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Interactive comment on "Size-resolved aerosol and cloud condensation nuclei (CCN) properties in the remote marine South China Sea, Part 1: Observations and source classification" *by* Samuel A. Atwood et al.

Anonymous Referee #1

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Overall.

This paper is clear and well written. Measurements were made in the remote South China Sea/East Sea during the previously unmeasured Southwestern Monsoon and biomass burning season, making the measurements unique. The analysis is described in detail, and the authors took care to provide all information necessary for a clear picture of the project. The classification of the aerosol types is interesting and relevant for this audience. However, the discussion or conclusion could be expanded to include the implications of these results.

General Comments.

More discussion of the back trajectories would be useful. Why was 72-hours back chosen? Was more than one back trajectory per day run? How did the patterns change based on time of day? What time were the daily back trajectories calculated at, or are they representative of a daily average? The height of 500 m is discussed – how do other heights compare?

For the cluster identification in Section 3.3, more details could be added to each group to further explain the identification. While some of the events used to identify the clusters were discussed in an earlier section, they could be added here for emphasis and clarity.

Correlations with wind speed and other indicators (salt concentrations, etc.) could be useful in identifying the Background Marine cluster. It is discussed later that the coarse mode concentrations increase with increasing wind speed. Was this only for the coarse mode particles? The Kappa value for background marine is also much lower than that of salt. How does that compare to other marine Kappa values, especially those with high O/C or hydrophilic compounds in the organic fraction?

More discussion of the impact and implications of these results should be included. These clusters of aerosol types are identified, but what does that mean for other aerosol or cloud properties in the area or even globally?

The Conclusions section is somewhat short and vague. A couple more sentences with specific conclusions would be useful to summarize the main points. Include some implications of the results.

Specific Comments.

Page 3, Line 8: How was sampling shut down? Add a reference to Reid et al., if it is described there.

Page 3, Line 20: Define "DMT PCASP X2"

Page 4, Line 12: Did the properties of the aerosol remain constant in that 2 hour time period?

Page 5, Line 23: Include the parameters input into the clustering here. Did any of the variables dominate the clustering (i.e. distribution variables vs. Kappa)?

Page 8, Line 2: Was there anything besides the bimodal distribution that indicated this was background marine air?

Page 9, Line 14: What was the source of the organic event?

Page 12, Line 14: If the background marine is comprised of primary marine and anthropogenic/biogenic sources, how is that type different from the Mixed Marine cluster?

Figure 1: There appear to be more square markers in the legend than in the figure. Are the square markers representative of the ship location on only the days matching the legend, or is it a range of days? It seems like it is a range of days. If that is the case, a different marker system or extended legend would be useful (i.e. circle for first 3 days, square for others, etc.). Some location labels would also be helpful for the discussion (i.e. Borneo, Sumatra, etc.).

Figure 2: The background colors in the panels should all be the same (a and b are darker than the others). It is hard to associate the variability of the Kappa parameter with the different aerosol types in e and f.

Table 1: The table is really small and should rotated or condensed for publication.