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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Empirical predictions of CCN from aerosol optical properties at four remote sites" *by* A. Jefferson

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This manuscript presents estimates of the Cloud Condensation Nuclei (CCN) concentration using optical aerosol measurements of scattering and absorption, in particular the scattering coefficient, back scatter fraction and single scattering albedo (SSA). This is an important area of research in that it 1.) provides relationships between aerosol nucleation properties and optical properties that models can use as a performance check and 2.) it is a step in demonstrating a link between aerosol optical properties and cloud microphysical properties. This is important since if optical properties can be retrieved via remote sensing (e.g. Aerosol Optical Thickness) and linked to cloud microphyiscal properties (e.g. of number concentration at cloud base), it would allow wider observations of this critical parameter than is possible using in-situ measurements.

While it is nice to see the measured CCN and estimated CCN broken out by supersaturation (as presented in supplement), I feel it is important to look at how well the measured C and k parameters compare to estimated C and k parameters. The C and k parameters are properties of the aerosol mode as are optical properties. For modeling and relating aerosols to cloud properties, C and k are the important parameters. Would it be possible to add a figure or table comparing measured and estimated, C and k parameters, even if it is just at one site (e.g. SGP).

As Steve Ghan points out, "But it performs remarkably well, certainly better than earlier estimates based only on scattering or extinction". I agree that the method performs remarkably well; however, it is not clear from the paper, how much better the presented method, which uses back scatter and SSA, performs than if you just use scattering or extinction. Could a reference or additional information be added to the paper to make it explicit how much better the presented method is than only using scattering or extinction. I feel that this would be an important conclusion of the paper.

These are my major comments about the paper, below are some comments on details.

Pg 8997 Line 5: The Andreae 2009 paper is about optical thickness and not directly aerosol extinction.

Pg 8999 Eq 2 & 3: Use subscripts or different symbols for the m and b parameter in these equations since they are different fit parameters.

Pg 9000 Line 7: "... are essentially a non-activating' should be " are essentially non-activating".

Table 1 caption: It would be helpful to give the full name of each site in all table and figure captions.

Figure 1: "The dashed lines show the range of backscatter values used in this study" can be written clearer. Something like, "The horizontal gray solid lines denote the 0.08 and 0.18 values of backscatter fraction used in this study, with the dashed vertical lines

showing the corresponding range of median radius values".

Figure 3: Please use the same x and y axis ranges for all plots.

Figure 4: Please use the same number (3) of digits on all x-axis tick labels.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 8995, 2010.