

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC2
<https://doi.org/10.5194/nhess-2021-384-RC2>, 2022
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Comment on nhess-2021-384

Anonymous Referee #2

Referee comment on "A data-driven model for Fennoscandian wildfire danger" by Sigrid Jørgensen Bakke et al., Nat. Hazards Earth Syst. Sci. Discuss.,
<https://doi.org/10.5194/nhess-2021-384-RC2>, 2022

This manuscript uses machine learning methods to predict fire danger in Fennoscandia at approximately 0.25 degree spatial scale for 2001-2019. Here, the authors are using official statistics compared to MODIS burned area, with predicted fire danger probability models compared to the results from the Canadian Fire Weather Index. The method is novel and the comparison is rigorous, but the data and approach need to be explained more – and at times even cited better – to assess the efficacy of the model. In general, this manuscript needs to be revised in order to understand why this method may be useful for predicting fire danger probabilities. First, the authors should explain what fire danger is as opposed to fire occurrence. Second, why are burned area data used as 'fire occurrence' when satellite-based active fire detections are available? Finally, the manuscript does not describe fully many of the datasets used, including where to obtain them and what their uncertainty are. Finally, the results seem to indicate that a single shallow soil moisture variable is driving the predictions (which is not usually considered in fire danger modeling like FWI). A major revision and resubmission is recommended.

Specific comments:

- The title is "A data-driven prediction model for Fennoscandian wildfires" but the thesis of the paper is to produce spatiotemporally resolved fire danger probability maps – which is not quite the same as predicting wildfires. Consider revising the title to be more specific.
- Line 19: "which stores approx. 30% of the world's soil carbon pool" needs a citation
- Lines 26-27: "However, to the best of our knowledge, fire studies of the European boreal zone are limited." needs a citation.
- Line 144: What is the spatial resolution of a European Space Agency Climate Change

Initiative (ESA145 CCI) product version 5.1.1cds? Please include that.

- Line 146-147: "and is based on Terra Moderate Resolution Imaging Spectroradiometer (MODIS) Reflection information" is not correct way to right this. It should be "the reflectance product of the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor on the Terra satellite". Can the authors please specify which reflectance information is used? Daily surface reflectance?
- Section 2.2 Norwegian fire occurrence dataset – the authors have not provided a citation to the dataset, where it can be accessed, and how it is collected. Are these truly wildfires or are these fires from all ignition sources (lightning plus human-caused)? Is there a burned area minimum that fires must meet to be included in this wildfire dataset? Please describe this dataset more.
- Line 164: Why were the months April – September selected?
- Figure 3: The authors are using burned area from the European Space Agency Climate Change Initiative (ESA145 CCI) product version 5.1.1cds but noting it as fire occurrence and number of fires. Can the authors describe how this was done with the burned area product? Is this the most appropriate comparison of burned area to number of fires in the official statistics? What is the original spatial resolution and what is lost when aggregated to 0.25 degrees?
- Line 230: Can the authors explain how snow cover was used? Especially since the model was limited to monthly values from April to September over the period 2001–2019.
- Line 235: The land cover data and fraction of burnable area is not well described. Which land covers? Why were those chosen? Are all vegetation types are included?
- Line 241-242: Can the authors provide citations for this statement (and for Norway and Sweden, specifically): "We chose FWI because it is developed for boreal forests and because it is used for fire danger forecasts in large parts of Fennoscandia (Norway and Sweden)."
- Figure 6: Should readers interpret Figure 6 as the only important variable to be soil moisture anomalies in the layer 7-28 cm? It would be helpful for the authors to spend more time explaining why this figure is important for creating a data-driven model, i.e., variable selection.
- Table 1: Should NDVI be included in this as a potential predictor?
- Figure 8: The red-blue scheme is not colorblind safe. Can the authors change these figures to make them colorblind safe? Tools like colorbrewer can help.
- Figure 8: At first look, a reader may think that the fire danger probability maps did not perform well, especially compared to the satellite-based fire occurrence (which is really burned area dataset). Using the active fire products from MODIS or VIIRS may provide a better match than the burned area. Further, consider changing the title and better explaining fire danger in the Introduction so that interpretation of the Results is more straightforward.
- Figure 9: Same comment as for Figure 8. Is this colorblind safe? The colors chosen are hard to interpret, particularly in Figure 9c.
- Line 500: Most of the figures and results in the manuscript highlight the importance of swvl2_anomaly only. The manuscript needs to better describe the input and importance of other variables.
- Lines 535: The authors need to better evidence to say that reanalysis products are helpful when what was used in this study is mainly reanalysis.
- Conclusions: Since the subsurface soil layers are the best predictors, can the authors provide some description of this dataset and the uncertainties / validation of the product? This is not described in section 2.3.3.
- The authors have not shared the data or code and these should be provided. How was this study conducted? In R? In MATLAB? Please provide these details.