**Reviewer #3: Anonymous Referee**

**Thanks to their authors for their submission. The fire science discipline is always advantaged by studies on pre-burn biomass determination followed by assessing the impact of fire behaviour on fuel consumption and emissions. In a changing climate, such investigations are worthwhile so well done on getting the work to this point. Some corrections are required before a favourable decision can be reached on this article. Two higher-level questions involve:**

Thank you very much for your reply. We appreciate the time the reviewer spent on reviewing the manuscript. We have considered all of the reviewer comments and suggestions, and either incorporated them into the text or responded to them below.

**Statistical analysis. Multiple linear regression and two/three-way Analysis of Variance is used in this manuscript. I would recommend that the authors check (and report upon) whether the assumptions underpinning these techniques are satisfied or not. The conclusions of this manuscript hinge on statistical analysis of results so a robust effort is required here.**

What we have done with all parametric tests is to represent the residuals of the models with the predicted values. Examining the graphical representation of the residuals against the expected values allows us to assess a series of assumptions made about the quality of the model fit: (i) Normality: the residuals are assumed to be normally distributed around each predicted value; (ii) Linearity: it is also assumed that there is a linear relationship between the residuals and the predicted values; (iii) Homoscedasticity: it is also assumed that the variance of the residuals is similar for different values of the dependent variable.

If the editor considers it appropriate to show all residual graphics in the supplementary material, we will include them.

**The discussion section needs more work. In my opinion two extra sections are required. 1) An additional sub-section would compare your results with other inventories in your country either at the regional or national level. This will make it easier for the reader to see how your estimates quantitatively compare with previous work. 2) A section should be added on uncertainties in your emissions estimates since you rely on information source with error e.g. allometric equations for biomass determination, plot level sampling errors and emission factors with uncertainties.**

We agree with your two suggestions. First, we have upgraded the discussion including more references to compare our results with other works or methodologies used to measure wildfire emissions. Second, there is a new section "4.4 Uncertainties in emissions estimates and limitations", which includes the various limitations and uncertainties at the different levels of emissions estimation (field work, different components of the calculation method, i.e. calculation of the pre-fire fuel load, estimation of the combustion factor, emission factors, etc.). We have included in this section all comments from all of reviewers to enrich and clarify how can be considered the results of this study.

**Some other suggested corrections are:**

**The phrase 'wind-driven wildfire' is used in the manuscript. Is there such a thing as 'non-**

**wind-driven wildfire'. I thought wind would always be a necessary component for wildland fire.**

This terminology started to be used more frequently after the Fire Paradox project in Europe (Silva et al, 2010). The European Project "Fire Paradox" analyzed the spread of fire in historical wildfires and showed that there were similar spread schemes dominated by common factors (e.g. wind direction and speed). Depending on the spread scheme and the dominant spread factor, three fire types were defined: convection or plume dominated fires, wind-driven fires and topographic fires (Castellnou et al., 2013; Costa et al., 2011). Firstly, convection or plume-dominated fires are characterized by the accumulation of high quantity of available fuels and atmospheric instability. This fire type has such a high intensity and extreme behavior that produces its own fire environment and generates massive spotting. Secondly, wind-driven fires follow the speed and direction of strong winds when the meteorological window that produces the fire conditions is maintained, with the same intensity and velocity during day and night. In both of them, small changes in the landscape have little influence in the direction and behavior of these fire types, especially under extreme meteorological conditions. In contrast, topographic fires are dominated by local winds caused by slope and differences in solar heating of the earth surface (i.e. sea breeze, land breeze, valley and slope winds). The direction of this fire type changes with topography (e.g. hydrographic basins, main valley), and it has high intensity during the day and low intensity at night (Castellnou et al., 2013; Costa et al., 2011). In the latter fire type, wildfire is more sensitive to small changes, thus little variations of topographical wind, slope or aspect have higher influence on fire behavior (Lecina-Diaz et al., 2014).

The combination of two or three fire types in the same wildfire might be common in North America, Canada and Australia, since fire usually burns during many days or months and involves large areas of the landscape. Nevertheless, the majority of wildfires in Europe burn for 48 hours or less, thus fire has fewer opportunities to flip from one fire type to another.

**References:**

Castellnou, M., Pagés, J., Miralles, M., Piqué, M.: Tipificación de los incendios forestales de Catalunña. Elaboración del mapa de incendios de diseño como herramienta para la gestión forestal. Proceedings of the 5th Congreso Forestal Espanñool Ávila, Spain. Available: https://interior.gencat.cat/web/.content/home/030_arees_dactuacio/bombers/foc_forestal/jornades_recerca_cooperacio_internacional/articles_de_recerca_en_foc_forestal/articles_incendis_forestals/2009_Castellnou-et-al_tipificacion-IF-en-CAT_Mapa-incendios-de-diseno_CongrAvila.pdf (last access: 29 July 2024), 2009.

Costa, P., Castellnou, M., Larrañaga, A., Miralles, M., and Kraus, D.: Prevention of Large Wildfires using the Fire Types Concept, Departament de Interior.Generalitat de Catalunya., Cerdanyola del Vall,s, Barcelona, Spain., https://interior.gencat.cat/ca/el_departament/publicacions/proteccio_civil/la_prevencio_dels_grans_incendis_forestals_adaptada_a_l_incendi_tipus/index.html (last access: 29 July 2024), 2011.

Lecina-Diaz, J., Alvarez, A., and Retana, J.: Extreme fire severity patterns in topographic, convective and wind-driven historical wildfires of mediterranean pine forests, PLoS One, https://doi.org/10.1371/journal.pone.0085127, 2014.

Silva, JS., Rego, F., Fernandes, P., Rigolot, E., editors Towards Integrated Fire Management - Outcomes of the European Project Fire Paradox. European Forest Institute Research Report 23. https://efi.int/publications-bank/towards-integrated-fire-management-outcomes-european-project-fire-paradox (last access: 29 July 2024), 2010.

**Line (L) 15. … 'one of the largest wildfires of the last decade'. In what context is this e.g. fires in Spain, fires in the Mediterranean region?**

You are right, we did not specify the location well enough in the abstract. The Jonquera fire was in north-eastern Spain, we have included this information in the abstract.

**Please remove emotive phrases from the manuscript e.g. L25 'massive wildfire', L56 'huge inaccuracies'**

We have revised the text to remove all emotive sentences and rephrase unnecessary nuances.

**L44. You mention health impacts from wildfire particulate matter. It is worth pointing out that gas phase pollutants from wildfire also have health effects as well.**

Thank you, you are right, we have included this point in the sentence.

**L53. Referring to the 'Seiler and Crutzen (1980) method' strikes me as jargon. Technically, it is a fuel consumption method that Seiler and Crutzen (1980) developed.**

Yes, thank you for the observation, we have written another brief paragraph to clarify the method is in comprehensive way.

**Page 2 bottom paragraph. I'm wondering whether the paper below is worth citing to provide a technical definition for what you are referring to as 'fire severity'?**

**E. Keeley. Fire intensity, fire severity and burn severity: A brief review and suggested usage**

**International Journal of Wildland Fire https://doi.org/10.1071/WF07049**

Yes, thank you, we have included a technical definition with your reference (Keeley, 2009) to clarify the meaning of fire severity, together with a suggestion from other reviewer that asks for including a reference for what fire severity is.

**Page 3. L2 and L415. I would remove the phrase 'unprecedented combination of …'. The type of investigation you are conducting is standard practice rather than unprecedented.**

Yes, we have removed "unprecedented combination", but we have highlighted the novelty of the field work data in Spain at least, and the use of litter component in the total fuel load component.

**L115. Moisture content. Is this fine fuel moisture content or something else?**

Yes, that was a mistake. It has been corrected to "Relative humidity".

**Around L130. When you refer to charred trees up to what height level are trees generally charred?**

We have clarified this description in the section "2.3 Field plot data and fire severity estimation", which was split into two different paragraphs with a brief description of the fire severity classification from tree level to plot level following Alvarez et al. (2013).

Reference:

Alvarez, A., Gracia, M., Castellnou, M., and Retana, J.: Variables That Influence Changes in Fire Severity and Their Relationship with Changes Between Surface and Crown Fires in a Wind-Driven Wildfire, For. Sci., 59, 139–150, https://doi.org/10.5849/forsci.10-140, 2013.

**Figure 2. Is this figure adapted or adopted from Alvarez et al. (2012)? If it is adopted you will need copyright permissions to use this figure.**

Thank you for the observation, the figure has been taken and adopted from Alvarez et al. (2012), so, probably we will redraw a new one to convey the same meaning.

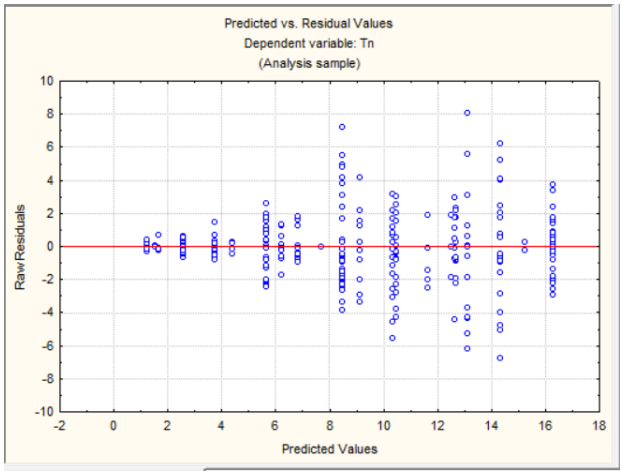
**Equation 1. Use multiplication signs rather than the letter x.**

Thank you, this has been changed.

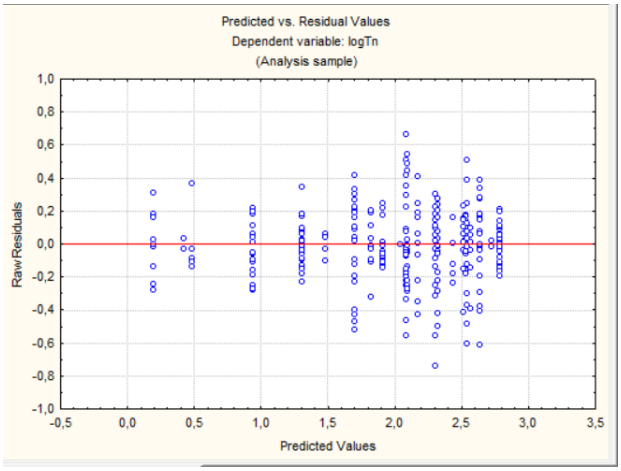
**L233. Log transform for normality. What test did you use for this and what was the result e.g. test statistic and p-value?**

As we have explained in the first response to the reviewer, we have examined the graphical representation of the residuals against the expected values allows us to assess a series of assumptions made about the quality of the model fit: normality, linearity and homoscedasticity. When we transformed the variable into logarithm, the graph of the residuals improved as you can see in the three factor ANOVA of available biomass among fuel types considering the three different layers (crown, shrub and litter) in the two species.

Untransformed available biomass (also in the pdf)




Log-transformed available biomass (also in the pdf)




**L241. What was the required significance level for significant differences?**

The required significance level was 0.05, which corresponds to a 95% confidence level

**Figure 3. Is the log base 10 or base e?**

It is base e.

**Table 2. Is there any reason why nitrous oxide was excluded from your analysis since it is a major greenhouse gas?**

We understand the concern about the lack of nitrous oxide emission values. We only used those gases and pollutants with values from each stratum (crown, shrub, litter) but we did not find emission factors for litter from *Pinus halepensis* and *Quercus suber*. We have added one sentence highlining the importance of having more emission factors available for species especially for nitrous oxide and similar components because of their higher impact on greenhouse phenomenon in the new section **"4.4 Uncertainties in emissions estimates and limitations"**