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Atmospheric Chemistry and Physics Discussions

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 #2

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This study investigates the size-resolved mixing state, absorption enhancement (Eabs) and single scattering albedo (SSA) of ambient aerosol at a rural site in East China. They found diurnal variability of Eabs, SSA and a proxy of photochemical aging (Ox). The authors suggested a three stage Eabs process at difference degree of atmospheric photochemical aging. Absorption enhancement is an important topic and more field measurements are needed to understand the variability of Eabs at different geographical locations and under different pollutant conditions. Overall, the manuscript is well written. The paper is worth publishing, but some of the points need to be explained. Authors suggest that the three stage Eabs process is due to collapsed semispherical to highly compact spherical morphology of BC without any morphological data. Authors

should be careful to make this claim. Why the Eabs was stable for Ox mixing ratio between 35 and 50 ppbv? Some of the figures (figs. 7 and 8) need expanded discussion. Authors found relatively higher Eabs compared to other study at similar wavelength. Authors should add some discussion on this.

Specific comments:

Please provide details of the detection limit of the scattering and extinction measurement. Also explain how the uncertainties in extinction, scattering and absorption coefficients were estimated.

Explain how the optical loss of the thermodenuded aerosol were estimated and also contribution of different uncertainties in Eabs measurements.

Authors suggested increase in SSA-TD may be due to incomplete volatilization of non-volatile matter and generation of LV-oxygenated organic aerosol. It will be interesting to see how sca and abs response to TD at different Ox.

Authors found average Eabs of 2.3 at 532 nm which is even higher than Lack et (2012) for forest fire samples (1.4 at 532 nm). Normally BC particles from forest fire are heavily coated and one would expect high Eabs. However, it is not clear if airmasses investigated in this study were also influenced by biomass burning? Or Authors suggest that at higher degree of photochemical aging one would expect higher Eabs compared to thickly coated BC from forest fire?

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