This manuscript presented a method to predict the optical properties of internally mixed black carbon. Based on this manuscript, we can use a single factor called the phase shift parameter to estimate the change of light absorption of internally mixed BC due to different morphology, mixing-state, mass, and coating composition. The method also can be used to predict the absorption properties of coating material and morphology of BC core. This study is significant for BC optical research since it can help improve uncertainties in the current climate model related to BC absorption. The manuscript is well written, and the presentation is clear. The topic also fits very well into the scope of the journal. However, I have some comments and questions about the paper. After considering, responding, and revising the manuscript based on them, this paper should be considered for publication.

Major Comments:

1. This manuscript discusses the influence of the mixing state of BC and coating on the absorption of the entire particle. Have you conducted any simulation for BC mixed with inorganics (e.g., dust, sea salt) then coated by other materials? How would that affect your model results?
2. For the AADA model, could you provide a short description of it? I suggest adding a table of import parameters you used.
3. The first Section 3.1 is not clear to me.
   a. Does ΔMAC_{BC} represent the MAC of the entire particle - MAC of BC core? Same question for Δk_{coat} and Δn_{coat}. Please clarify them.
   b. You used 30 BC aggregates. Does that mean for each aggregate, you used a different combination of n_{coat} and k_{coat}? Why do you only have 7 points in figure 3? Shouldn't you have 3 points for k and 3 points for n at each R_{BC}?
   c. I also noticed that in Fig. 3, at R_{BC} = 10, the ratio decreases. Do you have any explanation for that?
   d. I am not surprised to see $\Delta MAC_{BC}/\Delta k_{coat}$ is always greater than $\Delta MAC_{BC}/\Delta n_{coat}$ since k changes over an order of magnitude, while n only changes within 0.2.
   e. You used k_{coat} between 0.00 and 0.05. What is the step size? Moreover, I think the upper limit of k might be too low to represent a highly absorbing coating. I am wondering why you choose 0.05 instead of 0.1? Also, a range of n instead of 1.55 can better represent ambient particles. I recommend adding sensitivity analysis with a broader range of k and n.
4. For equations 3 a and b, how did you come out with this function? Is there any physical meaning? Moreover, does equation 3 only work with k = 0, 0.01, and 0.05?

Specific comments

1. L83-85, "The mass of the BC … (Bond and Bergstrom, 2006)." For the density you chose, I suggest using a range instead of single values so that you can represent the wide range of ambient particle density and uncertainties in the literature. Thus, I am also curious to see the dependence or uncertainties related to the density.
2. Figure 2 is very blurry. Please make sure the final version has a higher resolution.
3. Figure 3, What are these error bars represent?
4. In the manuscript, you used ρ to represent the phase shift parameter. However, ρ is usually used for density. I suggest using a different Greek letter.

5. L132-133, "The BC refractive … ,2006)." Could you clarify whether you use this RI value for all wavelengths or just 550 nm?
6. Section number for sub-sections in Sect. 3 need to be corrected.
7. In figure 4, I can see the authors want to keep the same scale for all sub-figures, but there are too many white spaces in b, d, and f, making it very difficult to see the trend in the $\rho<1$ regime. Please consider changing the y-axis limit. Moreover, in b and f, why the number of R_{BC} dots is different from other R_{BC}?
8. L232-234, "It has been … fixed at 0.00." Could it be that the coating is absorbing, but ρ is greater than 1?
9. Figure 7 b should be a table, not a figure.
10. L250, should not Figure 3(b) be Figure 7(b)?