6. Please explain this phenomenon. 15. Line 631, “indicate” should be “indicated”. 16. Line 835, “top panel” and “bottom panel” should be “left panel” and “right panel”.

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