Biogeosciences
Discussions

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

Anonymous Referee #3

Received and published: 12 January 2015

This paper examines the distribution of pyrogenic carbon in litter and soil stratified by slope and burn intensity, following a major a major bushfire in the Rock Mountains in 2012. The study uses BPCA analysis to quantify pyrogenic carbon and finds minimal translocation of pyrogenic carbon into the soil 4 months after the fire, concluding that erosion may be a major pathway for loss of pyrogenic carbon from the sites investigated. The study is methodologically sound and very clearly and logically presented with a minimum of grammatical/typographical errors. With the caveats below I believe the manuscript is publishable after minor revision to address the issues below.

(i) It is clear from the data presented that unburnt litter has a lot less pyrogenic carbon than litter from the burnt sites, which means that the pyrogenic carbon from previous fires has gone 'somewhere'. The authors seem to favour erosional loss as the dominant

mechanism for the difference, but its not clear to me why this mechanism is favoured over biotic/abiotic degradation/mineralization (possibly followed by leaching), given the 40-100 year fire return interval, which leaves plenty of time for both degradation and erosion. I don't think its possible to pick between these possibilities based on the data presented, so I would recommend expanding the text to elaborate on the possibility that degradation also a plausible mechanism for loss. Over a few years, with resampling of the sites, it may well be possible to demonstrate that erosion is dominant in this environment, but this can't be uniquely concluded to be the dominant mechanism from a single post-fire sampling. This probably also means softening/modifying some of the conclusions in the abstract as well as parts of the discussion.

(ii) As I understand it, the BPCA technique likely under-estimates to pyrogenic carbon because the technique cannot completely break down large polyaromatic compounds. This is implied on pp16806 line 27 where conversion factors are mentioned but it should be explicitly stated that to stocks are likely under-estimated by a significant amount - its not a problem for the comparisons in this paper, because like is being compared with like, but it is important in terms of comparing this data with other techniques.

(iii) The BPCA analyses were calibrated through an analysis of a 'laboratory biochar'. Please provide further information on the characteristics of this char, and the degree to which it might be representative of natural bushfire chars

(iv) can you add any information on the likely temperatures achieved in the fire at different intensities? This bears particularly on the recalcitrance of the pyrogenic carbon produced in the fire at different intensities, and probably on its observability by BPCA analysis. For example, it is possible that there was 'more' total PyC made during the high intensity fire, but less of it measured by BPCA analysis because a higher proportion was not liberated for analysis (ie a correction factor closer to 5 than 2.27. This might explain in part the apparent similarity of stocks between the medium and high intensity burn sites in the litter layer.

(v) it seems important to include information about whether the sites chosen are all sites of erosion rather than colluvial accumulation, the latter potentially being sites enhanced burial of pyrogenic carbon from previous fires?

Smaller things: Page 16801 line 2 – change in which to during which 16803 – 4 – highly is probably not the right word here 16803 – 7 – I think you means BPCA-C? 16803 – 13 – delete first occurence of the 16811 – 25 – how many rain events of what magnitude? 16813 – 10 – this is a place where the erosion argument is made a bit strongly and could be reworded – there are others.