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Biogeosciences Discussions

Interactive comment on "Two thresholds determine climatic control of forest-fire size in Europe" *by* L. Loepfe et al.

Anonymous Referee #2

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Review Âń two thresholds determine forest fire size in europe Âż by loepfe et al. BGD

The present paper aims at understanding the fire size/weather relationship along the European climate gradient from northern latitudes to the Mediterranean at a continental scale. The idea of focusing the study on fire size is definitely a focus of interest hardly ever considered in the literature with the reasons clearly stated in the paper (the availability of large scale datasets). Using the MODIS database to identify large fires is a step forward in the use of this global dataset, usually processed for fire emissions at the global scale in terms of burnt areas and seasonality. In this sense, the topic of the paper is of interest for publication.

However I have some concerns about the direct link of climate with fire size and the way the data have been studied.

Climate data base: the authors use the ENSEMBLE daily climate data covering Europe and north Africa. This database is actually a key database for continental studies in Europe. However, the authors mention the gaps in the database along the whole time serie and the way they corrected these gaps. As a user of this database also for some specific regions where I could identify significant gaps, I'd like the authors to provide the amount of gap days in the series and their continental distribution. I am particularly concerned for the north African part and the representativeness of the number of stations used for this database, which as far as I know, are much lower than in Europe. In case the accuracy of data is not as good as the European side, is it useful to insert north Africa in the study? Other datasets as JRCmars agri4cast from JRC, might be less gapped.

Vegetation maps: the authors use the IGBP land cover map. Many other datasets do exist for land cover and some studies illustrated the discrepancies in the datasets (MacCallum 2006, Herold 2008). I understand the use of this dataset to cover Europe and north Africa. In the case of a Europe only analysis, why not using corine land cover, with might be far more accurate and more detailed?

Figure 1: figure 1 illustrates the relationship between actual fire size and MODIS fire size for Portugal. The authors mention the good agreement for large fires. I am actually concerned that some actual large fires are not captured by MODIS. I am wondering if these large fires not captured by MODIS would be preferentially located in the dryer areas where fire signal could be weaker and not captured by MODIS? Could the authors confirm with a figure that these missed large fires are evenly distributed in the wettest and driest part of Portugal? If this is not the case and there is a link between missed large fires and drought index (I mean the Biomass index related to drought in the text), most of the conclusions would be biased.

Figure 2 is the key result of that study, showing that large fires happen at intermediate DC. However, processes behind that result are poorly explored. Many indirect links are proposed in the discussion, particularly through fuel continuity. This graph is based on

the relation ship between the size of each single fire and the daily DC where the fire happens. One missing information is some landscape fragmentation data where these fires happen. I am wondering if forested patch size would be lower where extremely high DC happen, thus preventing fires to spread out into fire as large as with lower DC. Corine land cover might provide enough details to bring this information. Without this information, I am actually only partially convinced by the results for higher DC. A graph showing forested patch size where a fire happen as a function of DC for that fire would be very helpful to figure if the bell shaped curve of observed for large fire occurrence would be the result (or not) of a bell shaped curve of forest patches as a function of DC.

Figure 3 is actually informative but poorly described in the results. The conclusions from this figure are that large fires happen for intermediate DC where average annual rainfall (a proxy to biomass) is high. In this sense, the changes in large fire risk (safe transition and saturation) in the last decades in figure 5 should account for both information, the changes in annual rainfall (long term changes in vegetation) and DC (fuel dryness).

In conclusion, I think there is here a very interesting topic to explore, but the use of DC only is not fully convincing. As the result part of the paper is short compared to discussion, I think additional results would be necessary for a more convincing statement. Also the long term effects of drought (annual average rainfall and effect on biomass or fuel continuity) and short term effects on fuel dryness are not clearly stated, bringing some confusion for the reader. I suggest to include these additional information and reformulate the result part (and shorten the conceptual discussion before final publication)

McCallum, I., Obersteiner, M. et al. (2006). "A spatial comparison of four satellite derived 1 km global land cover datasets." International Journal of Applied Earth Observation and Geoinformation 8(4): 246-255. Herold, M., Mayaux, P. et al. (2008). "Some challenges in global land cover mapping: An assessment of agreement and accuracy

in existing 1 km datasets." Remote Sensing of Environment 112(5): 2538-2556.

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