

Interactive comment on “Relative Importance of Black Carbon, Brown Carbon and Absorption Enhancement from Clear Coatings in Biomass Burning Emissions” by Rudra P. Pokhrel et al.

Anonymous Referee #1

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The authors used different methodologies to quantify the relative contributions of absorption from BC, BrC and lensing for 12 different fuels with significant global emissions over 22 individual burns. They demonstrated that the BrC was an important contributor to biomass burning aerosol absorption at blue end of the visible spectrum. The work is original, contain important addition to existing literature. The paper is clearly written, and is suited for publication to ACP. However, there are several concerns that should be addressed or considered before being accepted for publication.

Major comments:

(1) In this work, three different methodologies were used to calculate the contributions of absorption from BC, BrC and lensing. The authors described the methodologies in

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the Results and Discussion section (Sec. 3.3). I would suggest the three approaches discussed in the Sec. 2 (Materials and Method).

(2) I would suggest providing a schematic of the instrument setup in the Materials and Method section.

(3) The efficiency of the thermal removal mechanism of non-refractory component is a critical point, but in this work is poorly investigated. Incomplete removal of organics (e.g. low-volatile BrC coatings on BC surface) by the thermal denuder would influence the estimate in the relative contributions from BC, BrC and lensing, especially for approach 1. It will be helpful to estimate the removal of low-volatile component after the heating stage. If the author cannot quantify the efficiency of the thermal removal, they can make a sensitive analysis to discuss the uncertainties of relative contributions from BC, rBC and lensing due to incomplete removal of low-volatile organics.

(4) Due to incomplete removal of low-volatile organics, the Eabs_660 was underestimated and the babs_405_den was overestimated in Eq. (3), which would result in an unclear uncertainty (overestimate, underestimate or counteraction) in the fraction of absorption from BrC using approach 1. Meanwhile, the assumption of coated BC with an AAE of 1 in approach 2 led to an overestimate in the fraction of absorption from BrC. I do not know why the author could concluded that the BrC contributions derived from approach 2 was closer to reality than approach 1.

Specific points:

(1) P. 1 L 17: The temperate unit should be “°C” .

(2) P. 1 L 18-20: Three approaches was used to calculate the contributions of absorption from BC, BrC and lensing. However, the author only described two methodologies (i.e. with one.and the other. . . .).

(3) P. 7 L 12-14: Please define the absorption Angstrom exponent (AAE), such as using an equation.

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