

GENERAL COMMENTS

(Comment) The authors did an excellent job of addressing referees' comments/questions which greatly improved the manuscript. In particular, the addition of a new paragraph in the methods section detailing more clearly the statistical analyses performed in this study is very helpful. I only have a few minor suggestions below.

Thanks again for the detailed comments that are helpful for further improvement. We respond below with original reviewer text in **black**, author comments in **blue**, and manuscript amendments given in **red** with the corresponding updated line number.

SPECIFIC COMMENTS

ABSTRACT:

- L5: "Meter-scale estimates of area-normalized fire emissions are regionally limited and knowledge of their relation to climate and ecosystem properties is sparse."

(Comment) Please consider adding "are limited in Eurasian boreal forests".

Changed as suggested

LN5: Meter-scale estimates of area-normalized fire emissions are limited in Eurasian boreal forests and knowledge of their relation to climate and ecosystem properties is sparse.

INTRODUCTION:

- L40: (Comment) Please consider rephrasing as follows "Both long (interannual variability) and short (intraannual variability) processes".

Changed as suggested.

LN39: Both long (interannual variability) and short-term (intraannual variability) processes have been identified as drivers of the dynamics of fire events.

- L42: "The accumulation of fuel itself has been found to be strongly related to stand age and longer-term moisture levels (a factor of drainage conditions, evapotranspiration and inputs through precipitation and lateral water flow) (Walker et al., 2018, 2020a, b)."

(Comment) Please consider rephrasing this sentence.

We assumed the part that needs rephrasing is the first part.

LN41: Fuel accumulation has been found to be strongly related to stand age and longer-term moisture levels (a factor of drainage conditions, evapotranspiration and inputs through precipitation and lateral water flow)...

- L70: "This field sampling has been regionally limited and biased towards a few high intensity burn complexes in North America which may in turn bias global emission estimates (Veraverbeke et al., 2021; van Leeuwen et al., 2014; Akagi et al., 2011)."
(Comment) There is no statement of potential bias in global emissions modelling in Veraverbeke et al. (2021). If you want to cite this paper, please consider rephrasing this sentence as follows "This field sampling has been regionally limited and biased towards a few high intensity burn complexes in North America (Veraverbeke et al., 2021), which may in turn bias global emission estimates (van Leeuwen et al., 2014; Akagi et al., 2011)."

Thank you, this was changed.

LN68: This field sampling has been regionally limited and biased towards a few high intensity burn complexes in North America (Veraverbeke et al., 2021) which may in turn bias global emission estimates (van Leeuwen et al., 2014; Akagi et al., 2011).

- L86: (Comment) I do not understand what the authors mean by "simultaneous measurements". Please consider removing it.

It was meant to follow up on the previous sentence suggesting studies with measurements taken during the same season and time since fire are useful. The phrase was removed and a clarifier added.

LN85: Therefore, widely replicated, systematic field measurements of single-season fire processes in under sampled regions...

METHODS

- L139: "This method intended to add consistency to plot selection within the larger burn scars by placing sampled regions within the most developed portions of each fire. Thereby, the potential for observed differences in fire effect between burn scars due to varied spatial proximity to the fire periphery is assumed to be reduced."
(Comment) These two sentences are not clear to me. What do the authors mean by "the most developed portions of each fire"? Please consider rephrasing it.

We clarify that our measure of the development of the fire is using NBR. We modify the phrasing to more specifically state that we wish to avoid seeing differences in fire effect between burn scars due to varied proximity to these high NBR regions, rather than distance to the fire "periphery".

LN139: This method intended to add consistency to plot selection by placing sampled regions within the most highly fire-impacted regions as measured by NBR. Thereby, the potential for

observed differences in fire effect between burn scars due to varied spatial proximity to these highest impacted regions is assumed to be reduced.

- L183: “difficult to accurately measure and lacks standard methodology to estimate its consumption by fire (Jonsson et al., 2016).”

(Comment) It is understandable that the authors did not sample coarse woody debris (CWD) in their study sites for the reasons mentioned above but the last part of the sentence is more questionable. It is true that only few studies have included CWD in combustion estimates (e.g., Dieleman et al., 2020) based on visual estimation of fuel consumption, yet many studies have quantified CWD biomass in boreal forest stands (Alexander et al., 2012; Yang et al., 2018; Hanes et al., 2021) using field-based approaches. Please consider rephrasing the last part of this statement.

Thank you for pointing this out and understanding. We rephrase and reference to acknowledge that field estimates of CWD consumption exist.

LN180: Woody debris mixed in the moss/litter layer was sampled in this study, though not the coarse woody debris laying on top of this layer. While larger dead wood lying on top of the forest floor can contribute to C and N stocks and their losses due to fire, this material is typically of low prevalence in Sweden (Jonsson et al., 2016), difficult to accurately measure and standard methodology to estimate its consumption by fire is only beginning to be developed (Dieleman et al., 2020).

- L315: “Replacing C with N also showed no significant correlations”

(Comment) Please consider rephrasing this sentence.

LN316: These relationships regarding N also showed no significant correlations.

TECHNICAL COMMENTS

(Comment) Please find attached pdf with minor suggestions directly on the manuscript.

Thanks for the detailed attention. These comments were addressed in a new revision of the manuscript.