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Interactive comment on “Distribution of black carbon in Ponderosa pine litter and soils following the High Park wildfire” by C. M. Boot et al.

C. M. Boot et al.

claudia.boot@colostate.edu

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We have a few technical comments: (1) the usage of a B5CA/B6CA ratio and interpretations about condensation could be better introduced and explained. For example, in the abstract, B5CA/B6CA is described as “less condensed to more condensed BC”, which is not fully correct because it actually is just a ratio of less carboxylated to more carboxylated building blocks of a part of BC (B3CA, B4CA exist, too) after BC digestion.

Dr. Weidemeier has very recently published some interesting work where he examining the degree of BC condensation as a ratio of B6CA to total BPCAs. We have revised the abstract and discussion to use the B6CA:total BC to determine the effect of burn intensity and layer on the degree of condensation of BC in light of Dr. Weidemeier’s findings. We also describe and maintain the use of B5CA:B6CA as an indication of

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heat of BC formation as described in Wolf et al. 2013.

The paper that you cited (Rodionov et al. 2006) does not explicitly make this link nor mention BPCA ratios. Moreover, the postulated link in the manuscript between BPCA ratios and degree of processing is still a topic of research and the link between the ratios and age seems rather hypothetical (p 16803).

The reviewer is correct, we provided the wrong citation. It should be Rodionov et al. 2010, Black carbon in grassland ecosystems of the world. Global Biogeochemical Cycles vol. 24 GB3013, doi:10.1029/2009GB003669. We agree the link between age and BPCA ratios has not been well established and have revised the discussion to focus on the potential to relate BPCA ratios with the heat of BC formation.

The fully factorial design of the study allows for a lot of statistics. However, as it is currently presented, it is hard to check if the used statistical methods (ANOVA and post-hoc (F-test?)) really aid data interpretation. Mentioning the number of replicates (also in figures/captions), conducting and showing the residual analysis and model plausibility of ANOVA (in supplement), including a table showing all data including BC (maybe in supplement or extending table 1), and a more transparent handling of statistics could enhance the credibility of the findings. For example, F-values do not add much information when p-values are shown and it is pretty risky to state that burn intensity and layer affect %C when their interaction is significant (p. 16807& table S1).

The statistical analyses were repeated using SAS instead of sigmaplot for increased flexibility and better visualization of residual analysis. The Data Analysis section (2.5) was updated to reflect this change. The number of replicates was added to all figure captions and stated more explicitly in the data analysis section. The results of residual analyses are not typically presented in supplemental information for Biogeosciences Discussion papers, so, similar to the full dataset, we have elected to make them available upon request. F-values were removed from data presentation and text in the results section was updated to note the independent effects of burn severity and layer

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could not be assessed due to the significant interaction term.

Generally, we think that the manuscript could considerably profit from focusing on the main story (post-fire BC distribution) while additional information can be given in the supplement and/or omitted. Shortening would be particularly useful in the Materials and Method section as it is very long, very descriptive and mostly published elsewhere in detail (e.g. density measurement, elemental, BPCA and statistical analysis). Moreover, the “BPCA method validation” has been published before (in our method paper and supplement), yielding the same CV’s and linearities on a variety of materials and can therefore be omitted or put into the supplement as a “BPCA setup check”.

The manuscript has been refocused to highlight the major findings on post-fire BC distribution, and the methods section was shortened for the BPCA method validation and bulk density determination, the BPCA method validation was moved to the Supplemental Information.

In contrast, some sections could potentially be slightly expanded, for example: Based on the entire BPCA distribution patterns (figure 3), could you distinguish litter BC from soil BC and what are the implications? Or why did you prefer slope as a factor instead of landform (0 can be on a peak or in a valley but with very different erosion characteristics)?

The BPCA distribution patterns discussion was expanded, although, as noted in the results, we could distinguish the soil layers (litter vs. 5-15 cm soils, and 0-5 cm soils vs. 5-15 cm soils) based on the proportion of B6CA and B5CA:B6CA. This sentence was added to explain our choice of soil slope versus landform, “We opted to constrain the study by slope rather than landscape position (e.g. hilltop versus valley location of flat surface) in order to constrain study site criteria to public lands within the patchy distribution of fire-impacted sites of Ponderosa pine vegetation on difficult to access terrain.” (inserted in section 2.2 Litter and soil collection). We also added this statement in the discussion, “The position of our sites on the landscape may have also

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contributed to the lack of effect of slope on BC distribution. Because our aim was to address slope, rather than position, the sites were not oriented in a consistent up- or downslope manner, thus some 0-5° sites are located on hilltops and others at valley bottoms. In addition, the landscape position influences the location of Ponderosa pine through elevational temperature and moisture gradients (Peet, 1981). We focused on the Ponderosa pine because it is the dominant vegetation in the drainage located on a variety of slopes, whereas consideration of hillslope processes would require accounting for the differences in fire properties and BC inputs that would likely result from grass or shrub dominated areas (DeBano, 2000).”

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