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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Modeling anthropogenic and natural fire ignitions in an inner-alpine valley" *by* Giorgio Vacchiano et al.

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Reviewer comments #1

RC1.1: Introduction - The assumption that the increase in total area burned by fires larger than 10 ha in 1981-2000 relative to 1961-1980 must be duly justified. How the authors have separated the influence of climate change from the other socioeconomic and environmental changes occurred since the 60's?

REPLY: This is a result from a previous referenced work referenced at the end of the paragraph (Vacchiano & Motta 2015, doi:10.1007/s13595-014-0439-4). In that paper this was just a descriptive summary statistic of burned area across time, computed from regional fire records. I will make the reference more explicit and rewrite the sentence as

to present the fact and avoid directly suggesting that it might be due to climate change.

RC1.2: The objectives and hypothesis presented in this section are not fully explored/justified in the following ones; Further work is required to improve the manuscript by adjusting the concepts and references presented to the ideas and assumptions presented in the results and discussion.

REPLY: this remark is quite general; replies to RC1.9 and RC1.11 apply.

RC1.3: Methods - Overall, the conceptual design of the study is not properly explained, in what concerns the creation of individual datasets and the interpretation of the results obtained. The conceptual choice of dividing the fire ignition data by land cover type (grassland or forest) only for winter fires is not properly justified. Why is this choice made? It can be a valuable option, considering the specific characteristics of alpine fires, but they are not explained. This changes the interpretation of the results and the assessment of the implications for fire management.

REPLY: the first subdivision is made because summer and winter fires are hypothesized to have different causes (eg lightning vs management practices). Then, fires that were hypothesized to be preferentially caused from management (ie winter fires) were further subdivided between forests and grasslands, because management practices of these two land covers differ and management-related predictors could therefore play a different role. A sentence will be added to the methods to explain such rationale.

RC1.4: Furthermore, since land cover types were also used as predictors in the model, how can their influence in fire ignition patterns be evaluated independently, considering that they were already applied as criteria for creating separate datasets of the dependent variable?

REPLY: The reviewer is right. Land cover will be removed from all analysis as it is redundant.

RC1.5: The categories of independent variables included in the model are unbalanced,

i.e., there are 15 climatic variables, 5 related to land cover (with the issues presented beforehand), 3 regarding topography and 3 for anthropogenic conditions. How is this reflected in the weighting of their importance in the analysis?

REPLY: The number and type of variables used reflects data availability for the region. We do not think that unbalanced types of predictors is a problem. If variable selection techniques are robust, collinear variables (eg many among the numerous group of climatic predictors) will be pruned. Then, the model will still be able to discriminate between important and unimportant variables (in our case by using PPI), and it should well be possible that for example all predictors belonging to a certain category (eg all topographic variables) are assigned a low importance (effect size).

RC1.6: The choice of the regularization coefficient of 1.5 is based on previous studies, preliminary assessment?...

REPLY: this is approximately the value where preliminary MaxEnt tests produced the best results in a paper on regularization coefficients (Dudik et al. 2004, Figure 5: http://rob.schapire.net/papers/maxent_colt.pdf), which we will reference in the sentence.

RC1.7: Results - What is the proportion of ignitions for which there is no known cause? How does that affect the dataset included in the model? Were only the ignitions with known causes included?

REPLY: ignition was due to unknown causes on 65% of cases -will update the text accordingly. However, this does not affect the results: all ignitions were used in the models, and cause was not used as a predictive variable - rather, the point was using environmental, climatic, and anthropogenic proxies precisely to gain some insight on the causes of these largely unexplained ignitions.

RC1.8: In the PCA analysis, land cover variables are mentioned, but which type of land cover is represented (out of the 5 categories defined) and which ones are collinear with

other variables are not presented.

REPLY: Land cover will be removed from all analysis as it is redundant.

RC1.9: Discussion - The discussion is generally organized by natural and anthropogenic fires, a structure that is not followed in the other sections nor steered the creation of separate datasets (winter + landcover / summer), despite being presented in the title. The interpretation seems to be made by the authors based on the results obtained and the influence of specific variables, as described in the results section, but it does not support the overall structure of the article nor helps evaluating the prior results presented nor the objectives defined in the introduction.

REPLY: The hypothesis that summer fires are more driven by natural causes and winter ones by anthropogenic causes will be more clearly stated in the introduction, and used to support the study design, i.e., subdividing winter vs summer fires (see also reply to RC1.3). We will also clarify that the analyses done in the paper aim to confirm the hypothesis (i.e., are there differences in factors conducive to ignition between summer vs winter fires?)

RC1.10: Also, some assumptions are made that are not entirely supported by the results presented, such as the areas with higher agricultural population being more prone to fire (page 8), with no obvious relation with the variables included (which variables integrated in the analysis have based this assumption?).

REPLY: Land cover will be removed from all analysis as it is redundant (we will delete lines 14-18, p.8).

RC1.11: The authors mention as an objective that the results of the analysis can be used by land managers to inform fire prevention actions (P2), but this is not explored in the discussion and is only very briefly mentioned in the conclusions. What are the implications of these results for fire prevention and mitigation? Were the options regarding summer/winter fires related to fire management practiced in the study area?

How does the cause of fire (natural/anthropogenic) affect fire prevention in an alpine area?

REPLY: we will add to the Discussion a sentence describing how prevention measures can be (a) tailored seasonally (ie, focusing on education and prevention of negligence during the winter time when forest and pasture management are carried out, and aimed at reducing fuel biomass before the climatically-driven summer fires), and (b) informed by spatially-explicit risk assessment carried out by extrapolating model results to the whole land area of the region (Figure 8). Regarding fire prevention strategy already put into action: fuel management is not routinely carried out in the region, and prescribed fire is prohibited by law. A fire ban is in place at certain times of the year (depending on a fire danger rating calculated daily), but it is often ignored (knowingly or otherwise). We will add a sentence to the study area description and/or discussion to highlight this point.

RC1.12: The Tables/Figures presented are generally explicit, but do not cover all the desirable components; a table with the sources and scale of the variables integrated and how they were normalized would be useful; maps with the spatial distribution of the most important variables (and the classes defined) would be helpful.

REPLY: a summary table with mean and ranges for the predictors used, and a panelled map figure with their spatial distribution, will be added at the beginning of the Results section.

RC1.13: In legend of Fig 2 - Is it Corine Land Cover 1990 used, or 2006, as mentioned in text?

REPLY: 1990 is correct, as it is the year when monitoring of fire ignition started. Also see reply to RC1.4.

RC1.14: Scale of graphs of fig. 7 should be all the same to facilitate comparison

REPLY: agree, we will homogenize the range of y-axis for Figures 6 and 7 (range: 0 to

0.7)

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