

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC1
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Comment on nhess-2021-262

Anonymous Referee #1

Referee comment on "Forecasting the regional fire radiative power for regularly ignited vegetation fires" by Tero M. Partanen and Mikhail Sofiev, Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-262-RC1>, 2021

The manuscript entitled "Forecasting the regional fire radiative power for regularly ignited vegetation fires" develops a model that can be used to predict the fire radiative power (FRP) and evaluates it against SEVIRI/MSG observations in the south-central African savannah. This paper is generally well written: the method is clearly presented, and the limitation for application in irregularly ignited fires is well discussed. However, I have a few concerns regarding the characteristics of the fire prediction model and its potential application.

Major comments:

- While I was reading the introduction, I was confused about the advantage of predicting FRP rather than using fire indices directly. The authors touch a little bit on the advantages in Lines 55-56 but it is not enough. If we want to apply some indices to guide fire prevention or forest fire suppression, fire indices are probably enough as they provide fire danger/potential regardless of if fire will happen. What additional information can FRP provide regarding fire prevention compared to fire indices? On the other hand, the prediction of FRP uses previous FRF information at annual and daily scales, which inherently includes the stochastic processes that happened before. And as also mentioned by the authors, the FRP prediction is difficult for irregularly ignited fires. Yet, there are limited areas with regularly ignited fires except for the sub-Saharan African savannah, south-central African savannah, and South America savannah. Clarifications should be added where FRP can be used and if it provides additional information compared to fire indices – this may depend on which conditions it will be used.

- The introduction shall be expanded to provide a more comprehensive background to a broader audience: 1) The review of fire effects is concentrated on the climate and health effects of fire emissions, while other fire effects on the ecosystem, surface energy, climate system are not mentioned. At least a few lines shall be added to provide an overview of these effects 2) Why do you predict FRP rather than burned area? The latter is more commonly used and has more observations with a longer period?
- After section 4.2, the authors shall include more comprehensive discussions regarding how the prediction of FRP can be applied in different parts of the world and their limitations. Moreover, as the fire prediction model method constructs the equation based on historical FRP information, it is not clear if the model performance is sensitive to different training years (as only 2010 is used for training in this paper). In addition, can we apply the model to predict FRP in the background of climate change?

Minor Comments

- Line 19: "anticipated in (Pechony and Shindell 2010)" shall be "anticipated in Pechony and Shindell (2010)". Revise here and other places in the remaining paragraphs.
- "Lines 46: Unfortunately, globally, neither all fires (ideally with a full FRP time dependence) nor their sources are observed remotely." The authors may want to emphasize a lack of FRP data on the global scale, yet the sentence is misleading. There are multiple remote sensing fire products worldwide. Please modify it to be more accurate
- Line 61: "It is estimated that of about 90 % of wildfires are human-induced (Lobert et al., 1999)." This is not accurate—please add time periods and regions.
- Line 75-76: should it be "we developed" and "we improved"?
- Line 90: Please merge the single line with the previous paragraph.
- Line 120: Define the biomass burning rate
- Line 125: Are there any references for the assumption?
- Line 139: It is a typo? "Julian-day-" should be "time-" to represent the daily shape curve?
- Line 199: When you split the Southern Africa Savanna into different grids, do you consider the land cover effects? In other words, does your method reflect the effects of land cover types on FRP?

- Line 200-201: Why do you use 2010 for model training and 2018 for evaluation? Back to my major comment #3, is the model performance sensitive to different training years?
- This may be a methodology question but it came to me when I was looking at Fig 1a: Why do you include time (Julian day) information when you describe the meteorological impact on FRP (the first term of Eq.1)? The Julian-day information is already included in the second term of Eq.1
- There are no figures showing the observed and predicted FRP magnitude on the regional scale. I would suggest adding a figure similar to Figure 4 but for FRP magnitude.
- Explain the red dots in Fig. 5
- Line 317: where do you show the “anthropogenic drivers of fires”?