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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The analysis of size-segregated cloud condensation nuclei counter (CCNC) data and its implications for aerosol-cloud interactions" *by* M. Paramonov et al.

Anonymous Referee #1

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The authors present a collection of long-term CCN measurements sampled at the SMEAR II station in Finland with the outlined goals of investigating temporal variations of aerosol properties and CCN behavior, determining the aerosol mixing state and its seasonality, comparing this study's long-term measurements with shorter-term measurements made in several other published studies, and providing comprehensive insight into aerosol-cloud interactions in the boreal environment.

This paper is well written and presents an impressive 29 month dataset of CCN properties. Though it doesn't present significant advances in its methods of data collection and analysis, the comprehensive CCN dataset presents a fine overview and compar-

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ison of CCN-relevant aerosol properties in the boreal environment. The paper is well cited and its aims are clearly defined, though some specific items should be further addressed.

Major revisions

1) The title and aim (iv) indicate that a comprehensive insight of aerosol-cloud interactions and its implications will be addressed. At its current state, I would consider it at most a qualitative discussion on potential aerosol-cloud interactions. A discussion of the importance of the paper's findings and the impacts of ignoring said findings on droplet number would be interesting and show the potential importance of capturing CCN behavior in the boreal forest environment. Without these elements or something similar, I would not consider implications on aerosol-cloud interactions to be one of the key points in this paper.

2) Seasonal and monthly median κ values as high as approximately 0.8 are shown with error bars extending up to 1 (e.g., Figures 6 and 8). This is an extremely high κ for an area typically dominated by organics, and the reason for this is not discussed in the paper. An analysis of chemical composition is necessary to provide a clear analysis (Figure 8).

Minor and technical revisions

1) Page 9688, line 14 – Which T is used (e.g., mid-column temp or average temp)?

2) Page 9691, line 18 – I recommend clarifying that 1 μm is the cutoff at which a particle is considered a CCN.

3) Page 9691, line 29 – Does "full scan" mean the full scan of size-segregated CN by stepping through all of the sizes? It should be clearly stated to avoid confusion since the previous two sentences discuss non-size-segregated measurements.

4) Page 9692, line 14 – You state that dataset has undergone rigorous procedures in order to remove bad data. Please expand upon the procedures used (e.g., counting

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statistics, unstable supersaturations) in addition to what is discussed in Section 4.

5) Page 9699, line 19 – If you are referring to the same average value of 0.18 on line 18, "median" needs to be changed to "average." It also makes sense to report this work's average when comparing with other published averages (e.g., page 9697, line 25).

6) Page 9703, line 17 - Cerully et al. (2010) should be Cerully et al. (2011).

7) Page 9727, Figure 7 - While the figure provides a nice picture of the spread in the dataset, I would suggest using the data to quantitatively calculate the chemical dispersion in terms of $\sigma(\kappa)$ and $\sigma(\kappa)/\kappa$ as was done in Cerully et al. (2011) and Su et al. (2010).

References

Cerully et al.: Aerosol hygroscopicity and CCN activation kinetics in a boreal forest environment during the 2007 EUCAARI campaign, Atmos. Chem. Phys., 11, 12369–12386, doi:10.5194/acp-11-12369-2011, 2011.

Su et al.: Hygroscopicity distribution concept for measurement data analysis and modeling of aerosol particle mixing state with regard to hygroscopic growth and CCN activation, Atmos. Chem. Phys., 10, 7489–7503, doi:10.5194/acp-10-7489-2010, 2010.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9681, 2013.