The authors investigated the evolution of BC optical properties, and concluded that under more polluted conditions, the aging process will enhance the coating of BC-containing particles and thus contribute to larger enhancement of BC particle light absorption. They further claim that pollution control strategy will have co-benefit effects on both air quality and climate. The content is suitable for publication within the scope of ACP, while some revisions are required. Please see detailed comments below.

Major issues:

1) The manuscript is still in need of a better discussion on uncertainties. Some examples are listed below, while I would suggest the authors do a systematic discussion on all the associated uncertainties, not just here and there.

    a. Page 4, lines 1-3: The authors mentioned the correction to Aethalometer data in the SI, where there is something confusing to me. First, the authors said they retrieved the correction factor by comparing absorption coefficients measured by AE and MAAP, but since AE was measuring at 660 nm while MAAP at 670 nm, are the authors just neglecting the difference? Second, the authors used an average value of 2.6 for all their AE measurements while they did determine a pretty wide range of the C, from 1.9 to 4.0, then how did the authors decide the uncertainty of 10% confidently?

    b. Page 4, line 26: the authors used 1.50-0i as the RIs value, is there any reason why? Is there some information on, e.g., the chemical compositions of the coating materials, to support that the use of 1.50-0i is reasonable? Otherwise I would suggest the authors consider some sensitivity test on RIs values as well as on RIc.

    c. Page 8, line 3: I am not sure how the authors determine that the Mie calculation has an uncertainty "smaller than 7%". The authors have shown in Figure S3 and the associated discussions that different RI values could result in 3%-10% difference in Dc. Assume it is on average 5%, then the mass concentration of rBC would be different by 16% (1.05^3, the cubic is converting from diameter to volume), not mentioning the uncertainties on the estimation of e.g., density, mixing, etc. I would suggest the authors do a much more careful job when they are talking about uncertainties.

2) About the processes contributing to the enhancement of BC light absorption. The authors are trying to add some discussions on the causes of BC coating and thus light absorption enhancement, but these discussions read somewhat weird if there is no sufficient evidence to support. Similarly, a couple of examples below:

    a. Page 8, line 18: "due to more secondary component formation", is it possible that more primary components were also emitted under the more polluted condition and coated onto the BC core during the aging process?

b. Page 10, lines 19-28: I do not understand why the authors are looking at the temporal trend of O3 to evaluate local photochemical processes. The trend of O3 could mean weak production, could mean strong ozonolysis (which could be dark reaction, i.e., nothing with photochemistry), or could just mean cloudy days thus no sunlight. This is not a sound reason for "weak local aging".

Minor issues:

The authors sometimes used "BC-containing particles" while sometimes "BC particles" and "BC" to name the same term, the BC-cored and other materials coated particles. Please try to be consistent throughout the manuscript, otherwise it will be confusing, e.g., Page 2, the "BC" of line 12, and the first "BC" of line 22, they did not actually have the same meaning.

Page 1, line 14: It "is" well known…

Page 2, line 5: both emissions of BC and the coating materials -> emissions of both BC and the coating materials;

Page 2, line 22: lens effect -> lensing effect. Same problem throughout the paper, e.g., Page 5, line 24, and Page 8, line 10, etc.

Page 2, line 23: results -> result;

Page 3, line 25: the particles were not "collected" by the diffusion dryer, please correct;

Page 4, line 25: not "RIs and RIc", here it should be RIs only.

Page 5, line 10: underestimate -> underestimation;

Page 5, equation (4) and equation (6): what is the difference between m_{rBC} and C_{rBC}?

Page 7, line 21: that -> those;

Page 7, lines 22-24: The logic of this sentence is not 100% correct. Dp increases, which could be the increase of either Dc or coating materials, or both. The authors mentioned "simultaneous increase in the rBC mass concentration" exactly in the following sentence, which makes this sentence reads really weird. Same problem applies to the texts following Figure S8, that the authors only suggested the "18-fold" increase of σ_{ab}, and will need to provide more evidence on the "simultaneous increase" in both rBC and the coating materials.

Page 8, line 30: change rates -> changing rates;

Page 9, line 3: at our study -> in our study;

Page 9, line 21: (A) BC aging and (B) BC internally mixed with other components, it is hard to say A is the consequence of B, or vice versa;

Page 12, line 3: capacity or capability? Please note this is not the only place.

Page 12, lines 14-15: decreased by significantly -> decreased significantly;

Table 1, the unit is "$\mu g\ m^{-3}$", not "$\mu g\ cm^{-3}$";

Figure 2: Eab is not light absorption capability, it should be enhancement;

SI: page 4, line 13: what is "larges of coating materials"?