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Interactive comment on "Quantifying the Importance of Antecedent Fuel-Related Vegetation Properties for Burnt Area using Random Forests" *by* Alexander Kuhn-Régnier et al.

Anonymous Referee #1

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Review of "Quantifying the Importance of Antecedent Fuel-Related Vegetation Properties for Burnt Area using Random Forests" by Alexander Kuhn-Régnier

The study tries to quantify the importance of antecedent vegetation status as drivers of global burnt area. The study builds on previous research using random forest modeling to understand the drivers of burnt area. While the importance of antecedent fuel load and type as drivers have been indicated previously, the study is well conducted and provides a deeper understanding towards the importance of these variables. The manuscript is well written. I have a couple of suggestions which I hope will improve the manuscript further.

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The paper shows clearly that including indicators of fuel quantity and properties improves the representation of monthly burnt area. However, monthly burnt area includes the spatial pattern, seasonality and interannual variability all together. One thing I would have like to see was a figure trying to split these factors apart, so showing whether the inclusion of antecedent fuel indicators also improves the seasonality and/or IAV of burnt area. Now, everything is mixed together, and it is hard to know whether the results are caused by an overall improvement of the spatial pattern in burnt area, the improved representation of the seasonality or improved representation of IAV. The problems with representing seasonality and IAV of burnt area is one of the topics discussed in the introduction, and seemingly partly why the authors conducted the study, so it is a bit strange that no detailed results are presented on this topic.

I was surprised to read that the study only used data for 2010-2015, while the MODIS record now covers 20 years. Knowing that in fuel limited semi-arid regions wet events can be very sporadic, I wondered whether this short timespan does not limit the study too much, especially with regard to representing IAV. The authors indicate that they use the time period for which all variables are present, but a slightly more restrictive set of variables (e.g. the least important ones) might allow for a much longer timeseries to be used and hence present more robust results. This might also help to extract results regarding seasonality and IAV.

While I think it is nice that the authors present the training and validation model performance results (Figure 1), I cannot deny that I am a bit worried regarding the relatively large differences in model performance between the training and the validation data. One indeed always expect some difference, but (at least for the models I have been building) the differences never get so big except when there is some important overfitting going on.

Some minor comments:

Title: the title reads a bit weird, at least the “for Burnt Area” part. Maybe “as drivers of

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burnt area", or something similar might sound slightly better?

L13: "are more sensitive to current conditions "are you still talking about the length of the period which needs to be considered to account for fuel build-up, or more about fuel dryness?

Table 1: "End" date seems pretty arbitrary, e.g. GFED4 burnt area has been updated up to the present.

Figure 2: There seems to be a couple of issues with the figure: 1) there is no separation between areas without data and no fire (e.g. Sahara compared to S-Australia). 2) There seems to be an artefact in the Iran/Afghanistan area, with a block-shape present. 3) for plot c the colors blend into each other so that it is hard to see any pattern (if it is present).

L215: there are a lot of abbreviations used in the manuscript. Many are pretty obvious (e.g. MaxT), but I would suggest writing out completely the less obvious ones like DD.

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