

## ***Interactive comment on “Variations in $N_{cn}$ and $N_{ccn}$ over China marginal seas related to marine traffic emissions, new particle formation and aerosol aging” by Yang Gao et al.***

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1. Page 5, line 128: If the authors used CPC 3775, then the default D50 should be 4 nm. Did you alter the supersaturation to get smaller cut-off size?

Response: The D50 is 4 nm, and this was revised.

2. Page 5, lines 134-139: Please provide the thermodynamic parameterizations for CCNC calibration. What do you mean “collection of CCN”?

Response: The calibration curve has been added in revised Supporting Information (Fig S1). “collection of CCN” has been changed to “measurement of  $N_{ccn}$ ” to avoid

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confusion.

3. Page 6, lines 161-171: I don't understand the method to calculate the kappa value, of which critical dry diameter and  $Sc$  are needed. I guess there is no measurement of size distribution of CCN (DMA-CCNC), so how could you get the dry diameter?

Response: This has been clarified in the revision, i.e., "The  $D_d$  was not measured directly and assumed to be equal to the critical diameter for CCN activation ( $D_{crit}$ ).  $D_{crit}$  was defined as the particle diameter down to which by integrating from the largest diameter with the number concentration equals to CCN concentration (Hung et al., 2014; Cheung et al., 2020)."

4. Page 12, line 358-373: there are many assumptions in this section. Could AIM-IC measurement provide some evidence?

Response: We agree that the weakness indeed exists because of lack of direct measurements of chemical composition of nanometer particles. In the revision, we added "However, the direct measurements of chemical composition of nanometer particles needed to confirm the argument."

It is a common challenge to measure high time-resolution chemical composition of atmospheric nanometer particles. Based on our experience using AMS-measurements in Hong Kong, mass concentrations of chemical species in atmospheric nanometer particles are always negative (Environ. Sci. Technol. 2015, 49, 12, 7170–7178). AIM-IC only measures ionic species in  $PM_{2.5}$ , but cannot measure most of organics and black carbon. We are sorry for this because the AIM-IC data cannot allow us saying more on this issue.

5. How you use Hysplit model and fire spots, I did not see it in the main text.

Response: The Hysplit model results are shown in Fig. S11-S14 in the supporting information. There was no fire data used, and the relevant descriptions have been deleted.

6. There are several grammar mistakes in the text and figures, the language, symbols and labels should be checked carefully.

Response: Thanks. We have checked the entire manuscript.

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