

## ***Interactive comment on “Measurements to determine mixing state of black carbon emitted from the 2017/2018 California wildfires and urban Los Angeles” by Joseph Ko et al.***

### **Anonymous Referee #1**

Received and published: 24 October 2019

This paper presents SP2 measurements downwind of the USA and contrasts urban and biomass burning emissions after varying degrees of ageing. These observations are of importance to the regional and global climate modelling communities, as the evolution of black carbon in the atmosphere and formation of coatings affects both the optical properties and scavenging lifetime. Therefore, work of this nature is very relevant to ACP.

While the paper is well written and the graphs well presented, I find this paper somewhat lacking in terms of the interpretation side. The dataset is certainly interesting, however I find myself at odds with the conclusions. Given that addressing these reser-

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vations would likely change the take-home messages of the paper, I therefore recommend major revisions.

Major comments:

\* Unless I have misunderstood something, the core conclusions of this paper regarding coatings with ageing timescales seem to be based on the assumption that both urban and biomass burning BC are emitted with thin coatings. However, there is much evidence to the contrary, as most SP2 measurements of biomass burning at or near source would indicate that they have thick coatings at the point of emission. Furthermore, the thickness of this coating can vary significantly fire to fire (see <https://www.atmos-chem-phys.net/14/10061/2014/>, <https://www.nature.com/articles/ngeo2901>, <https://www.atmos-chem-phys-discuss.net/acp-2019-157/>). It therefore doesn't seem correct to infer conclusions regarding the effect of ageing timescales on coating thicknesses when comparing aerosols from different sources. The authors should review their findings taking this into consideration.

\* The conclusions section is long but mainly seems to recap the earlier observations rather than focus on the key scientific advancements being offered by this work. In order to properly judge this aspect of the paper and therefore its suitability for publication, this should be restructured.

Minor comments:

\* Measurements of coating thickness can become biased if the particles are sufficiently small that the signal-to-noise ratios of the instrument's scattering channels aren't sufficient to successfully retrieve a coating thickness or a delay time. Was the rate of failed retrievals monitored? How was this reflected in the data?

\* Setting 'calm' winds as zero on direction on figure 5 makes no sense as this also corresponds to north. The periods should probably be blanked out instead.

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\* The points plotted on figure S9 should be individually identified according to event.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-769>, 2019.

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