

## ***Interactive comment on “Emission factors and light absorption properties of brown carbon from household coal combustion in China” by Jianzhong Sun et al.***

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Received and published: 1 February 2017

Black carbon (BC) and Brown carbon (BrC) have significant impacts on regional climate change and residential coal combustion is a major source of these pollutants. Emission data of BC and BrC from residential solid fuel combustion, depending on coals and stove types are still limited, though more and more studies are available during the last several years (most reported BC and/or elemental carbon). The present study measured emissions of BC and BrC from residential coal combustion in 7 different coals burnt in 4 different stoves in China. The study provided firsthand data on pollutant emission factors from residential coal combustion that would be interesting and helpful for emission inventory, air quality modelling and also control policies on raw

C1

coal combustion in the country. Overall the experiments are well conducted and the manuscript is clearly present. I have the following concerns to be considered by the authors before the paper published in ACP.

1. The study used optical integrating sphere method to quantify BC and BrC amounts. The quantification is based on calibration curves using CarB and HASS as standards. Chemical compositions and properties could be different between BrC and HASS (Page 6 lines 20-25). In fact, these two terms (BC and BrC) are initially defined based on the light properties while chemical compositions of BrC is still not well characterized. So in my opinion although the difference here is out of this study scope it might be necessary and important to highlight in the paper that results reported here is probably different from others in literature reporting BC and/or BrC using other measurement techniques, which should be considered in the generation of results. What reported here are more likely a CarB-equivalent and HASS-equivalent carbon emissions. Interesting to know whether the authors had BC data from typical BC measurement instruments or BrC data from carbon analysis, and are the results comparable if you have the data?

2. Section 3.1-influence of briquetting, and Figure 3: are the results for chunk coals from traditional SC stove, or averaged from all three chunk stoves? Note that briquettes were burned in WJ stove while raw chunk coals were burned in another three stoves, therefore differences observed here are resulting from not only coal briquetting but also stove types. Can the author evaluate difference among different stoves, for example, emissions from chunk between traditional SJ stove and HD/LW stoves?

3. As only two repeats for each experiment, it is inappropriate to calculate standard deviations. In Table 2, suggest to put all data for each coal. The overall means with standard deviations for anthracite and bituminous are fine. Also replace means with standard deviations by ranges in text if only two numbers.

4. As the research group had published a series of BC emission data from coal com-

C2

bustion, it is suggested to compare and discuss the results here and the previous studies, taking differences (if any) of coal types and stoves in the consideration. Will the overall means of BC for anthracite and briquettes change when taking more data into account, and how much the variation would be?

5. Lab experiments are easier to be controlled and repeatable, but more and more studies suggested that lab studies may fail to simulate high emissions and be difficult to capture high variations in real field. Both methods have advantage and disadvantage. The limitation and consequent impacts on the generation of these lab-experimental data should be briefly discussed in main text.

some specific ones:

Page 5 line 23, "PFS-4000" not "FPS"

Page 7 line 10-15, the information should be shortened and moved to the section 2.4.

Page 8 line 25-30, high emissions from medium-volatile content coals are also found in PAHs emissions. Therefore, it appears that this type of coals should be eliminated in use.

Page 9 line 11, delete "either"

Page 9 line 25, please note that 20% briquettes probably underestimated, though no reliable statistical data available so far. Suggest to add a discussion on uncertainties of these estimated emissions, due to fractions of briquettes and variations of EFs

Page 9 line 30, "less than BrC emissions from residential coal combustion in the same period"?

Table 1, can the authors provide heating values of these coals? And, are these properties like moisture and ash content changed when briquetting?

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-1090, 2017.