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Atmospheric Measurement Techniques Discussions

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Interactive comment on "Versatile Aerosol Concentration Enrichment System (VACES) operating as a Cloud Condensation Nuclei (CCN) concentrator. Development and laboratory characterization" *by* C. Dameto de España et al.

Anonymous Referee #1

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The strength of the VACES system is its ability to enrich the sample, which allows for additional chemical analysis which is problematic in case of typically used CCN counters. However, based on the results presented I have some reservations how well it actually works. Although this is more like an introductory manuscript intended to demonstrate that VACES has some potential to operate as CCN counter, I would still like to see more evidence. Now the results are presented only for NaCl, which is a natural choice as it is well characterized material, but results with other particle types with lower hygroscopicity would be needed also. Based on the presented data it is

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Discussion paper

really difficult to estimate if the instrument accuracy is high enough for determining the CCN activity. Thus I recommend major revision before acceptance.

1) The instrument is described nicely, but more information could be added how long it actually takes to conduct a full scan of particle size and different temperatures. Also it is said that original VACES is modified to get into lower supersaturations, this could be elaborated more also.

2) There is always quite a high fraction of activated particles. Have the authors accounted for the multiple charging of particles in neutralizer? As the cut of size of virtual impactor is relatively low, part of that could be explained with multiple charged larger particles selected by DMA. However, activated fraction should still go closer to zero. The reason for high activated fraction should be explained.

3) Compared to actual differences in activation temperatures, the slope of activation curve is very gentle. Why is that? Do the particles experience highly different supersaturation conditions within the condenser? It is said that the flow is turbulent, but could this cause different growth behavior for different sized particles? Can the NaCl calibration be used also for particles with greatly lower hygroscopicity or should there some other component also? I see this as a big source of uncertainty and makes me wonder if it is possible at all to use the instrument outside laboratory conditions where the capability for chemical analysis would be really needed?

4) Is the data used for figures 3 and 6 the same. Behavior looks highly different and I doubt if observations are as reproducible as claimed by the authors. In Figure 3 the Delta T differs most for smaller particles whereas in Figure 6 T_out differs most for larger particles.

5) There is no variability (deviation from the mean) presented in the observations. Presenting that could give some information how stable the condenser is.

6) Measurement setup involves quite high temperature differences. This might cause

problems with particles of semivolatile nature like several organics or even nitrates. How do you account for this?

7) In Equation 2 the critical supersaturation is determined by the particles size. The temperature contribution is minimal and thus Table 3 gives no information which could somehow be used to evaluate the performance. Thus it could be removed.

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