

Interactive comment on “Strong Light Absorption Induced by Aged Biomass Burning Black Carbon over the Southeastern Tibetan Plateau in Pre-monsoon Season” by Tianyi Tan et al.

Anonymous Referee #1

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This paper presents a field measurement at a remote background site to elucidate the influence of transported biomass burning (BB) plumes on the abundance and mixing state of BC particles over the southeastern TP. A combined system of differential mobility analyzer and single-particle soot photometer (DMA-SP2) was applied. Both the number concentration of BC-containing particles and the percentage of thickly-coated BC increased significantly during the pollution episode period due to the transport of BB plumes. Those transported BC particles were also found to have much thicker coatings and slightly larger core size than the background BC particles. Besides, the mass absorption cross-section and the total light absorption of BC particles also increased significantly, with 79

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Specific comments:

Line 36: check the reference and clarify who first came up with the concept of "lensing effect".

Line 37: change to "requires the information of its size distribution..."

Line 51: Please add some more authoritative references rather than just "Zhao et al., 2013".

Line 72: change "import" to "transport"

Line 73: what's the criteria of the identification of pre-monsoon season?

Figure 1: I think there is a serious question for the current version of the map. The revised version need to correct the disputed boundary line between China and India.

Line 87: why not the typical 10:1 ratio between the sheath flow rate and the aerosol flow rate?

Line 92: Add the references. Equation 1: what's the diameters of D_p and D_c ? Both the mobility diameters? Section 3.1: Although biomass burning was the major source of BC in the South Asia regions, it was not the only source for BC. For example, the fossil fuel combustions (vehicle exhausts and coal combustion) also emitted BC particles. So, it maybe not appropriate for the statement of "biomass burning black carbon" in your study.

Line 158: why calculated the coating thickness with BC core diameter only between 100-120 nm? How much of a deviation between it with the real ambient condition?

Line 159: it is better to do the comparison from Period I to Period II, namely decreased from Period I to Period II.

Line 166: it is strange why less fire spots in the Indo-Gangetic Plain where had serious pollution. Please check the fire data again.

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Line 171: similar to above comment, the biomass burning is the major origin source for BC rather the only source.

Section 3.2: what's the reason for the large discrepancy between the mean and median values at 0-8h in Figure 3.2a1?

Line 192: As the author explained the high pollutant concentration occurred during the daytime due to the strong convective mixing, however, the highest BC number concentration in Figure 3.2a2 occurred at 10-13h, but showed obvious decrease in the afternoon when have the strong convective mixing conditions. Why? It is also inappropriate to say the number fraction of BC-containing particles shows an increasing trend during the daytime but decreased clearly after 13h.

Line 193-198: the explanation is not convincing. Firstly, the highest value was just 40 during the background P2 period, but larger than 200 during the P1 period, so it can not to say "This can be attributed to the comparable level of BC concentration between the upper and surface atmosphere". Secondly, the daily variation characteristics in Fig3a1 are not completely understood in this explanation, such as why the concentration is low during 20-24h but much higher during 0-8h? Overall, this section need to be rephrased clearly to explain why the diurnal patterns of BC number concentration are influence by the regional transport of BB plumes during the night but strong convective mixing during the daytime.

Line 231: " The difference of BC core size distribution between these two periods confirms that the BC emission source in Period I and II could be different." In my view, the size distribution in Period I and II are similar in Figure 4.

Line 234: it is insufficient to verify those aged BC particles are from the northern India just according to the close mean diameters. Rephrase the caption of Figure 5 clearly.

Line 249-250: "This implicates that the smaller BC cores are prone to obtain more coatings than larger cores during the atmospheric aging process" What's the reason?

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Line 290: "As a result of the transport of BB plumes, the number concentration of BC-containing particles was greatly increased" It is not right to use the passive voice here in my opinion, please consider to change these in the entire conclusion section.

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