

Comment on cp-2021-125

Anonymous Referee #1

Referee comment on "Holocene wildfire regimes in western Siberia: interaction between peatland moisture conditions and the composition of plant functional types" by Angelica Feurdean et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-125-RC1>, 2021

This is a review for the manuscript "Holocene wildfire regimes in forested peatlands in western Siberia: interaction between peatland moisture conditions and the composition of plant functional types" by Angelica Feurdean et al. The study explores the interactions between peatland moisture, vegetation composition and fire regime from two peatland sites in Western Siberia. The study provides new and valuable insights of the relationship between the different proxies and the significance of the findings for ongoing and future climate change in boreal peatland ecosystems. Overall, I find the paper well-structured and the multiproxy data clearly presented with sound interpretations of the paleorecords. However, I would encourage the authors to make some of the fonts in figures larger to be print-friendly. I am not an expert for amoeba and thus my review comments are focussed primarily on the paleofire and vegetation records, which align best with my own research background.

General comments

Introduction: I think the authors mix fire (events) with fire regimes a few times and I suggest checking that the words are used correctly as fire regime is a defined term describing the general pattern in which fires naturally occur in a particular ecosystem over an extended period of time not an individual fire. See e.g., line 65 ff.

Chronology: I would like to see more details on the chronology establishment in the main text, for example what material was dated and also why the authors included so many bulk dates instead of picking terrestrial macrofossils for dating purposes. The site description with local *Betula* growths implies that the record should contain enough datable terrestrial macrofossils for 14C purposes thus it's difficult to understand, why bulk material was dated instead.

Charcoal morphology: The authors state that they grouped charcoal in woody and non-woody at both sites based on morphology criteria. However, they also state that the charcoal was classified based on length ratio for one site to achieve an additional classification of graminoids vs leaves/wood. It is unclear why they chose two methods to achieve the ratio for one site while only one method for the other site. This is especially surprising since the two classifications largely overlap for interpretation (graminae vs. woody/leaves and non-woody vs woody).

Numerical analyses: I am a bit surprised to see how local indicators (watertable, macroscopic charcoal) and regional indicators (pollen) were combined for correlation calculations. Usually, microscopic charcoal >10µm is used for regional reconstructions that would align better with the catchment of micron-size pollen. The authors should consider adding a justification why in this case such correlations across spatial scales are considered more useful than combining proxies with a similar catchment estimate? The difference in the geographic scale covered by the individual proxies seems also the most likely explanation why the authors couldn't find some of the statistical correlations they were expecting between watertable, fire and vegetation indicators

Comparison between recent charcoal and satellite images: In my opinion the first paragraphs are presenting results rather than discussion of the results and should be moved to the results section. For the discussion of the relationship between charcoal-based fire reconstructions and satellite-derived fire detection, I would like to see some references to other studies such as e.g. Adolf et al. (2018) or Daniau et al. (2017)

Betula pollen: Please clarify if you determined tree type Birch and shrub type birch (*Betula nana*) pollen (e.g. see Birks 1968). If *Betula* could not be identified, it may contain *Betula nana* as well, not only *Betula* trees, which should be considered for discussing the results.

Specific comments

Line 64-65 Reference needed: When these aerosols persist in the atmosphere, it leads to a medium-term increase in albedo and ultimately to regional cooling.

Line 65ff: The sentence needs rewording, it currently reads : fire regimes ... are surface fires, see general comment above

Line 97: add spore analysis to pollen analysis

Line 99: I think it would be better to add "plant/vegetation, ...)" to "community" to clarify what community the authors refer to

Line 103: the term "charcoal site selection" seems misleading as the authors conduct a multiproxy paleoecological study not just charcoal analysis

Line 112: I believe the coring was conducted near the river not on the river

Line 114: Local peatland? Vegetation?

Line 115: What species are the dead tree trunks?

Line 124: add unit (cal yr BP) to the surface age -69 and -67

Line 129: fire history is not inferred from the peat sample but from the charcoal information in these samples. This needs to be rephrased.

Line 137: Reference for charcoal catchment. Consider for example Adolf et al., 2018

Line 230ff: provide absolute values of change of understory vegetation values rather than "more", "predominantly",...

Line 240f: mention water table values as well for the second part of the paragraph rather than relative descriptions.

Line 244ff: the lack of correlation could be due to the different proxies reflecting local and regional spatial scales.

Line 265f: charcoal occurrence should be presented as concentrations of particles per volume or better as charcoal influx per year and a given area rather than "pieces".

Line 289: add "for both sites"?

Line 320: determination of the detrital element Ti should be mentioned in the methods section

Line 401: Scenario should be replaced by period if considering how it is referred to in the following sentences.

Line 411ff: references needed for future climate scenarios in Siberia

Appendix A1: font too small to read when printed in A4

Figure 1: fonts are very small in the maps, indicate latitudes and longitudes as well as direction of North for map b-d

Figure 6: labels for correlation: increase font size

All figures showing Holocene records: x-axis, I believe you show kilo-years here not years, adjust unit accordingly

Technical comments

Line 64: this leads =they lead

Line 97: Multiproxy analysis should be used in plural form here

Line 99: "with regard to" instead of "in"

Line 122: add supplementary to file S1

Line 171f: using vs used, somehow the sentence structure is wrong

Line 354: change primally to primarily

Line 378: "from" or similar word missing

References:

Adolf, C., Wunderle, S., Colombaroli, D., Weber, H., Gobet, E., Heiri, O., ... & Tinner, W. (2018). The sedimentary and remote sensing reflection of biomass burning in Europe. *Global Ecology and Biogeography*, 27(2), 199-212.

Daniau, R. F., Arneth, A., Forrest, M., Hantson, S., & Kehrwald, N. (2017). Historic global biomass burning emissions for CMIP6 (BB4CMIP) based on merging satellite observations with proxies and fire models (1750–2015).

Birks, H. J. (1968). The identification of *Betula nana* pollen. *New Phytologist*, 67(2), 309-314.