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## ***Interactive comment on “A synthesis of cloud condensation nuclei counter (CCNC) measurements within the EUCAARI network” by M. Paramonov et al.***

### **Anonymous Referee #1**

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This paper provides an overall analysis of the CCNC measurements in EUCAARI sites with an emphasis to develop common features based on the data from various sites. Although there is not a lot of new science, it has improved the understanding of the characteristics of the EUCAARI datasets with a few important overall observations. It is well written and clear and I just have a few minor questions for the considerations of the authors.

1) It is said that water activity was asked to be parameterized according to EAIM or ADDEM. What is the outcome of such parameterization? Estimation of K from composition?

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- 2) Dc, wherever available, is suggested to be included in Table 3.
- 3) Figure 4 and 5 are key results of the paper. While it is understood that A increases as Seff increases, it is less clear why the data are not in a sigmoidal shape. Pls explain.
- 4) The discussions of the results are categorized based on the groupings as a result of Figure 4 and 5. While this is useful in a European context, it may be useful to the general audience if there are discussions in grouping of CCN results at low Seff and high Seff. It is expected that at high Seff, particles are easily activated and hence the total CN concentrations would play a dominant role in the total CCNC. At low Seff, hygroscopicity and size distributions may be more important. Maybe some discussions with an expanded Table 3 can give more insights on the characteristics of the CCNC results. For example, it is interesting to know the sensitivity of CCNC to Kappa under different conditions.
- 5) The use of N50 and N100 as the basis for calculating A to reduce the variations of the results is interesting. It would be useful if there can be more discussions on how these observations can be generalized. For example, it appears that these general trends happen when there is an abundance of particles smaller than 50nm, which are not easily activated. The difference (ratio) in A100 and A50 is rather constant at Seff of larger than 0.4% or so, which implies that the N50/N100 ratio of these sites are pretty constant.
- 6) There are discussions on the presence (and absence) of diurnal patterns of aerosol hygroscopicity at different sites and in different seasons. Can one argue that the lack of a diurnal pattern indicates the role of long range transport? Local meteorological effects and photochemical activities, which would lead to diurnal changes, did not happen.
- 7) The statement in conclusion “that in most cases the size distribution and its variation have a larger effect on the NCCN than the particle hygroscopicity and its variation with size” seems valid, especially for the sites shown in Figure 5. I would be interested to

see more evidence for the other sites, especially the non-European sites, in this study.

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