Author's reply to 'Comment on egusphere-2023-529', Anonymous Referee #1, 02 Jun 2023

This research examines historical burned area (2006-2022) in French Mediterranean, Atlantic Pine and temperature forests. 2022 was an exceptionally large fire year which led to higher than usual burned area to occur in the Atlantic Pine and temperature forests compared to more historically frequent burning in the Mediterranean systems. Burning in the old-growth Atlantic Pine and temperature forests lead to higher biomass loss than the Mediterranean forests, and by using higher resolution satellite imagery, less burned area was reported compared to EFFIS and MODIS. Additionally, Lidar based biomass estimates are combined with burned area in a novel approach.

First and foremost, the authors would like to thank referee #1 and the journal's associate editor, who agreed to supervise the peer review of this article. We would like to thank referee #1 for his comments on our study, and will do our best to respond to them in the remainder of this document.

Comments:

1. Line 85. This is a 0.25 degree product I believe.

Correct, this element has been corrected in the next version of the manuscript.

2. Line 134. I am a little confused how the pre and post-burn periods are defined temporally. Are NDVI, NBR and NBR2 acquired 1 year pre fire and 1 year post-fire or some other method used?

Indeed, this part of the study is not properly explained, and converges with issues raised by reviewer2. We have therefore added the following statements to the new version of the manuscript:
"The fire date is provided by the first hotspot detected by FIRMS. The pre-fire period thus runs from January 1st of the year of interest to the fire date, and the post-fire period lasts from the fire date to the analysis date. The analysis date is generally several months after the fire, to guarantee a sufficient number of satellite images without cloud cover.

3. Line 136. What are the parameters in your random forest? How many trees, depth of the trees etc. How is your random forest validated? Cross validation of some sort? What are the evaluation metrics? Without knowing how well the model is performing it is hard to know if the classifier is any good. I realize you compare burned area to ERFFIS and MODIS, but the actual random forest validation metrics will be useful to include.

In the BAMT software as described in Roteta et al. 2021, we use 500 trees and the maximum tree depth ("maxNodes") was kept as default, which means that's unlimited. The evaluation is basically done through visual inspection (by comparing the burned patch with the pre- and post-composites in the background to see if it was correct), a standard for reference datasets as we mentioned (Franquesa et al.). BAMTS provides a final probability layer from the RF analysis that defines what is burned (>=50%) vs unburned. The cross validation would require ‘ground reference datasets’ not available, replaced by a visual inspection on each single fire. This is a semi automated method with visual checking for each single fire (not a fully automated), guaranteeing the data quality and full inspection, so we highly reduce the uncertainty own to locally varying spectral signal and affecting the performance of fully automated methods which have to be evaluated against reference datasets (as BARD dataset franquesa et al.) performed with visual checking by expert, the level of accuracy that we provided here.

4. Line 143. In general it would be better if your figures went in order, they jump from 1 to 4 here.

In order to maintain the correct sequence of figure references, we mention figure 2 here in the next version, which also shows examples of BAMTS polygons.

5. Line 144. How are you designating the forest/shrubland/pasture/grasslands? Is this an ancillary product that should be cited?

The distinction between forest and low vegetation is mentioned line 255 and 256 "all burned 10 m pixels with vegetation higher than 3 meters were treated like forests to calculate AGB-L. The pixels with vegetation shorter than 3 meters were considered to be non-forests. ". Areas considered as forest (height > 3m) acquire a biomass value according to the AGB-L method presented.
Shrublands are only considered in the case of areas of sclerophyllous vegetation. This information is provided by the CORINE LC dataset. These zones are assigned a specific biomass value (10t/ha). Areas corresponding to neither forest nor sclerophyllous vegetation are considered as grassland (no distinction with pasture), and are assigned a biomass value of 4t/ha.

6. Line 157. What type of resampling?

We used a nearest neighbours resampling method here in order to preserve the original aspect of the 20 m resolution bands.

7. Line 160. Which cloud mask? Citation needed.

We used the QA60 cloud mask provided with the Sentinel-2 data in order to mask the clouds. This operation was done in Google Earth Engine as described here: https://developers.google.com/earth-engine/datasets/catalog/COPERNICUS_S2_SR#description

To help the reader learn more about the details of height estimation, we refer to the manuscript submitted by Schwartz et al. 2023 to the journal Earth System Science Data in the next version : Schwartz, M., Ciais, P., De Truchis, A., Chave, J., Ottlé, C., Vega, C., Wigneron, J.-P., Nicolas, M., Jouaber, S., Liu, S., Brandt, M., and Fayad, I.: FORMS: Forest Multiple Source height, wood volume, and biomass maps in France at 10 to 30 m resolution based on Sentinel-1, Sentinel-2, and GEDI data with a deep learning approach, Earth Syst. Sci. Data Discuss. [preprint], https://doi.org/10.5194/essd-2023-196, in review, 2023.

8. Line 285. Space between 66,393 and ha needed.

This has been corrected for the next version

9. Line 398. Space needed, 2022,before.

This has been corrected for the next version