

## ***Interactive comment on “Influence of photochemical aging on light absorption of atmospheric black carbon and aerosol single scattering albedo” by Xuezhe Xu et al.***

### **Anonymous Referee #1**

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This paper is well written and has considered many aspects in terms of absorption enhancement of BC, but it will be more convincing after addressing the following points:

The Esca vs Ox and SSA vs Ox plots seem crucial, however it seems only overall hourly mean values (from the diurnal variation of entire experimental period) was used, I would say maybe making the scattering plot for all of the data points (maybe hourly average), then bin it in Ox, for each bin, giving the mean/median/percentile etc. you need to make this plot solid, also give the fitting function in the plot.

It would be useful to point out Ox actually may just determine how much secondary aerosol is formed, i.e. increasing the overall ensemble of PM, then increase SSA.

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There may not be too much exciting to see the Ox positively correlated with SSA.

The collapse concept is repeatedly discussed but there is no support in your work, how could you say the flat Eabs (even may not be flat after you put all data points in) in the medium Ox is compact soot or not? Could you somehow prove the collapse you are “guessing”? if you can’t prove, it is not necessary to emphasize this at many places but just report the solid results you have.

What is the reason to plot  $\omega_{TD}$  vs Ox? That means some of the low-volatile coating has not been removed, then you will underestimate the Eabs? (it has been mentioned in the text but would be good if this could be properly included)

For your calculation at section 3, could you point out the uncertainty you have by assuming the fixed core size? But I presume you need to use a size distribution of core size? And how did you apply the coated size distribution upon core size?

I am still struggling to understand what is the point for section 4, your results on the Eabs only represent a single ground measurement with limited sources, not even open biomass burning etc. how could be recommend for global models. Also, the surface measurement cannot necessarily represent the columnar information. I would hesitate to expand your work that big given you haven’t really done this job.

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