

## ***Interactive comment on “Aerosol Properties and Their Influences on Low Warm Clouds during the Two-Column Aerosol Project” by Jianjun Liu and Zhanqing Li***

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This study investigates the aerosol properties and sensitivity of clouds to aerosol perturbation at Cape Cod, Massachusetts. During a 12-month period, the physical, chemical and optical properties of aerosol are investigated under both continental and marine air masses. The aerosol effects on cloud properties are also examined, which demonstrates different responses of cloud properties to meteorological factors under low and high amount of aerosol penetration. The aerosol first indirect effect is quantified under the influence of continental air masses, with the magnitude generally consistent with previous studies. An interesting result influencing aerosol composition on cloud micro-

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physical responses is also shown in this study, which adds on the information of FIE assessments and broaden the understanding of aerosol cloud interaction. Therefore, I would suggest that this paper can be accepted by ACP after minor revision.

Questions and concerns regarding this study are listed as follow:

1. Page 4, Line 23. What is the temporal resolution of Na and aerosol optical properties used in this study?
2. Page 6, Line 25. LTS is calculated at 1-min resolution?
3. Page 6, Line 29. Please specify how to collocate the datasets of different time resolutions (e.g. ACSM, AOS, LTS, large-scale vertical velocity and cloud properties) for the comparisons later on in the manuscript, particularly shown in Figure 10 & 11. And the final temporal resolution for collocated data.
4. Page 7, Line 23-25. For Spring season, AE values generally lower than other season, especially for April and May as shown in Figure 3 and Table 1. Also,  $\sigma_{10}$  value is lowest in Spring. Which indicates aerosol plumes more enriched by larger particles, relatively. Please provide more evidences or paper citations to support the statement “due to the presence of a great number of smaller particles. . .”.
5. Page 8, Line 2-6. Please specify the exact months in this argument, and how to conclude that “This indicates that strong surface. . .”
6. Page 8, Line 25. Why only data of July and August 2012 are shown? How about particle size distribution in Spring and Autumn, since they are argued in section 3.1.1 as having discrepancies between Na and  $\sigma$  due to particle size distributions.
7. Page 9, Line 1. Please specify the bin sizes used for low and high AI condition. Is there any reason for the mismatched bins between those two conditions, as shown in Figure 7?
8. Page 10, Line 8. “positive correlation each other” should be “positive correlation

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between each other”.

9. Page 11, Line 30. “a narrower PDF a distinct peak” should be “a narrower PDF with distinct peak”.

10. Page 12, Line 23-24. How about FIE under cluster III which has occurrence of 21.6%, and how to determine samples are not enough under cluster II.

11. Page 13, Line 5-9. For ground-based assessments of FIE, Kim et al. (2008) and McComiskey et al. (2009) found decrease of FIE with LWP due to enhanced collision coalescence, please provide the information of cloud droplet number concentration to support the statement “more droplets can get activated”.

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