Authors' response

Interactive comment on "Key drivers of pyrogenic carbon redistribution during a simulated rainfall event" by Severin-Luca Bellè et al.

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Received and published: 21 November 2020

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Dear authors,

After reading your manuscript on the "Key drivers of pyrogenic carbon redistribution during a simulated rainfall event", I could evaluate this work as solid and rigorous. The amount of simulations performed was substantial, statistically robust and the conclusions are in line with the observations.

We thank Dr. Vieira for the overall positive feedback and for the useful suggestions to improve our manuscript.

However, I believe there are a couple of aspects you can still address in the manuscript that could clarify the reader:

1. The amount of comparisons that you do difficult the reading of the manuscript. I understand you are making use of the collected data, but keeping track of your observations it's a great effort for the reader. Therefore, I would suggest a budget scheme (example figure 1 attached). This scheme could help us readers keeping track of the distribution and still give the relative importance to the values you are providing.

We agree with the reviewer that the amount of comparisons is substantial, and that a generalized budget scheme could be of help to guide better through the presented results. We suggest to include one more figure that shows the distribution of PyC by runoff, splash and in the soil for each combination of the four studied drivers (total 16 small schemes). However, we would not present the results from the soil core calculations (PyC fractions) in % redistributed PyC per sector or depth increment, but just give one general value of how much PyC remained on/in the soil. This is because we also did not want to convert PyC fractions to PyC recovery for the soil samples, as stated in the manuscript in section 2.7.

See the suggested budget scheme figure on the next page:

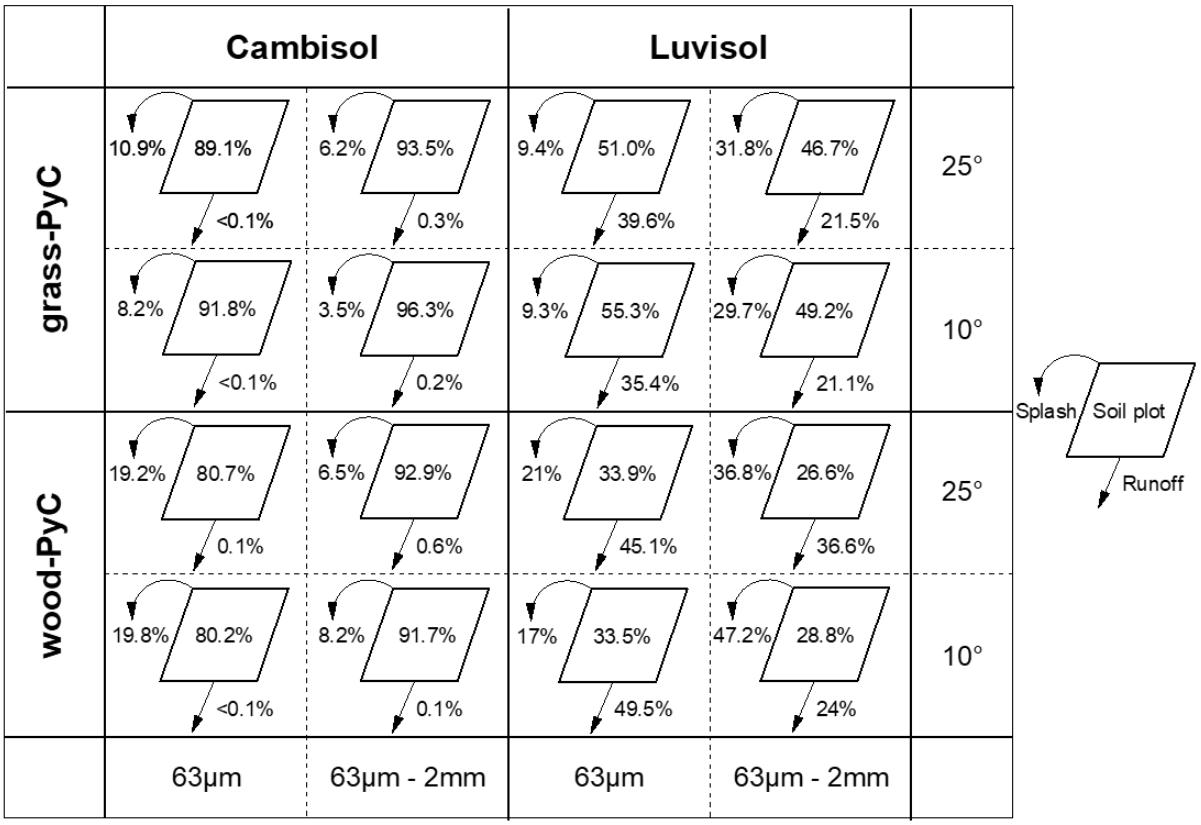

Figure 1: Redistribution of PyC (in %) through runoff and splash erosion, and within the soil plots for all combinations of studied drivers (soil texture (Cambisol vs. Luvisol), slope angle (25° vs. 10°), PyC feedstock (grass vs. wood) and particle size (63µm vs. 63 µm – 2mm)). Values represent averages per treatment (n = 3).

2. The relative comparisons could be simplified somehow. For example, in Line 270 you say “it was on average 1.5 times less”. This didn’t help me visualize the value, you could have said 37% less. Another example is in line 317, where you say “was more or less 300 times less”, I believe the usage of 300 is appropriate but I would simplify by saying it “was approximately 300 times more” by switching the soil order. My point is if you simplify these terms fewer difficulties the readers will have to follow the text.

We agree with the reviewer and we will simplify comparisons in line 269-270, 285, 317-318 in the manuscript.

I do also have a methodological issue, that cannot be solved since the data is already is collected but can be addressed on 4.4 where you address some of the limitations of this work, and in the M&M. Its about the splash and the runoff generation. If I understood it well, and please clarify me if I am making a wrong assumption, the runoff generation is not entirely separated from the splash prosses, since the splash occurs in a 360◦ direction, whereas runoff occurs in a single direction, the slope direction. For that, I’ve uploaded another figure (fig 2). With your runoff transport, you will have a part of the splash component. Transported particles by splash will achieve further distances with the direction of the slope because gravity favors this matter, and when the runoff is generated both fractions are combined and distribute particles over midslope and downslope soil tray. Having that said, I would like to ask if you could address these limitations, by identifying early in the MS that your splash component is underestimated, but is the best estimation you could get, and how this limitation propagates error along with your results.

We fully agree with the reviewer that the methodological approach underestimates the importance of splash erosion by only accounting the PyC particles to splash erosion that left the soil plot on the sites, but not the PyC particles that were splashed within the plot (these are then accounted for redistribution on the plot itself mid- and downslope) or further transported by runoff (these are then accounted for runoff erosion). We agree that this methodological issue must be addressed both in the material and methods (i.e. at the end of section 2.4 “Plot preparation”, line 180) and in the discussion (i.e. section 4.4, line 547) by saying that the splash component would be higher if the distribution of PyC on the surface of the plots and part of the PyC in runoff would also be accounted for in the splash erosion component.

We propose to add this explanation in section 2.4 in the Material and Methods (line 180):

“We are aware that the set-up used in our study will underestimate the splash erosion component. Splash erosion will not only occur to the sides of the soil plots (captured with the shelter around it), but also on the plots itself. This latter component of splash erosion will be counted as either runoff erosion if the material leaves the plot in the direction of slope, or as distribution of soil, SOC and PyC within the soil surface/plot mid- and downslope. Since the processes of splash and runoff erosion are linked, we need to bear in mind that part of the eroded material by runoff may be attributable to splash erosion. Still, our results are the best estimation we could get for the two processes.”

We propose to add the following sentence in section 4.4 in the discussion (line 547):

“In this regard, it has to be noted that not only runoff erosion will likely change on longer hillslopes, but the interaction of runoff and splash erosion. With our methodological approach, we could not fully separate these two processes and parts of eroded material by splash was accounted for runoff erosion since it occurred on the soil plots itself in direction of the slope, which favours its final export by runoff.”

Despite the identified issues, I believe the work is solid and makes good use of laboratory experiments. Works as these ones are very important to identify key-processes that are under the influence of many variables in the field.

We thank Dr. Vieira again for the feedback and valuable suggestions to improve our manuscript in general and especially to make the presented results more understandable for the reader to follow.