Interactive comment on "Comparing modelled fire dynamics with charcoal records for the Holocene" by T. Brücher et al.

Reply to Anonymous Referee #1

Dear Referee,

thanks for your kind and helpful comments to the paper to improve the paper further.

Please find our specific changes to your comments:

Interpretation of charcoal records (L113-122). Are these records not regional and time dependent?

> Yes, they are regional and time dependent. To make this more precise, we will change the paragraph as follows:
>
> *"The last question is important because (i) the fire model provides quantitative information about burned area and fire-related emissions of CO_2, but charcoal-based palaeofire data only provide information about relative changes in biomass burning for specific regions and time periods, and (ii) since the charcoal records are interpreted via a non-linear power transformation, the model can be used to determine whether, ..."*

some more discussion about the fire model is necessary (L234-239). Potential area burned is a function of moisture and wind speed - what moisture - fuel moisture – live or dead - atmospheric moisture

> Sorry for not being specific enough in this sentence. It is for sure fuel moisture, which is stated in the sentence before. Anyhow, we will clarify this by the following changes:
>
> *"The fire model calculates a potential burned area, which is simulated as a function of fuel moisture and wind speed. Fuel moisture is not explicitly simulated in the model. Soil moisture is taken as a proxy for the fuel moisture."*

L309 250 year moving window...why 250 - did you try other time periods.

> If it comes to the analysis of charcoal data, we used 250years as a moving window, because it provides a reasonable trade-off between having enough samples and records inside the moving window, and yet is not so big that it smoothes interesting details that we wanted to capture.
> There is a range we could have possibly used, but 250 captures multi-century scale variability and millennial-scale trends, but does not overwhelm us with too much detail at this scale.

L335 - substantial summer warming - how much?

Some 2 to 3°C summer warming in the Northern boreal region. We will add the numbers.

"This led to substantial summer warming of up to 2 to 3°C which was most pronounced in high northern latitudes (e.g, Renssen et al., 2009)."

L395-400 you state that the trend in fire activity is climate driven and not fuel driven...this is important and perhaps some discussions on the relative role of climate and fuel over different regions and time periods is in order

It might be, that the sentence is misleading. We change 'climate driven' to 'moisture driven' (as fuel is also driven by climate), and put the statement as a hypothesis, as our model simulation could not answer the question, which trend is climate (moisture) or fuel driven. So, further simulations would be necessary to have a complete setup to do a factor separation keeping fuel or moisture or climate constant. This goes beyond the scope of this work.

The sentence will be changed as follows:

"Because of the humid climate in the northern tropics, decreases in fire activity become amplified with time. Therefore, we hypothesize the trend in fire activity is moisture driven and not determined by fuel."