

We thank our two reviewers for their helpful comments on our manuscript.

Response to Reviewer 2:

1. *In their study the authors hold met and dynamics at 10 km baseline for both averaged and high resolution runs. But in global models the met and dynamics are at 80 km. How would their results change if they had used met and dynamics at 80 km baseline?*

This is an interesting point you raise and one that the authors considered. The design of the experiment, however, does not allow for this since we cannot 'create' high resolution data from a low resolution simulation. It is difficult to say how this would affect the results without being able to test it.

2. *Aerosol nucleation and secondary organic aerosols: Although not the focus of their study aerosol nucleation and new particle formation is significantly affected by low volatility organic vapors (see several recent papers e.g. "Trostl, J., et al. (2016), The role of low-volatility organic compounds in initial particle growth in the atmosphere, Nature, 533(7604), 527" More future studies similar to what the authors presented are needed not just for inorganic but organic aerosol systems.*

This is true and would be interesting future work. Unfortunately, the nucleation scheme in this version of WRF-Chem includes only the effect of sulphuric acid vapour. This paper is limited in reporting resolution effects of the processes that are included within this specific model – a caveat that you point out in your third comment (I have added a sentence to the conclusion to reflect this). It would be valuable to repeat the experiment with a more sophisticated nucleation scheme to explore what kind of effect this would have on CCN.

3. *It should be acknowledged, that the overestimations in CCN the authors see can get affected by what processes (e.g. effects of organic aerosols, and their non-linear relations with chemistry) are included. The resolution effects, although valuable as presented in their study, are subject to change based on simulations of aerosols and aerosol processes. This caveat is very important to acknowledge in the conclusions sections.*

A fair point – I have added the sentence below to Line 713 to reflect this caveat:

"We should add that while these resolution effects are subject to change based on the aerosol processes that are included in the specific model simulation, these results point to non-linear processes as being most significantly affected."