Review of Nair et al.

This manuscript is worthy of publication after some revisions.

The term ultrafine is not incorrect, but it is misleading. It begs the question of the fine mode (100-2500 nm), which is not mentioned, but which is synonymous with accumulation mode, which is mentioned. The coarse mode is mentioned but I do not see any measurements larger than 2500 nm (2.5 μm) or even 1μm by some fine mode definitions. It is more appropriate to use Aitken rather than ultrafine when comparing with accumulation.

Figs. 3, 7a, 7c. CCN spectra are generally and traditionally plotted log-log so that the slope, k, is easily illustrated. Furthermore, when presenting k, the supersaturation range must be specified.

Analysis of Fig. 3 indicates that k was calculated between 1 and 0.2%. This is rather deceptive for the red (SEAS1) and black (SEAS2) data where k varies over S. The 0.83 k is thus exaggerated compared to 0.53 for green. Furthermore, it is also necessary to tell all readers that these are cumulative concentrations, all particles with critical S less than the specified S. Thus, concentrations must always increase or remain the same toward the right of such figures. This is certainly not the case for green (especially solid) in Fig. 7c between 0.2 and 0.3% and Fig. 7a for solid black between 0.6 to 0.7% and possibly black between 0.8 and 1% of Fig. 3. This can of course be due to experimental uncertainty/error. But the omission of noting cumulative concentrations could mislead readers less familiar with CCN. This is especially inconsistent with the later noting of cumulative concentrations in Figs. 4 & 10. This issue needs discussion.

P6. L13-14. The concentration did not increase. Increase implies change over time. The cumulative concentration is merely higher at higher S as it should be. It is a lot greater at higher S (higher k) in SEAS1 compared to SEAS2 and EIO where concentration is more similar with S.

P7. L15. Why? Possibly due to cloud processing in maritime clouds (Hoppel et al., 1985, 1986, 1990, 1994, 1996; Hudson et al., 2015, 2018) ?

P8. L 5&6. Actually, more like 1200 (1190) and 200 (176) cm^{-3}. Also Fig. 2 of that paper reveals concentrations at the various S used in this manuscript for comparison. It demonstrates similar low k for cleaner air but not such high k of polluted air.

L20. Hudson & Yum (2002) Fig. 1 show the latitudinal decrease of CCN and CN. This continental influence ceased below 5° south latitude due to the intertropical convergence zone.

Fig. 4a. The mixture of open and closed symbols in the legend is misleading as is putting colors into the legend. The colors only refer to the GMD color scale at the right. All symbols should be open so that the overlapping data can be discerned. This figure is difficult enough to understand even without these distractions.

Fig. 4b. These data could be plotted against each other to better reveal their relationship/correlation.

Fig. 5. Fraction and percentage are confused.

Fig. 9a. Symbols should be open. Again, the mixture of open and closed legend symbols is confusing.

P10. L12. C was used on p7L6, $N = CS^k$. C here is entirely different and should be represented by a different symbol.

P11. L16. How do you know that this is irrespective of chemistry.

P12. L2. How do you know that this is irrespective of chemistry.

L14-15. I do not see this. Fig. 6 considers only 0.4%.

Fig. 9b. R^2 is coefficient of determination. R is correlation coefficient.

P13. L7-8. This does not make sense.
P14. L3. The accumulation mode is not omnipresent (Hoppel et al. & Hudson et al.) It is caused by cloud processing (Noble & Hudson 2019).
P16. L5. Explain this regression.
L6. R^2 is not the regression coefficient, it is the coefficient of determination.
P20. L17-18. More likely just continental pollution.
P20 L23. Explain open mode.
P21 L12. Also Hudson & Da (1996) and Hudson (2007).
P21 L30-31. How can such low ks be higher than previous measurements? Fig. 2 of Hudson & Yum (2002) shows k 0.23 for 1-0.2% S.
P21 L32. They do not get activated as CCN. They are CCN.
L33. This would imply that there are many CN that are not CCN, but I do not see this in this manuscript.

Minor:
Fig. 2. It would be more appropriate to reverse the positions of 0.2% and 1% in the legend.
P2. L12. Insert The before South.
L13. In to within.
L14. Delete the.
L23. Add Hudson & Yum (2002).
L28. Change never to not.
P3. L1-2. Add Hudson (2007).
L4. Delete the.
L5. Insert a before few. Level plural.
L15. Delete 2nd the.
P4. L12.
P5. L32. Delete enough.
P6. L1. Change values to concentrations.
L4-5. Delete in the.
L9. Delete in.
L12. Delete 1st the.
L13-14. Change increased by to was. Folds singular. Change when to higher at. Move 1% before supersaturation. Replace changed from to than at. Delete to. Change increase to concentration was similar. Delete is significant.
P7 L1. Delete as.
L5. Delete ‘s. Add ship to relation.
L7. Add s to indicate.
L13. Insert somewhat before hydrophobic. Hydrophobic particles would not be CCN at all.
P8. L18. Delete s of towards.
P9. L12. Delete has.
L13. Is to was.
L17. Change get activated to CCN.
L18. Delete last the.
P10. L16. Insert for after accounting.
L18. Define coarse mode.

L20. Particles singular.
L21. Insert the after in.

P11. L2. Distribution plural.
L7. Insert the after from.
L12. Insert in EIO after particles. Change ed to s.
L13. Insert concentration after CN.
L23. Pattern plural.

P12. L7. Distribution plural.
L14-15. This implies relatively higher CN at EIO.

P13. L8. Activation efficiency is redundant with CCN. It is not necessary.

P14. L13. Explain flip-flops.
L13. Bursts singular.
L17. Delete the.
L23. This is so even at 0.55%.
L24. It is not an increase. It is higher concentrations.
L26. This is not shown.
L26-7. Delete activated to. This is redundant. If they are CCN they can be activated.

P15. L8. Change spectra to distribution. Spectra implies CCN S spectra. Delete a. Supersaturation plural.
L11. Not so for 0.2 & 0.3%.
L 12. Move also before clearly.
L14. Delete system and then end the sentence.
L15. Delete 1st the.
L16. Delete parentheses and values. Insert or before k.
L17. Period after concentration. Change which to This. Delete in. delete last the. Delete values.

P16. L2. Comma after Thumba.
L3. Period after particles. Insert This is.
L5. Delete 1st the.
L7. Change Further to Then. Delete from the data set.
L8. Fig. 8a. is not mentioned.
L12-13. Activation fraction does not drop. It is lower.

P17. L11. Coefficient of determination. Delete which.
L12. Add ed to depend.

P18. L1. Change activated as to are.
L2. Insert at 0.4% after concentration. Change reduced drastically to lower.
L10-11. Specify S, probably 0.4%.
L12. Delete last the.

P19. L5. Change decreased with an increase in to was lower for higher. Supersaturation plural.
L6. Period after regions. Change in to This is. Change consistency to consistent. Delete the.
L10. Change primarily to possibly.

P20. L1. Insert of before aerosol. Delete highly.
L2. Delete 1st the. Delete size range.
L4. Move the after over.
L28. Particle plural.

L31. Change reinstated to emphasized.
L33. Change change in the aerosol to also been due to. Change as well to differences.

P21. L12. Insert Hudson (2007).
L20. Insert the before major.
L21. Change vice versa to not.
L26. Delete 1st the.
L30. Concentration plural. Insert k after low.
L32. Move at high (1.0%) supersaturations after CCN. Change get activated as to are.
L33. Delete even.

P22. L2. Change 2nd the to greater. Delete in the size distribution.

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