

## ***Interactive comment on “Atmospheric emissions from vegetation fires in Portugal (1990–2008): estimates, uncertainty analysis, and sensitivity analysis” by I. M. D. Rosa et al.***

### **Anonymous Referee #2**

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Atmospheric emissions from vegetation fires in Portugal (1990–2008): estimates, uncertainty analysis, and sensitivity analysis

The authors present wildfires annual emissions in Portugal over the last two decades. The most interesting and innovative part of the paper is the uncertainty and in some way sensitivity analysis of this emissions estimation. The paper is very interesting and it was a pleasure to read it and analyse it. It addresses one important and up to date research topic, which is the need to clearly quantify wildfire emissions uncertainty and to identify the most important parameters affecting these emissions.

The concepts, ideas, tools and data are not so innovative, but the final results and

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conclusions can be considered as a scientific advance allowing a better understanding of wildfire emissions over the time for a south-European country.

However, there are some aspects of the paper that should be improved and/or better explained, namely:

- the methods and scientific assumptions are not always clearly outlined; several times “grey literature” is referred as the basis for the applied methods. The authors should avoid to be based on this type of references only. If these are the only ones authors should develop more the description of the used methods, equations, and assumptions.

- one conclusion is the possibility to estimate GHG emissions based on burnt area; I would like to have a stronger scientific basis for this conclusion (a simple linear regression is not enough). Anyway this correlation between GHG emissions and burnt area should be mentioned and stated (but not as a clear conclusion).

- the traceability of results is not always possible. For instance authors don't provide neither mention the area burnt data source. Only the abstract contains this information and it is very generic.

- the authors tried to do a comprehensive state-of-the-art, but one of the most important topics is not covered – new methodologies to estimate wildfire emissions. Also other wildfire emissions inventories and estimates are not entirely covered. Moreover, a comparison of those emission inventories data for wildfires in Portugal with this paper's data would be an added value.

- remember to write the names of the species in italic.

In summary, I consider the papers interesting and worth to publish if major revision is done.

Following you can find more specific comments along the document:

- Abstract The abstract provides a concise and complete summary of the paper. Only

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three remarks: line 9 – Monte Carlos is only mentioned here. Along the paper Monte Carlo is not clearly mentioned again. line 11 – clarify what is CO<sub>2</sub>eq. line 15 – “allowing for accurate emissions estimated” – do you really think these emissions estimate are going to be accurate?

- 1. Introduction The CO<sub>2</sub>eq concept is not explained at all. Page 22049 line 2- Brown et al or Brown and Smith? line 2 – 7 – this sentence is not clear to me. Please, revise it. line 10 – clarify Miranda et al, 2009: is it 2009a, 2009b, or both? line 11 – Hodzic et al is missing in the references list. Page 22050 line 11 – 19 – these sentences are not clear. Too many numbers (emissions, dates, percentages) are provided with too much detail. Try to rewrite them. line 27 – Korontzi et al is missing in the references list. line 27 – 29 – you’re saying that you used much higher spatial resolution satellite imagery and checked for accuracy against filed data, but you never describe what you used and how.

- 2. Study area line 8 – Portuguese climate is temperate.

- 3. Data and Methods line 7 – you have to clarify which GHG are you considering. You’re including other than only GHG gases in your analysis. 3.1 Burnt area The used land cover datasets are described, but how did you get the burnt area? Based on satellite data? lines 11 – 12 – please explain how did you update the land cover maps with the areas burnt annually. Table 1 – clarify what is “Burnt in 1990 to Burnt on 2007”. lines 19 – 20 – once again, describe how did you overlaid the land cover map with the fire perimeter atlas. What fire perimeter atlas? 3.2 Biomass estimation In this section you’re using several references to support the description of your methods, which are not peer-reviewed international publications. You should avoid this type of references to support your methodology description. Table 2 – order the forest cover as in the previous table. Fernandes et al (2000b) is missing. At the references list you have to clarify what is Fernandes et al 2000a and Fernandes et al 2000b. Table 3 – Include BEHAVE in the table’s caption. 3.3 Combustion factors You have to say that Table 4 data are coming from a bibliographic review. Table 4 – Pay attention to Fernandes et

al 2000a; it not yet defined in the references list. Table 4 doesn't include combustion factors for agriculture. So, what did you use? 3.4 Emission factors line 16 – nitric oxide (NO) or nitrogen oxides (NO<sub>x</sub>)? Because when presenting and discussing results you mention NO<sub>x</sub> instead of NO. 3.5 Uncertainty and sensitivity analysis Page 22057 line 23 – I don't understand why the variable space  $k$  is equal to 441. line 27 – the same applies to  $N$  equals to 256 and a total of 113408 runs. If you cannot easily explain why you're using these numbers, don't mention them. Page 22058 Line 15 – 18 – now you're mentioning Landsat-based annual burnt area maps and country-level field statistics. I really would like to have a better description of the used burnt area data at section 3.1. I also would like to have a stronger basis for the 10% postulated coefficient of variation. Page 22059 line 2 – equation 7 was not presented yet. The Olson's model is presented in equation 3. line 3 – What is Rambal data? line 7 – 8 – where are the combustion factors for agriculture? Or did I miss something?

- 4. Results Figure 1 – take a look to the vertical axis; it is not starting at zero. Figure 2, 3 and 4 – Can't you join these 3 figures? Page 22061 Figure 6 – horizontal axis – kg instead of Kg. line 21 – how did you estimate CO<sub>2</sub>eq? Based on what GWP values? Figure 12 – include GHG in the figure caption.

- 5. Discussion Page 22066 Line 26 – replace MP2.5 by PM2.5 Page 22067 line 17 – Miranda et al 2009b didn't publish emission estimates, but generic emission factors to be applied in Portugal. If you want wildfire emission estimates and their comparison with emissions from other sources take a look to Miranda et al., 2008 (Forest fires impact on air quality over Portugal. In NATO/CCMS International Technical Meeting on Air Pollution Modeling and its applications, 29, Aveiro, Portugal, 24-28 September 2007 – Air Pollution Modeling and Its Applications XIX. Springer: C. Borrego & A.I. Miranda, 2008, p. 190-198). Page 22068 Before starting analysing figure 13's content you have to mention the figure.

- 6. Conclusions line 9 – remember my comment regarding the gases for what you estimated emissions. Not only GHG were considered.

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