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Comment on cp-2021-36

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Community comment on "Reconstructing burnt area during the Holocene: an Iberian case study" by Yicheng Shen et al., *Clim. Past Discuss.*,
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Quite interesting work. However I have a major concern regarding the reasoning used in S3 (Justification for the use of the fourth root of the palaeo burnt area fraction used in the fxTWA-PLS analyses). The authors state that "Fire accelerates as it spreads". This is only true during the initial stage of fire development. A fire takes 15-30 min to accelerate to its potential spread rate under the prevailing environmental conditions, and other studies found out that the potential ROS is attained only when the width of the fire reaches 50-200 m, depending on fuel type. After that ROS will not be influenced by time, and will only react to changes in wind, moisture, fuel structure and terrain. Consequently, ROS is independent of time (spread duration) for any established free-burning fire and so "thus, ROS is proportional to the square of the fire duration" is also untrue. The authors also say that "the area covered by a fire is approximately proportional to the square of the distance covered by the fire front" when in fact such area is directly proportional to $(\text{distance})^2$. I am not including references but all this is easily found in the fire behaviour literature (fire development following an elliptical model) and used in point (BehavePlus) or spatial standard fire growth software (Farsite/FlamMap and its Canadian and Australian counterparts). S3 assumptions and calculations are incorrect and so this implies that the burnt area reconstruction should be reconstructed.

Additionally, I have two comments in relation to the burned area figures:

- 1) Figure 2 indicates the mean annual burned area to reach a maximum of 0.30% in northwestern Iberia. This is 2 orders of magnitude lower than the observed values. Judging from the map in Giglio et al. 2013 it's not produced by GFED4 underestimation, which by the way appears as GEFD4 in the text at least once.
- 2) Annual burned area of the Iberian Peninsula is currently about 200 kha, or 0.34% of the land mass. However, Fig. 5 points to about 0.04%, so about 10 times less. Again, this does not seem to be an artifact of using GFED4