We thank reviewer 1 for her/his assessment of our paper and his/her comments and suggestions, which we will reply to point by point below.

**1) Page 4.** *Check spelling of “Zhnag”.*

Typo.

**Changes to the manuscript:** Typo will be corrected. In addition, this reference was missing in the list of references and will be added.

**2) Page 4, line 10.** *The authors indicate that the k-values correspond to SOA from different locations. Does this include brown carbon from biomass burning and smoldering combustion? Do the k-values used in the simulations cover the full range of k-values observed in the atmosphere? Although not absolutely necessary, it would be very helpful if the authors discussed k-values and AAE–values corresponding to different types of brown carbon found in the atmosphere. For example, what are typical values for biomass burning, smoldering combustion, SOA generated in environmental chambers, and organic material collected in the atmosphere? A small table would be very helpful. This would make it easier for a non-expert to put the results into context.*

We thank the reviewer for the suggestion. Although additional data became available, we believe the ranges given in Table 3 of Moise at al. (2015) are still representative for the k-values of the different sources. Rather than providing any mean values, the ranges reported at about 355 nm taken from this table are:

Laboratory reacted organic compounds
(biogenic SOA) 9E-4 to 3.7E-3
(anthropogenic SOA) 4.7E-2
(HULIS proxies) 4.6E-2 to 9.8E-2
(ammonia mediated aging of SOA) 7E-3 to 3.1E-2

Ambient aerosol
(pollution Hulis) 9.8E-2
(smoke HULIS) 1.16E-1
(rural HULIS) 2.3E-2
(biomass burning HULIS) 7E-3

Taking this compilation, it is evident, that our k-values cover the full range of the atmospherically relevant values, with k=0.168 @355 nm being one of the largest k-values observed. You may also look at Fig. 1 of Wang et al. (2014), whose data we added to the revised Fig. B3, see below.

**Changes to the manuscript:** We will add the Moise at al. (2015)

and Wang et al. (2014) references and change the sentence starting at line 10 to:
“To account for the absorptivity of BrC, we take the imaginary parts of the refractive index (k) for BrC spanning a wide range from non-absorbing organic material (k = 0) to highly absorbing organic matter (k = 0.168 at 355 nm). This range is based on various studies (Kirchstetter et al., 2004; Chen and Bond, 2010; Feng et al., 2013, Wang et al., 2014, Moise et al., 2015) that measured or collected data of k for different absorbing aerosol at different locations.”

**3) Figure 3.** *What is plotted on the x-axis (include units)?*

We thank the reviewer for pointing out the missing description. Plotted is scattering efficiency versus the position of the center of the core relative to the center of the particle. Units of the original figure were µm.

**Changes to the manuscript:** We will change the axis title of Fig. 3 and its caption as well. New caption:
“Figure 3. The change in Qscat with the relative position of the core (r(core) = 92.8 nm) to the particle center perpendicular to the direction of light, x- and y-axis (panel a) and along the direction of light , z-axis (panel b) for particle with OIR = 1:4, k = 0.168, r(particle) = 100 nm over 10000 realizations.”

**4) Page 10, line 15,** *delete “with”.*

**Changes to the manuscript:** will delete.

**5) Equation 4.** *On the denominator, should “betaLLPS” be replaced with “betaHomo”?*

Yes, the reviewer is correct. However, we will change the whole section following the advice of reviewer 2, see the answers to the comments of reviewer 2.

**Changes to the manuscript:** revised version of the atmospheric implication section

**6)** *AAE values ranging from 2 to 6 where used. References for these values should be included. Sorry if I missed the references.*

We take the advice of the reviewer and will put more detailed information into Fig. B3 from Wang et al. (2014).

**Changes to the manuscript:** We will revise Fig. B3 by adding the parametrizations of Wang et al. (2014) for comparison as well as the data collected in this reference. We will add a sentence to the text of Fig. B3: “Clearly, the AAE=2 case poses an upper limit of absorptivity, whereas the AAE=6 case is in-between of the parametrization for brown carbon primary organic aerosol and brown carbon secondary aerosol estimates of Wang et al. (2015).”

**7) Figure B1**. *Shown is the refractive indices for pure SOM from Lienhard. What type of SOM (e.g. pinene or toluene SOM) was used to determine these refractive indices? Also how do these refractive indices compare with what is observed in atmospheric particles? Will the authors reach different conclusions if a different type of SOM is used?*

The SOM of Lienhard et al. (2015) was generated in a PAM chamber by OH oxidation of α-pinene. The real part of refractive index is almost identical to the one determined by Liu et al. (2013) for particles generated by ozonolysis of alpha-pinene. Liu et al. (2013) measure the one for limonene and catechol as well, with catechol having a larger index compared to our SOM (catechol @ 550 nm: 1.5147, our SOM: 1.4968).
However, for the simulations shown in Fig. 6 we used an even higher real part of the refractive index than that of catechol and do not see any significant differences compared to the simulations shown in Figs 8 and 9. Therefore, we conclude that the exact value for the real part of the refractive index will not lead to different conclusions.

**Changes to the manuscript:**

We will add the parametrizations of Liu et al. (2013) to Fig. B1 to allow a comparison.

**Revised figures:**

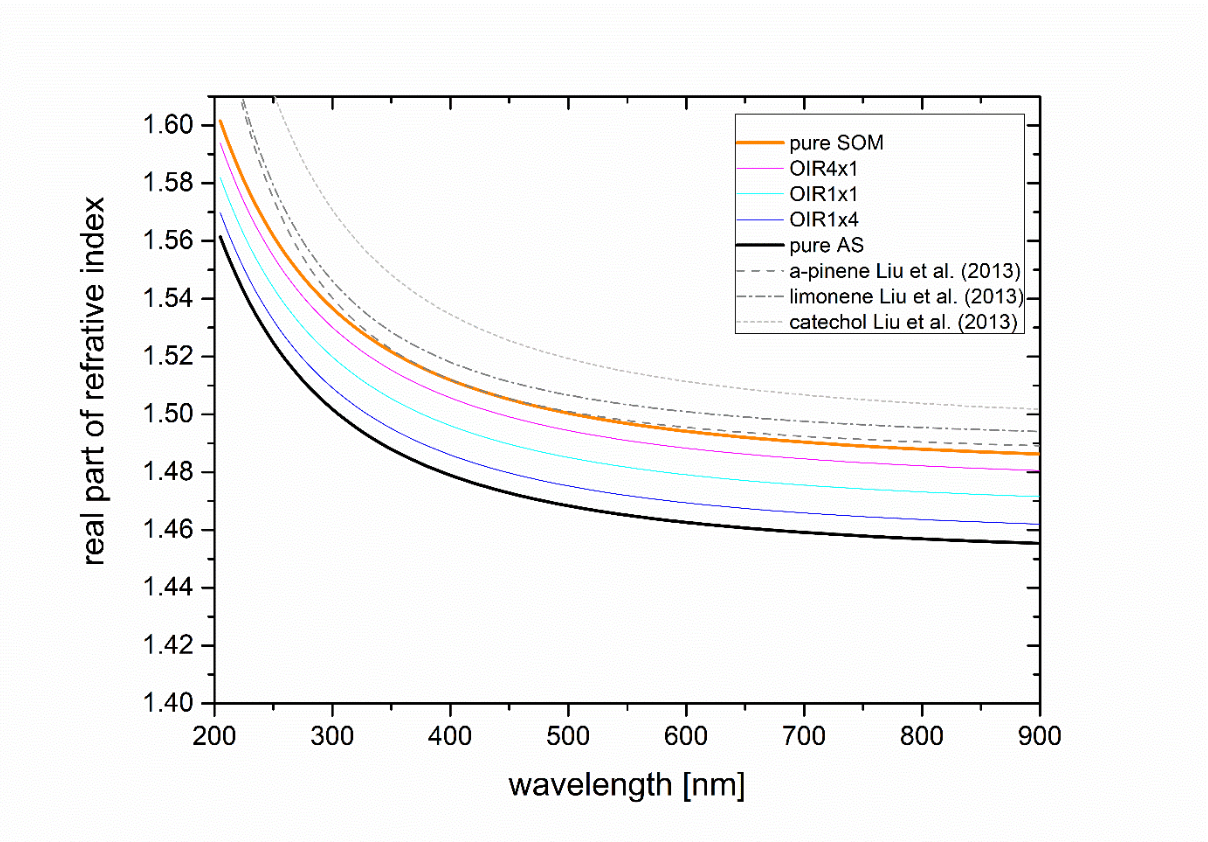

**Figure B1: Real part of refractive index, *n*, for aqueous mixtures of ammonium sulfate (AS) and secondary organic matter (SOM) with varying OIR extrapolated to dry condition (lines in various colors). For comparison, the parametrizations of Liu et al. (2013) for SOM obtained by ozonolysis of α-pinene, limonene and catechol are given (gray lines).**

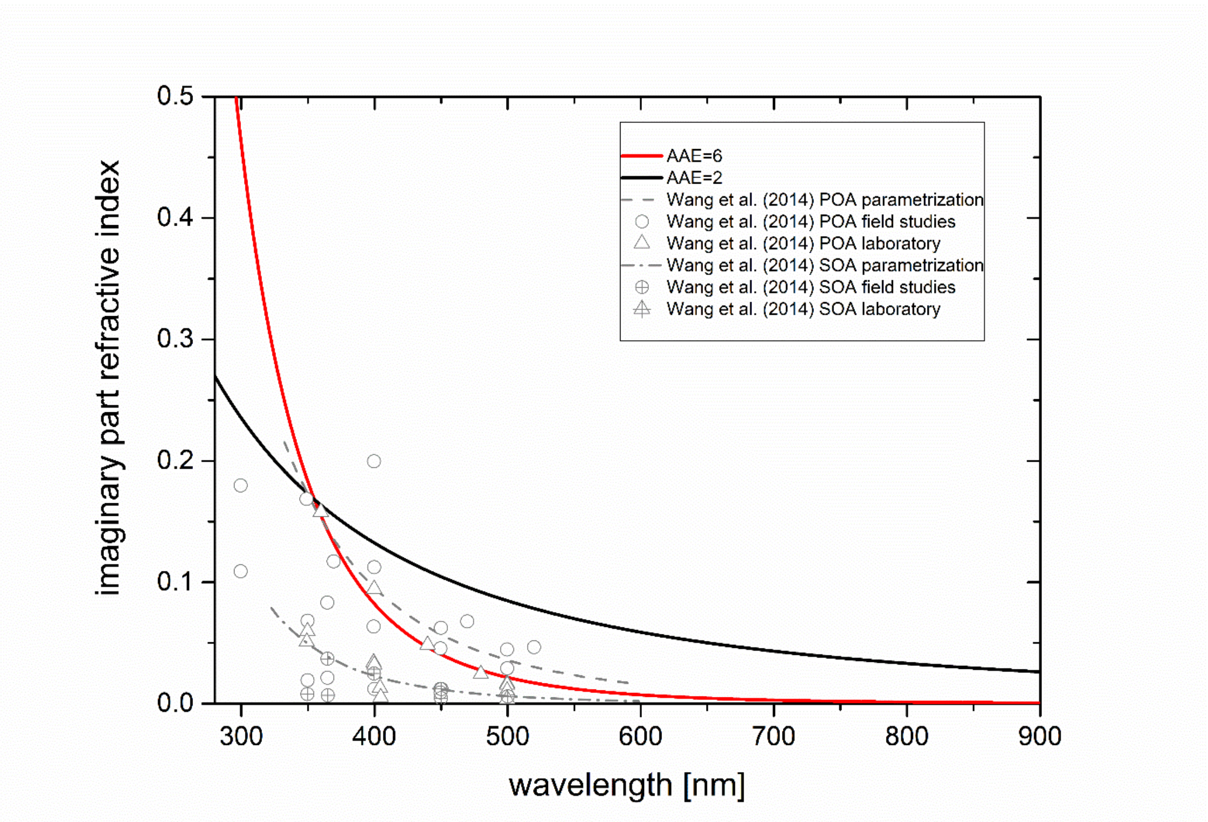

**Figure B3: Wavelength dependence of the imaginary part of the refractive index for AAE equal to 2 and 6 (solid black**

**and red lines, respectively. *k* = 0.168 for *λ* = 355 nm. For comparison the parametrizations of Wang et al. (2014) for brown primary organic aerosol (POA, dashed gray line) and brown secondary organic aerosol (SOA, dashed-dotted gray line) are plotted as well as the data from laboratory and field studies collected by Wang et al. (2014).**