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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 #2

RC2.1: In section 2.2, data analysis: You mention the fitting algorithm in MaxEnt. Could you please add more information about the way the best set of predictors is selected?

REPLY: Maximum entropy is a machine-learning general-purpose method used to obtain predictions or make inferences from incomplete information (Phillips et al., 2006). Given a set of samples (i.e., fire occurrences) and set of features (environmental variables), MaxEnt estimates "niches" for ignitions by finding the distribution of probabilities closest to uniform (maximum entropy), constrained to the fact that feature values match their empirical average (Phillips, 2004). However, MaxEnt does not perform

model selection; this was carried out by the preminary Principal Component Analysis. The methods will be clarified accordingly.

RC2.2: You mention several mathematical transformations, but how much exactly.

REPLY: Modeled feature classes in Maxent potentially included linear, quadratic, product, hinge, threshold, and categorical. Linear features model linear response to a covariate, while quadratic features model response to the variable squared. Product features model interactions between paired variables. Hinge features model piecewise constant responses, while threshold features model abrupt boundary relationships between covariates and response. Category features are binary indicators used to indicate positive or null response to each class within a categorical covariate (e.g., thematic land cover map). The methods will be clarified accordingly.

RC2.3: Moreover, what does "the regularization coefficient" mean, and how do you fix it at 1.5 ?

REPLY: A procedure called regularization is used in MaxEnt to avoid overfitting. If the algorithm is overfitting at the observed presence points, the response curves (y as a function of the given predictor, see reply to RC2.8) will contain reversals of direction, sharp bends, and other shapes that do not make biological sense. The ability to change the regularization settings for each feature type (see reply to RC2.2) is available in MaxEnt, but users typically adjust regularization via a single setting that acts as a multiplier for the default values. The methods will be clarified accordingly.

RC2.4: You mention "data splitting was carried out by 5 bootstrap samples". Could you clarify this process and explain how it is combined with the (70%/30%) subsets?

REPLY: Bootstrap is a model validation technique whereby the points belonging to the calibration (model fitting) and validation (model checking) sets are assigned not just once but X times, by random sampling with replacement. Final validation statistics are averages of validation statistics computed on each of the X validation sets. The

methods will be clarified accordingly.

RC2.5: The "leave one out procedure assisted by jackknife repeated replication" is not clear. Could you please add more detail on this process?

REPLY: we will simplify reporting of effect size by reporting only PPI, so all mentions of %C and jackknife will be omitted from the manuscript.

RC2.6: In section 3, results: In table 1, you highlight the "Principal components analysis and selected predictors", but the first column (PC) is not clear and it is difficult to associate each PC to the corresponding variable. Could you please modify or add more information in order to understand the mentioned results?

REPLY: as explained in the methods, with the purpose of variable selection, we retained from each principal component only those variables with a loading > 0.32, i.e., explaining at least 10% of the variance of that component (Booth, 1994). We will improve the able caption and modify the layout of rows to enable readers to better associate each PC to the corresponding variable(s).

RC2.7: You present the results of table 2, but only for IPP. What about %c? What are the main differences?

REPLY: we will simplify reporting of effect size by reporting only PPI, so all mentions of %C and jackknife will be omitted from the manuscript.

RC2.8: Figures 6 and 7 are not clear at all. How did you obtain these figures? Please, indicate at least the method used in order to generate these plots.

REPLY: Figures 6 and 7 show Maxent response curves, ie., how each predictor affects ignition when modeled by Maxent. The curves show how the logistic prediction (bound between 0 and 1) changes as each environmental variable is varied, keeping all other environmental variables at their average sample value. Methods and figure caption will be edited for clarity.

RC2.9: You mention the direct and inverse correlation between the ignition probability and the number of grazing domestic animals according to the summer versus winter fires (figure 7). But, does this variable (N_GRAZ_ANIMALS) vary according to the seasons? If yes, how would it affect the results highlighted in figure 7?

REPLY: unfortunately, the census data refer to whole years, and does not allow to break apart the number of grazing animals by season. This number would certainly vary due to common rangeland practices (cattle are mostly in the plains during the winter). However, this should not affect our results because grazing management practices conducive to fire are carried out especially in winter, in the absence of cattle (eg burning grazing lands or residuals). Our working hypothesis is that areas hosting more cattle during the grazing season would apply a more intensive pasture management even during the winter months.

RC2.10: Minor comment: The percent permutation importance is first written as PPI, and then as IPP. Please check in the entire paper this issue, it should be better to uniform terminology within the paper.

REPLY: the acronym will be homogenized as PPI throughout the paper

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