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Referee #2

We are grateful for the Referee for the comments and suggestions. Our replies to the comments are given in "Italics" after the comments given in the beginning of this document.

Projecting processes in future is a challenging issue for the scientists. Projecting fire risk is also very challenging. Additionally, it is a scientific research objective which has received recently quite a lot of interest. Especially for North Europe there are many studies with the same or similar research objective (projection of fire risk in general).

My main concerns with the manuscript are:

1. The fire data they use are limited to the period 1996-2014. I am wondering how safe is this limited period to project trends and patterns for the next 100 years in future. One of the authors leads a publication "Venäläinen, A., N. Korhonen, O. Hyvärinen, N. Koutsias, F. Xystrakis, I. R. Urbieta, and J. M. Moreno. 2014. Temporal variations and change in forest fire danger in Europe for 1960–2012. Natural Hazards and Earth System Sciences 14:1477-1490." where a data period with fire observations from Finland from 1960 to 2012 has been used. Working with fire data series is evident that there are short periods with quite different patterns in the number and the size of the fires that are defined maybe from important/big socio-economic issues. This is also supported by the authors in the manuscript where on page 4755 line 9-10 they say " The steep decline in forest fires across Fennoscandia in the late 19th century has been attributed to the 10 cultural transition to modern agriculture and forestry (Wallenius, 2011)."

The fire data set used in the study of Venäläinen et al. (2014) consist only annual total number of fires and burned area on country level. However, the annual burned area in Finland has remained rather stable after 1960, especially when compared to its large inter-annual variability. Hence, we believe that there have not been any major changes in the fire activity in Finland during the last 50 years due to socio-economic reasons. It is moreover important to note, that the annual numbers of forest fires in the statistics jumps around 1994 without any noticeable change in the annual burned areas. This indicates that smallest fires were not included in the statistics prior to 1994.

2. The authors support (page 4755 line 19-20) that forest fire risk is determined by weather/climate and fuel amount which is correct. My main issue now is that fuel amount and of course fuel characteristics have not been taken into consideration for the future projections. How safe is and how big can be the uncertainty/error to make the assumption that only weather/climate matters?

We certainly agree that changes in the fuel amounts may be even more important than changes in climate over certain regions. For example, Migliavacca et al. (2013) found out that decrease in the available fuel amounts in southern Europe restricts the increase in fire risk. On the other hand, they also found that temperature is the most important driver of fire activity in northern Europe. We do not see any reason to expect that fuel amounts would decrease in Finland. It is rather expected that they will increase due to enhanced forest growth, as we discuss in the Section 4.2. These issues can also be handled by proper forest management.

3. In the section 2.1 there is a confusion of the data used. I propose first to separate the two data sets and present them providing also some graphs. I am a bit skeptic with different sources especially for weather data the authors are using. In this section I was confused when going through. I believe that the text is a lot that instead of helping the reader creates difficulties.

Thank you for this comment. We agree that this section can be improved.

4. The authors did not present in details the outputs from regression analysis especially as far as the output statistics so that the reader becomes familiar on how the regression models fit the data. I am especially interested to see the errors of the regression model, for example their distribution and maybe scatter plots between the variables so that to explore the patterns of the errors. Additionally, I find important here to speak about the size of their sample and if it is enough for their analysis.

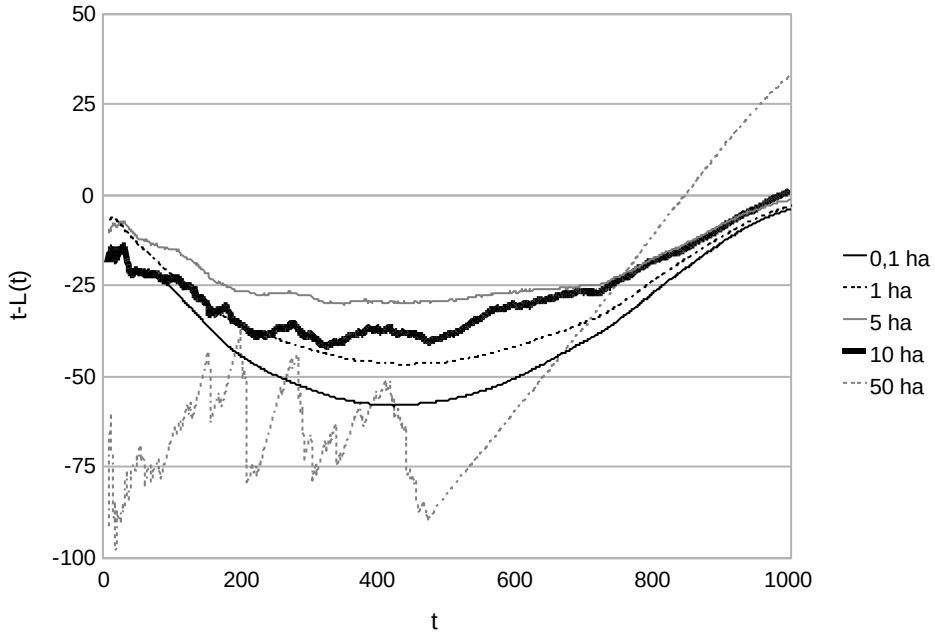
We present the mean bias error and root mean square error for the regression models in Table 4. Figure 2 shows the scatter plot between daily severity rating and probability of a large forest fire. Figures 5a and 5b furthermore show the observed and modelled annual numbers of large fires and annual burned area. In addition, Figure 4 shows the burned area and MSR by month. Surely, some more scatter plots could be included.

5. On page 4764 line 13 the authors support that the fires in Finland distribute uniformly. I propose to use a index for this from point patter analysis like for instance Ripley k function or Nearest Neighbor. I see from the map than eventually the distribution of the fires is slightly clumped (out of the three random, uniform and clumped). The authors here need a statistic to characterize the distribution.

Note that we do not suppose that the large fires are distributed exactly uniformly, but we rather state that they are not concentrated on southern Finland nearly as clearly as smaller fires and that they occurred around the country. As stated in the next sentence, large fires still occur more frequently in southern than northern Finland which we suppose is mainly because the forest fire danger is on average larger in the north than in the south, not because of the smaller population density which we think is the major reason for why smaller fires occur much more often in the south than in the north.

Anyway, here is a graph showing t-L(t) as a function of t where t is the search radius in kilometers and $L(t)=(K(t)/\pi)^{1/2}$ *where K is the value of Ripley's K function. The result is shown for the locations of fires with different sizes. In the case of homogenous distribution, the lines should follow*

the zero line. If all forest fires larger than 0.1 ha (approximately 25% of all forest fires in the data set) are included, it is clear that the distribution is not uniform. When the minimum fire size is increased to 1 ha and 5 ha, the distribution becomes more and more uniform (but not exactly uniform because the fires are still more common in the south than in the north). It seems that fires larger than 10 ha are again distributed slightly less uniformly than the fires larger than 5 ha. It is perhaps because smaller sample size leads to more random distribution as can be seen if the minimum fire size is increased to 50 ha.



6. The text can be improved. I have a feeling that there is a tendency by the authors to write a lot; in some cases instead of being more informative the text creates difficulties.

Thank you for this comment. We agree that the text can be improved and compressed.