

Interactive comment on “Superaggregates or instrument artifact?” by Ashley M. Pierce et al.

Anonymous Referee #1

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This work investigates the observations of superaggregates collected during a study at high and low elevation sites in Nevada in 2014. The authors investigated the potential influence of biomass smoke, a known source of superaggregates. The also investigated other possible sources and deduced that the source of superaggregates was likely related to the anodized Al tubing and fretting corrosion. This work is useful for others investigating observations of superaggregates and the potential role of sampling artifacts. Several fairly minor issues should be addressed before publication as noted in the following comments.

Page 1, Line 17, Can the authors phrase this as 36 out of X sample days?

Page 1, Line 21, This sentence is a bit unclear because it groups the types of influences that could be the source of superaggregates with the types of analysis performed.

Page 1, Line 22, Change “samples with aggregates” to “samples with superaggre-

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gates”, or state that they are the same thing. I think “aggregates” is used interchangeably with “superaggregates” throughout the paper, so it might help to be clear about this initially.

Page 1, Line 24, Change “high wind events were the probably reason” to “high wind events were probably the reason”

Page 2, Line 2, Can the authors clarify what they mean by “can be trapped in a high particle volume fraction”? Page 2, Line 6, Can the authors define “length”

Page 2, Line 8, What are the “different behaviors” the authors are referring to here?

Page 2, Line 10, Can the authors define “fractal dimensions”

Page 2, Line 14, Chakrabarty (2014) should be Chakrabarty et al. (2014)

Page 2, Line 21, How abundant are superaggregates? Are they abundant enough to influence estimates of climate forcing?

Page 2, Line 22, It would help to have a segue between this paragraph and the previous discussion.

Page 2, Line 24, To help the reader, the authors could add “a high elevation site” before “Peavine Peak”, and a similar “at a lower elevation site ~12 km southeast in Reno”. The elevations may not be needed here since they are again reported in the site description section.

Page 2, Line 27. Can the authors add the total number of days here, so “36 out of X days”.

Page 2, Line 31: Do the superaggregates have to conform to this particular description?

Page 2, Line 34: Please define “SEM” and “EDS” at first usage.

Page 3, Line 19-21, What is the purpose of this study and how does it fit in with the

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2014 study? Also, change “Statuses” to “Status”

Page 3, Line 24, Please add “mass concentration” after PM2.5

Page 3, line 26, Should “<” actually be “>” (particles larger than 2.5 μm are being prevented)

Page 4, line 32, Please add “Particles on the Teflon filters”

Page 5, Line 9, How far away from the sample sites was the AERONET site?

Page 5, Line 12, Was AEE calculated using only 2 wavelengths or as a linear fit to several wavelengths?

Page 5, Line 13, Given that the AERONET site is at the campus building, the impacts of urban pollution on AEE could be misinterpreted as biomass smoke if all $\text{AEE} > 1.8$ was flagged as fire. How did the authors separate urban influence from biomass smoke?

Page 5, Line 18, It is again unclear why data from the GBNP site are used here since it is a different time period. It would help to explain this earlier.

Page 6, Line 3, Add PM2.5 before “75th percentile”. Does this paragraph only refer to 1 inlet?

Page 6, Line 12, Are “black aggregates” different from superaggregates? A similar comment for “black particles” on line 13. Are “black particles” just a general description or refer to “black aggregates”?

Page 6, Line 27: How did the aggregate analysis differ from the fluffy or compact aggregates shown in Figure 3 versus Figure 7? The visual appearance is quite different. Perhaps Figure 3 is actually a superaggregate?

Page 6, Line 27: Did the elemental ratios differ between aggregates and non-aggregate PM2.5? For example, did the Al/O or the Al/Cu differ?

Page 7, Line 7-12, This is somewhat confusing. All data had $r^2 = 0.33$, aggregates only

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was $r^2 = 0.49$ and then no aggregates was $r^2 = 0.58$. If the correlation for aggregates only increased, then why did the correlation increase even higher for no aggregates?

Page 7, Line 7-12, The offset in the regressions suggests that when $\text{AOD} = 0$, $\text{PM}_{2.5} = 2 \mu\text{g}/\text{m}^3$ or $6 \mu\text{g}/\text{m}^3$ depending on all data or aggregates, respectively? Can the authors comment on this offset?

Page 7, Line 10, A Theil regression would help with this in that it doesn't heavily weight outliers.

Page 7, line 13, Figure 10(a) isn't referred to in the text. I am also concerned that the AEE used here to indicate smoke influence could also be indicating urban pollution. How did the authors account for this?

Page 7, line 15-16, Change to “nor between AEE and PM2.5 on days with aggregates”

Page 7, line 19, Was RH averaged to 24 hours?

Page 7, line 24, If the authors are interested in decreasing the length of the article, I am not sure that Figure 11 is necessary. The discussion of results may be sufficient. Also, it would help to point out that the hypothesis with investigating RH is that hygroscopic effects could have resulted in larger particles. However, the elemental composition and SEM images don't suggest hygroscopic particles.

Page 8, line 9, Why were multiple generators operated?

Page 8, Line 15, Were generators not in use on the weekends?

Page 8, Line 23-25, High aerosol loading in the atmospheric column doesn't necessarily have to indicate the presence of superaggregates. It could just be related to urban pollution.

Page 8, Line 29, The correlation of AOD and AEE may not be higher if there aren't enough superaggregates to affect the total column?

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Page 8, Line 30, It's not really clear why the authors included this paragraph? Did they perform some modeling of the hygroscopicity based on composition measurements? Can they tie this discussion back to their data?

Page 9, Line 30-35, Elements are defined here but not when listed on page 6 (24-29). I suggest being consistent or defining them once at first usage.

Page 10, Line 12-13, "RH and AEE were not correlated with aggregate measurements". Can the authors be more specific about the measurements they are referring to? Presence of aggregates? Length? Composition?

Figure 2: The two blue colors were very similar in my version and so difficult to tell the difference.

Figure 3: The superaggregate shown in this figure is very different from Figure 7- which type was more typical?

Figure 9: Instead of "in the valley", can the authors provide a more defined location of the site?

Figure 10: As mentioned earlier, this figure may not be necessary. But if the authors choose to keep it, the legend for "fire" was not pink although the data points were. Also, please provide the wavelengths over which AEE was calculated in the caption. And the same comment regarding "in the valley" also applies for this caption.

Figure 11: As also mentioned, this figure may not be necessary either.

Table 1: Please define "CEM", "SEM", and "EDS" in the caption. Also please include "PM2.5" in "PM2.5 mass concentration exceeded 75th percentile" in the caption.

Table 2: Please include site location in the table, define "both" and "Teflon". Ideally the reader could get the major points without having to read back through the text and "both" or "teflon" might be unclear.

Table 3: Similar comments as for table 2.

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