Editor's comments to the Author:

Question 1: There is one more remaining issue. 'In this study, the previous AAE method was improved by statistical analysis and applied to...', this statement in the abstract sounds somewhat vague to me. Do you mean that you used the AAE to OC/EC ratio to constrain the AAE_BC ext by extrapolating the relationship towards OC = 0 and use it in to the traditional AAE absorption attribution method discussed in Lack and Langridge (2013)? If yes, could you please specify what kind of improvement you have done for the AAE method in the abstract and maybe also some other suitable place in your main text?

REPLY:

1) This suggestion is taken. We have rephrased the related sentences in the abstract to specify this improvement as below:

"In this study, the AAE method was applied to both urban and rural environments in the Pearl River Delta (PRD) region of China, with an improvement of constraining the realistic AAE of "pure" BC through statistical analysis of on-line measurement data."

Also in the introduction part, the relevant sentences have been rephrased to:

"In this study, we tried to apply the AAE method to both urban and rural areas in the Pearl River Delta (PRD) region of China to attribute light absorption of BrC, with an emphasis of exploring realistic $AAE_{\_BC}$ based on on-line measurements in field campaigns."

Question 2: Also, as in your response to the question raised by reviewer #1, you think to use the relation of AAE to OC/EC ratio would be similar to using relation of AAE to OC/(OC+EC) when OC approaching 0. So, is the AAE_BCext remains the same or similar if you do the same analysis for AAE to OC/(OC+EC)? Could you please add a short comment on this in your revised manuscript?

REPLY:

Theoretically, the intercepts of the linear relation of AAE to OC/(OC+EC) should be similar to that of AAE to OC/EC. However, in our campaigns, OC/(OC+EC) might have much bigger uncertainty than OC/EC. On one hand, converting light absorption at 781 nm to EC mass can cause some uncertainty when assuming a fixed mass absorption efficiency (MAE). On the other hand, EC was measured by PASS for $PM_{2.5}$ while OC was measured by AMS for PM_1, so adding up them would also cause big uncertainty. As expected, when we did the regression analysis of AAE to OC/(OC+EC), the correlation became poorer and thus harder to extrapolate the intercepts with a small uncertainty. Therefore, we believe that OC/EC is a better index to represent the relative abundance of OC and EC in our campaigns, which was also chosen in a previous study (Utry et al., 2014).

Following the editor's suggestion, we have added a short comment on this in Section 3.2 as below:

"In our campaigns, $r_{\_org/bc}$ was a simpler while more effective index than other similar indices like the mass ratio of OC/(OC+EC), calculating which needed to assume a mass absorption efficiency for the measured light absorption data and correct the cutoff size difference for PASS-3 ($PM_{2.5}$) and AMS/ASCM (PM_1) sampling."