Referee 1

C1

The terms “Risk” and “Hazard” are not used as expected in a contemporary research work. The definition of “Risk” that is provided on page 4, line 23, was used in the past, but is nowadays avoided, since many terms related to natural hazards have been standardized. Therefore, the use of the term “risk assessment” in the title of the paper will be rather misleading for the readers of a recent paper. It is essential that a new work contributes to the effort for establishing a common language for the study of natural hazards and specifically wildland fires, and complies with the existing EU directives and standards. Thus, I would suggest the revision of the manuscript, in order to use other, more appropriate terms for the description of the work and the maps produced. The INSPIRE document, which can be found via the following link, is an important source of information: https://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_NZ_v3.0.pdf (see p.126)

According to contemporary definitions, risk is the potential for realization of unwanted, adverse consequences to human life, health, property or the environment (Miller and Ager, 2013). According to existing EU directives, risk is the product of two components: fire hazard and vulnerability. Fire hazard is governed by (i) ignition and (ii) propagation. This study focuses on the spatial distribution of the ignitions, hence the title was changed to ‘A first wildfire ignition probability assessment for Belgium’. The definitions in the text were adjusted, first explaining the Risk framework (p.3, 69-77) and then focusing on the ‘ignition’ part (p.3, 78-79).

C2

The “Hazard map” that has been produced in the context of this study is a reclassification of the land cover map, based on the “inflammability score” attributed to each land cover type. A name that includes the term "inflammability" or “combustibility” would be a more appropriate description of the content of this map. The following links are available to the authors, so as to study the concepts of “hazard potential” and “risk” that are used in the US:

https://www.firelab.org/project/wildfire-hazard-potential
https://www.firelab.org/sites/default/files/images/downloads/wfp_methods_041813.pdf

In line with the new Risk framework, the term ‘hazard’ is indeed misused throughout the paper, and I follow the recommendation of the reviewer to refer to the land cover map as the ‘inflammability score’. Following this new terminology, I do not longer see the relevance of showing this map and decided to no longer include the inflammability map. In the current risk framework, the map merely reflects the land cover classes (Figure 2c), as opposed to the old framework in which such a map was an important component of the risk (being the hazard).

C3

The inflammability categories and scores presented in table 1 are too generic for the creation of a map with reliable information for comparison with the “ignition probability map”. Moreover, the scores seem quite strange for some land cover categories and especially for “closed coniferous forest”. As the authors state on page 9, lines 23-24: “It seems that wildfires in such land cover are less controllable than those in coniferous or deciduous forests. This can be understood by the fact that

heathlands and fens are largely covered by shrubs and grass that ignite easily". However, the table 1 scores that are used in the study are not consistent with this statement. A clarification is needed as to what are the species and forest structure expressed by the category "closed coniferous forest". Is it fir or pine, dense and closed high forests or other type of conifers? Verboom et al. (2013), in section 6.1, refers to "bushy conifer forest, juniper and rhododendron" and the score 100 may be reasonable for these, but not for fir or pine closed forests (eg. dense overstory but without understory vegetation). I would suggest using more criteria for the reclassification of the land cover map into a map that can express inflammability. This might also provide better results in the comparison between the "probability of ignition" and "hazard" maps.

Although I do not give a lot of attention to the inflammability map anymore, I can give a few notes on the original file, of which the original classes are displayed in **Table 1**. Although I most certainly agree that the tree species and forest density influence the flammability, there is not enough information in this data layer to extract this information. Moreover, the method I use does not allow very complex covariates (p.7, 228-233), especially given the size of the used wildfire database. This lack of detail in the land cover map has also lead to the decision not to include the inflammability map in the manuscript, because I would not be able to follow your recommendations.

Referee 2

C1

The authors are recommended to revise the structure of the paper and use of a numbered outline.

C2

Anthropogenic factors and natural factors are known as the reasons behind the wildfire ignition in Belgium. It could be useful to provide the spatio-temporal map of these factors to characterize the superiority of human factors.

On Figure 1, you can find a map of Belgium. On this map, I added information on the population density and the (major) military training areas. Two observations can be made here: (i) most wildfires occur in regions with low or intermediate population densities, and (ii) many ignitions occurred in the vicinity of military domains. The latter makes sense, as many wildfires are ignited through military exercises, but the former observation can be somewhat contraintuitive, given the fact that an inverse relationship is often observed (higher density -> more fires) (e.g. Catry 2009). Indeed, the situation in Belgium is different, as relatively high population densities can be found practically everywhere. One could argue that the presence of more people would imply more social control and hence less arson or a faster suppression and thus avoiding wildfires.

C3

Page 6, lines 12-13 "The Flemish soil and land use layer date from 2016 and 2014, respectively, while those from Wallonia date from 2007 and 2016, respectively". The expressions "from 2016 and 2014" and "from 2007 and 2016" are not true. Please revise these expressions.

C4

Page 2, line 18, Page 6, line 19, line 27, Page 7, line 10, line 16. What do you mean by "Section"? Please mention the name of the desired section.

C5

Please use a flowchart in the methodology part of your manuscript to describe your methodology step by step.

Flowchart is added as Figure 4

C6

Page 13, lines 4-6, "All together, it seems that the best way of preventing wildfires is perhaps to exclude human activities in the most fire prone areas and increase the awareness among the general public, so that people become more aware of the danger they pose to their natural environment". The proposed solution "to exclude human activities in the most fire prone areas" does not seem to be scientific and logical to prevent wildfire. Please search about other solutions and methods to prevent wildfire and control it.

(p.13, 499-506) I agree that this recommendation was somewhat radical and certainly not socially acceptable. I revised the text and concluded with 5 recommendations (i) excluding military activity in fire-prone areas during the fire season, (ii) improving collaboration with foreign emergency services, (iii) concentrating the dedicated resources in the areas that display the highest ignition probabilities (iv) improving fire detection methods, and (v) raising more awareness amongst the population.

C7

According to the Figure 4, Although the summer is warmer than spring but most wildfires have occurred in the spring. Is there any scientific and specific reason behind the wildfire in spring?

(p.10, 365-371) An important controlling factor for anthropogenic fires is drought (Burk, 2005), and it happens so that April is the driest month in Belgium (Journée et al., 2015), hence the peak in this month. I considered more detailed information (on why this is the driest month) out of the scope of this article.

C8

As can be seen from Figure 5, the number of ignitions has increased between 2009 and 2015. Is there any relation between climate change and the number of ignitions in this period? I mean what is the reason behind the increasing the number of ignitions in this period?

The main reason for this is the availability of a detailed database in the period 2010-2013 (and partly 2014) giving rise to an elevated number of ignitions. There is indeed no consistent registration of ignitions, making it difficult, if not impossible, to quantify the impact of climate (change) on ignition frequency.

C9

The conclusion part is explained superficially. Please explain this part more precisely.

I restructured the paper: I merged the results and discussion session and extended it in many parts (mostly guided by your previous comments) and wrote a new conclusion section. Furthermore, I wrote a new introduction section and reorganized the methods and results section in a more logical and chronological way.

C10

The authors are recommended to analyze climatic data (temperature and precipitation) in meteorological stations close to the wildfire places to understand the relation between climate condition and wildfire ignition. The authors can use the data of some sample places in the Belgium to clarify this topic.

There are two reasons why I did not include climatological data: **(i)** the model can only deal with a limited amount of covariates (p.7, 228-233), and **(ii)** it is a challenging endeavor to find appropriate climatic variables (p.8, 271-285) I elaborated on the use of precipitation data (both the annual rainfall and the drought sensitivity). A quick glance at the two data layers (Figure 3) shows that neither variables are suitable for modelling. The wettest areas are known to be fire prone (Compare figure 3a and Figure 1) and the driest areas are almost free of wildfire occurrences. I am sure that drought has a strong impact on wildfires, but a more accurate proxy has to be found.

Appendix

Table 1: The land cover classes and the way they were reclassified

	Original	**Simplified**
1	Coniferous	Coniferous forest
2	Mixed coniferous-deciduous with dominance of coniferous forest	Coniferous forest
3	Mixed coniferous-deciduous with no dominance	Mixed forest
4	Mixed coniferous-deciduous with dominance of deciduous forest	Deciduous forest
5	Deciduous forest (F)	Deciduous forest
6	Poplar (Pp)	Deciduous forest
7	Tree nurseries (Os)	Agricultural
8	Orchards (V)	Agricultural
9	Bushes (B)	Shrubland
10	Heathland (La)	Heathland
11	Heathland with some coniferous trees (Las)	Mixed heathland Coniferous Forest
12	Heathland with some deciduous trees (Las) (Laf)	Mixed heathland Deciduous Forest
13	Mixed heathland and shrubs (Lab)	Heathland
14	Non-specified growth of annual plants/herbs (K)	Shrubland
15	Non-specified growth of annual plants/herbs with some trees and shrubs (Kb)	Shrubland
16	Reedland (Ro)	Reedland

17	Permanent pasture and hayland (P)	Agricultural
18	Grasspatch (G)	Urban
19	Garden (J)	Urban
20	Built-up land (C)	Urban
21	Bare sand (Z)	Other
22	Bare rock (Rx)	Other
23	Graveyard (Cx)	Other
24	Not specified (X)	Other