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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-resolved observations of refractory black carbon particles in cloud droplets at a marine boundary layer site" *by* J. C. Schroder et al.

Anonymous Referee #1

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The authors report their case study from two cloud events in southern California. The study involves an impressive number of instruments and methods and shows that refractory black carbon concentrations are consistent with kappa-Köhler theory.

Although carefully done, I am surprised that the manuscript does not express any science questions or hypotheses. It is not clear whether the authors expected that refractory black carbon concentrations do **not** conform to kappa-Köhler theory. Moreover, the quantification of the coating of the particles (and their activated fraction) is of high value.

Since I am not an expert in the field who knows all unwritten text on the topic, I would have benefited from a standard manuscript that clearly exposes a science question and hypotheses to address these questions. As is, the manuscript is a simple data publication, which has its value, but remains obscure in the aspects how representative the two cloud events are for average or extreme conditions at the site, and what we can learn out of it. The conclusions sound like “nothing new, but now with more accurate numbers”.

To be acceptable for final publication in ACP I recommend that the authors clearly expose the questions they were asking, what hypotheses they established before carrying out their research, and what was learnt besides having more accurate numbers.

Details

Somewhere in the methods section or the first reporting of data you must specify what the uncertainty presented after the $\pm$ sign actually is. Is it the standard error of the mean? Or standard deviation from the mean? Or the 95% confidence interval? Or something else? I question the assumption of symmetric uncertainties – please check and report on the distribution of your data and use the appropriate statistical parameter to specify uncertainty. Recall that SE and SD are parameters of the normal distribution and as long as it is not established that the distribution are normal, reporting SE or SD are not the key parameters of your statistics.

Section 2.9: more details on the operation of the FM-100 should be given. See Spiegel et al. (2012) – there are important issues with respect to facing the instrument towards the incoming airstream. Currently the reader has to assume that everything was done correctly, but the details must be given. The FM-100 does not provide the correct number counts by default, and the Mie-scattering correction suggested by Spiegel et al. (2012) is recommended, unless the authors used size bins that are broad enough to

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state that this does not affect their data. With 20 channels (of 40 that could be used) it appears that the authors probably used equal size bins which were large. But please be more specific on these details.

Turning the FM-100 into the wind direction is very important for Cloud 2 where a $\pm 90^\circ$ variability is given on p. 11458, l. 18. It is unclear that this actually means (if it is SD then it basically means that the wind was from all directions, although the mean was from 190°), but it must express a very unsteady wind vector during Cloud 2 and hence it is imperative to document proper orientation of the sensor under such conditions.

11454, 24: correct wording (and work flow) is to fit a function to the data, **not** to fit the data to a function!

References

Spiegel, J. K., P. Zieger, N. Bukowiecki, E. Hammer, E. Weingartner, and W. Eugster (2012) Evaluating the capabilities and uncertainties of droplet measurements for the fog droplet spectrometer (FM-100). *Atmospheric Measurement Technology* **5**, 2237–2260.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11447, 2014.