

Biogeosciences Discuss., referee comment RC3
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Comment on bg-2021-1

Anonymous Referee #3

Referee comment on "Experimental production of charcoal morphologies to discriminate fuel source and fire type: an example from Siberian taiga" by Angelica Feurdean, Biogeosciences Discuss., <https://doi.org/10.5194/bg-2021-1-RC3>, 2021

General comments

This manuscript provides new and additional information to the increasing body of knowledge of using sedimentary charcoal for more robust reconstructions of past fire regime including fire severity, fuel sources and fire type. The study combines different features analysed from modern burned plant materials and based on that provide assessment of possible methodology for defining fire type and fuel source also from sedimentary records. It would be interesting to see a comparison of the features from plant material burned in laboratory with features from actual sedimentary charcoal record from the same study area. However, I understand that this could be further work in addition to this manuscript.

In general, this manuscript is well organized and written in clear language. Introduction is informative and the aims of the study are clearly stated. Methods used in the study are relevant and justified and the approach provides novel information and methodology for using sedimentary charcoal in reconstructing past fire regime in boreal landscape. The results are interesting and I would have hoped to see more comparison of the results from this study to previous research also using laboratory techniques or sedimentary charcoal to analyze charcoal morphology in regards to the combustion temperature and fuel source. I was also partly missing clear numerical values when describing the morphological features. For example, I would have hoped more defined information of what is the size range of smaller and larger fragments, when morphometrically categorizing fuel types. More exact numerical information of size, ratios, mass retention etc. would make these results more comparable with later studies utilizing the methodology presented here.

Overall, I think this work brings important addition to the literature and methodology of using combination of different charcoal features for more robust reconstructions of past fire regime. I have made some minor suggestions for the author in the detailed comments.

In my opinion, this paper would be in wide interest of the readers of Biogeosciences and I recommend this paper to be accepted to publication after suggested minor revisions.

Detailed comments:

L 79: I would suggest adding right in the beginning that these identified plant materials were the actual samples that were later burned in the laboratory.

L 87-88: So, nothing was actually used to initiated flame, but the burning was due to high temperatures? How well does this mimic the natural conditions for fire and does it have an effect on the charcoal features compared to the ones in sedimentary record?

L 92-95: I would suggest to mark the mixed samples a bit more clearly. Now it takes some time to figure out that which proportion go to which sample.

L 126-128: Here is reference to the Fig. 1. However, there isn't as many types given in the figure as here in the text. This is a bit confusing and I recommend to fix this or adding some explanation for leaving some features out form the figure.

L 197-199: Here average results across all temperatures are referred to Fig. 1, but as far as I understand the figure presents results from different burning temperatures rather than averaged over all temperatures. I would suggest this to be clarified.

L 235-237: Here it is stated that larger fragments are more reliable to categorise fuel types. It would be useful to clearly state that what is the size ranges for what is considered larger and smaller fragments.