

Major Comments:

1. Clearly define and use the terms fire hazard, fire probability, fire danger, fire risk, fire exposure. Consider reducing the number of descriptive terms to “fire probability” and “fire risk” to avoid confusion. It is sometimes unclear for the reader to understand when the manuscript is talking about the output from the Bayesian Network model (fire probability) and when those results have been combined with ecosystem properties to determine potential impacts on ecosystems (fire risk).
 - The authors could add definitions potentially around lines 90 to 100.
 - Section 2.2: It is unclear exactly how the measures and properties in the table are used. The manuscript would benefit from a clearer definition here of how risk is defined and quantified.
 - L277 to L281: The description of the combination of fire probability with ecosystem vulnerability would benefit from more information and clarification. As I understand it, the combination of these two products defines the fire risk.
 - L369 to L376: This introduction section would benefit from more clarification. It is unclear whether the authors are talking about exposed areas in terms of fire probability or vulnerability to damage.
 - L383: Should “low danger” be “low fire probability”?
2. What is the resolution of the output from the fire prediction model, for example in Figure 12?
3. The manuscript would benefit from a clearer discussion of the process of interpreting the Directed Acyclic Graphs. Some specific comments regarding result interpretation:
 - Figure 4: Describe generally in the caption what all the B1 of X mean. Describe what the different colors mean in the bar charts. Describe what the arrows mean. Spell out DAG acronym in the caption.
 - How and why is Figure 8 different to Figure 4?
 - How do the values in Table S1 relate to Figure 8?
 - Describe the connection between Figure 9 and Figure 8.
 - L318-320: Please double check the values. If I am reading Figure 8 and Table S2 correctly, 18.75 should be 22.72, 25.55 should be 26.67 and 27.90 should be 29.80. Or, are the ranges associated with the bins in Figure 8 defined somewhere else rather than Table S2?
 - L328 to L330: Clarify how the most influential variables are determined. Is it because they are the first connections to the fire occurrence variable in the network?
 - LL397 to L402: Add in some more information about how the socioecological value was determined and what it means.
4. For future predictions – more information about which variables are available from CMIP5 sources. For instance are all variables noted in Table 5 and Fig 4 available from CMIP5 or are some variables assumed not to change (for example human settlements).
5. Are the spatial distributions of the type I and type II errors randomly distributed around Sicily or are the errors associated predominantly with one location in Sicily. The result can help interpret whether the model is more accurate for some parts of Sicily over others.
6. Section 3.2 requires an overall summary of the results found from the fire prediction in 2020 compared to 2050. For example a description of the total change in fires in the low, medium and high categories from 2020 to 2050.
7. Consider the use of “forest fires” throughout the manuscript and potentially change to “wildland fires” or “wildfires”. Table S1 indicates that vegetation types such as grassland and shrubland are considered in this work, which are not necessarily forests.

Minor Comments:

L20: Seeing as this manuscript does not specifically study “preventing fires due to climate change” I suggest to remove this part of the sentence.

L44: Are the results in Figure 1 driven by one year (e.g. from Fig. 5, 2012 is very high), or are the results for Sicily consistently in the highest number of fire events for Italy every year 2009-2016? Also, if possible, I suggest to analyze the data for this figure from 2007 to 2020 to be consistent with the rest of the manuscript.

Figure 1: Increase font size within the image and ensure legend and axes are in English.

L55: The comment about “biodiversity is lost” is completely opposite to L22 where the introduction mentions “fires increase biodiversity”. Please explain or correct this inconsistency.

Table 2: Define acronyms in the caption or a legend or table footnotes. “Temporal resolution” should be named “temporal coverage”. The description says data in fire perimeter category only extends to 2019, but the study period says the research covers 2020 (L90) – please clarify.

Table 3: This one-row table seems unnecessary and could be mentioned as a sentence instead.

Table 4: Define acronyms in the caption or a legend or table footnotes. It is unclear why ARIES is a source of data in this table, because it seemed ARIES is the model used. A clearer explanation of what ARIES is and what it contains in the methodology section would be helpful.

L181: Define the acronym E-OBS.

L190: Add a reference for the DEM.

L222 to 227 and Figure 3: The authors could consider removing most of this from the manuscript, or moving to a supplement, as some of the information is repeated later.

Table 5: What was the motivation behind using the equal weight method for some variables and using the equal frequency method other variables when choosing bins? What threshold or property was evaluated to determine the method used?

L248 to L249: Do all 3 requirements need to be met to move onto the next node or only one?

L274 to L275: It is unclear what the scale “low, medium and high” refers to. What is the measure/unit underlying the calculations? Are they different for each ecosystem property, for example, is pollination the number of plants, the number of seeds or something else? It would be valuable to have a small description of these. Finally, do the distributions of the ecosystem properties support three equidistant intervals?

L291 to L293: It was unclear where this information about monthly distribution and August maximum came from until later in the manuscript. I suggest to move Figure 11 (average monthly distribution of ignitions and burned area) to directly after Figure 5, and reference it in these sentences.

Figure 7: Label axes

Figure 8: Reference Table S2 in the caption to define bin ranges.

Figure 9: Add axes labels. I suggest to spell out the fuel type on the x-axis instead of using numbers. Alternatively, add a legend for the numbers.

L350: Define “ROC”.

Figure 10: Label axes.

L364 (and potentially elsewhere): Please be consistent in the use of either “medium” or “moderate” for the fire probability ranges. For example, line 364 mentions “medium”, Figure 12 shows “moderate”, Figure 13 shows “medium”.

Figure 13: Define ES and what high and low means.

Figure 14: Caption says “green” but I think it should be “grey”.

Figure 16: The description of colors in the caption is opposite to what the legend in the figure describes, i.e. caption: red = 0, blue = 3, legend: blue = 0, red = 3.

L408 to L419: This section of the discussion is confusing to understand and would benefit from a re-write.

Discussion: Consider renaming “Discussion and Summary” because some of the results are re-iterated here.

L435: What specifically is the “more complete data” that could be integrated?

Table S2: Describe what B1 to B10 are in the caption. Are these bins all determined with equal weight or equal frequency?

Table S3: Describe in the caption what ES means and the different categories. Here (and elsewhere) check the consistent use of of the full stop mark. In table S3 it is used like a “comma” in Table S2 it is used as a decimal point.

Technical Corrections:

Check consistency of “modelling” and “modeling”, for example the title and line 15 use different versions of the spelling.

L14: Remove “fashion” – unclear meaning in this sentence.

L15: Remote Sensing is a data product not a modeling method. Therefore, I suggest to change “employing modeling methods” to “combining methods and data”.

L26: ...area had a... → ...area has experience a...

L29: ...traditions, with...

L75: ...made, still few resources... → ...made, few resources...
L79: ...even within the decision support system
L111: Remove “nowadays”; ...southwest. Thus... (add the full stop)
L112: ...permanent crops. Roughly a third...
L113: ...protection, the most important being the Mount...
L230: ...values, so continuous data need to be discretized.
L240: lose less information → minimize information loss
Table 5: Firec → Fires; ount of Day... → Count of Day...
L246: ...through a heuristic search
L255: ...66% of chance → ...66% chance
L266: linked → connection
L276: ...was overlaid with wildland areas.
L297: ...once, 34.8% twice, 23.1% has burned three times or more, and nearly 6% has been burnt more than 5 times.
L364: ...level of fire occurrence...
Section 3.3 heading: Remove “and intermediate components” because it is unclear what these are.
L374: vertical axis → column
L375: axis → column
L408: remove “Concerning data sources” and start the sentence with “Although”
L409: Unclear what “fruition” means.
L456: Capitalize “Traditional”.
Table S3 caption: Area of ecosystem services potentially exposed to fire...