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Interactive comment on "Pyrogenic carbon from tropical savanna burning: production and stable isotope composition" *by* G. Saiz et al.

Anonymous Referee #1

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The manuscript reports the results of experimental burns over a rainfall transect of savanna where C4 grass represented from 35% to 99% of the standing biomass. The article reports and discuss results about the influence of standing biomass on fire residence time, production of HyPyC, and effect on the isotope disequilibrium induced by the combustion processes (SIDE). The authors found a negative correlation with the production of recalcitrant PyC (HyPyC) and a 13C in PyC compared to parent material. The hypotheses tested are extremely relevant both for the modeling of the impact of fires on C cycle and for reconstruction of past fire regimes. The experimental design is very innovative. The hypotheses tested were clearly stated in the introduction. Therefore I suggest the publication of this article in biogeoscience after some minor revision. Specific comments:

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Line 8-9: please specify the meaning of distal and proximate fluxes in this context (is clarified in the text, but it may worth a clarification also in the abstract).

Line 12: 17: I completely with the authors on the wide range of residence time estimates. Nonetheless the authors report that: "some components of PyC appear to be susceptible to degradation on comparatively short timescales (Bird et al., 1999; Zimmermann et al., 2012) while some are resistant to degradation, remaining in soils and sediments for thousands to millions of years (Cope and Chaloner, 1980; Lehmann et al., 2008; Masiello and Druffel, 1998)." I am not sure whether this difference is due to the presence of components having different decomposition rates or rather can be attributed to the different methodologies adopted to estimate PyC decomposition (incubation vs observation).

Line 16-23: are these Kuhlbush (1996) and Masiello (1998) the most up to date articles on this topic?

Page 15556: Line 10: In general were also reported the effect of being in a Tree (T) location or near a Grass (G location)?

Page 15159: The soot retrieved after cleaning the structure was it added to the >125 pool or < 125 or was it not measured? As it is specified later this is classified as distal, I suggest the authors report this also here for clarity. Also I would appreciate if they could discuss at which distance it is likely that fine particles are transported.

Page 15160: Line 16: Was all the non-HyPyC-C remaining after fire considered PyC? Was the hypotheses that part of the TEC was not altered by combustion discarded? I think that this is just a terminology issue, but it could worth to stress it in the text.

Page 15161: Line 12-16: I did not find very clear why two different methods were used. Basically you estimated first the real bulk 13C content by measuring it (and I assume was somewhere in between -13 and -27) and then you measured the theoretical bulk 13C based on a two pool mixing model? Did the two measures agreed?

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Line 24-26: It is not clear to me against what the SIDE was regressed, i.e. what was the explanatory variable of the SIDE? From figure 4 it looks like they were regressed against grass biomass. I suggest the authors report it in the text as well.

Line 27: of an F test, I would substitute with: “with an F test”. Did the authors also tested the normality and constance of errors using the power model?

Page 15162: This measure of fire residence time, is very interesting, it could worth to describe it in more in depth in the material section if it was created ad-hoc by the authors or cite the works if previously adopted, why was 100°C chosen?

Line 22: as it is reported in the figure the decrease is significant, I suggest the authors report it also in the text.

Line 15: Why was the median used as a measure of central tendency instead of the mean? Were there many outliers?

Figure 4: Since ”The 13C of the CO2 was calculated by mass balance using the amount and isotopic composition of initial biomass and and the residual product of combustion” , I was surprised that the uncertainty on the 13C of the CO2 was so little in fact this results from the sum of other measures (each having its own uncertainty usually higher than the one of CO2), therefore I would expect that the uncertainty would increase.

Pag 15164: So if I understood correctly in nature high TCE correspond to short residence time fires, while you observed the opposite. Could this be an artifact of the chamber you installed?

Pag 15165: Allocation of HyPyC produced during savanna fires: could the author discuss a bit deeper the mechanisms that regulate the relation between transport and residence of PyC in soil?

Page 15180: Figure 3: Was it taken into account that the part of the points where spatially correlated ? I mean that the points coming from the same area are likely to be spatially correlated, and could therefore be considered pseudoreplicates. This

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inconvenient could be solved by either using multiple variance anova, or mixed effect models. I think that r squared are not ideal to describe the fit of non-linear model (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2892436/)

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