

General comments

The paper's objective is to test the power of relatively simple and straightforward indices (dNBR and NDVI) to map fire intensity, extent and the subsequent vegetation recovery of a recent fire on a Mediterranean volcanic island. The vegetation recovery seems to be dominated by an alien grass species. The title fits this objective and the topic fits the Journals Special issue: "The role of fire in the Earth system: understanding interactions with the land, atmosphere, and society". The language in the study is mainly fluent and precise, however some parts would benefit from rephrasing (specified in the "Specific comments" section). The authors use two in theory well fitting indices for their approach (NDVI and dNBR) to map the extent and to a certain degree the fire intensity. Both indices are explained and used properly. The study is able to show, that the investigated fire boosted the distribution of the invasive alien species *S. biflorum*, outcompeting native vegetation in the time directly after the fire.

Thank you for your careful reading of the manuscript and for fully grasping the purpose of our work. In a second revised version of the manuscript we will try to shorten the longer sentences according to the suggestions in the "Specific comments" section.

However the structure should be streamlined: parts that are now in the method section rather belong in the introduction, parts that are now in the results belong in the methods part. The mentioned ground data should be explained further. Additionally, the figures / maps need to be reworked. Overall, the study investigates an interesting event and circumstance, but lacks depth, which should be added. It is also not entirely clear to me what exactly is the focus. Is it the fact that you could successfully map fire intensity and extent plus the vegetation recovery or the fact, that *S. biflorum* is the one species to rapidly and successfully grow on the burned areas. In the methods/ result section, you mainly talk about the mapping, how you created your damage/recovery maps and only very briefly touch on the fact, that *S. biflorum* could be observed as the dominant species and did fieldwork regarding its ability to colonize the burnt area. This lead me to believe, that the mapping with Satellite imagery is the main focus. However, in the discussion you mainly talk about the *S. biflorum* rather than your mapping. Some general suggestions for improvement are already given, more in depth comments can be found in the next section. The abstract summarizes the content of the paper well. The Keywords include "field monitoring", however, the description of the field methods is lacking and should be talked about and explained in more detail, especially if "field monitoring" is used as a keyword.

We agree with the reviewer that some part in the method section could be put in the introduction and that the first parts of the results might best be moved in the methods section. We will do our best to streamline the structure of the paper.

As for the focus of the paper, it is indeed twofold. On the one hand, we were interested in offering the reader a case study demonstrating the superiority of the dNBR over the NDVI for identifying and quantifying fire damage; on the other, we thought it would be interesting to highlight the ecological behaviour of an invasive exotic plant in the Mediterranean and its fire-driven ability to colonise new spaces. We will try to be clearer in this sense and to better balance the contents of the sections “results” and “discussion”. Also, as suggested, we will remove 'field monitoring' from the keywords, since our work does not actually focus on this issue.

Specific comments

1. Introduction:

The introduction overall manages to set the scene for the investigation. Some minor changes I would suggest:

1.1 Is the species *Saccharum biflorum* an alien or also an invasive alien species? In your short summary you call it invasive alien species, throughout the text you often only label it as alien.

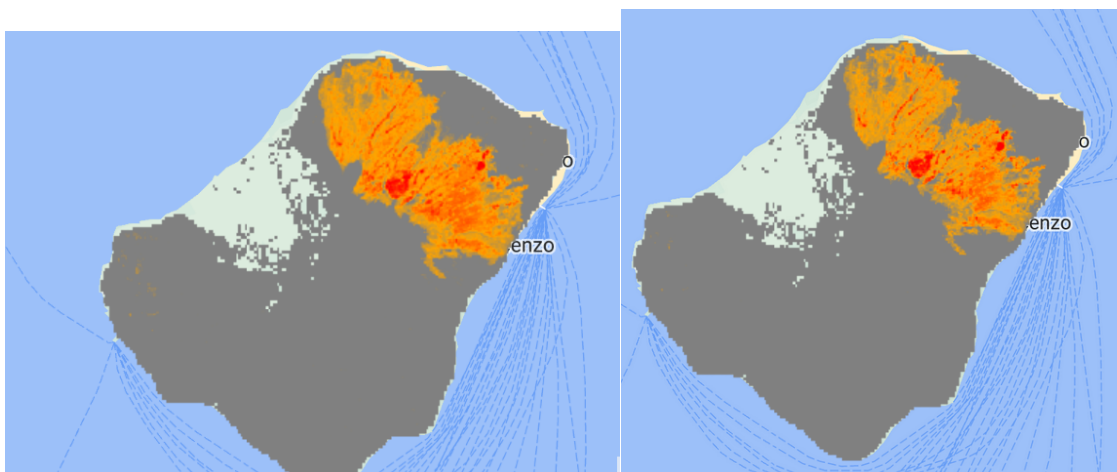
It is an invasive alien species. We will clarify it throughout the text

1.2 I suggest to add the part on *S. biflorum* (Line 167- 182) from the methods here rather than having it in the methods.

We agree

2. Methods:

2.1 Sensitivity of the red-edge portion of the electromagnetic spectrum to variations in vegetation cover/health has been discussed and accepted, have you tried e.g. also NDRE rather than NDVI for more precise results? Why did you exactly choose the NDVI?



Thanks for this remark. While designing the experiments, we considered that traditionally NDVI is more related to the extent of alive vegetation at canopy level, while NDRE is more sensitive to subtle variation in vegetation health (e.g. related to soil nitrogen concentration, chlorophyll level...). Nevertheless, I applied also the NDRE and report in the attached images the differential NDVI (left) and NDRE (right) before and after the fire, after optimizing the stretch of the false color map in order for them to match. A visual assessment reveals that, indeed, the maps are comparable. We computed Pearson's correlation, which shows that the correlation with dNBR is slightly higher for NDVI:

- Pearson's correlation
 - $dNBR / \text{diff NDRE} = 0.973$
 - $dNBR / NDVI = 0.977$

Anyway, as other reviewers also point out, the analysis through NDVI will be probably have less relevance in the new version of the paper, as it is more difficult to link it to damage extent (in the literature damage classes are better defined for dNBR).

2.2 Study area section has some unnecessary information (e.g. when the first weather station was installed and when the newer one took over e.g. around lines 92 ff). However, a better overview map over the study area is missing. You reference different landmarks on the island a lot, but give no map including any labeling.

We will add a map of the study area with the place names named in the text and we will remove the unnecessary information

2.3 For the NBR you describe which bands are used to calculate it, for the NDVI this information is missing.

This is correct. We selected band 8 for NIR and band 4 for red.

2.4 Maybe include the NDVI maps in the supplements or leave out the NDVI entirely if you do not show any results on it and rather mention, that you tested it but the dNBR worked considerably better. The whole explanation including the formula is not needed in my opinion if you don't show any results (at least in the supplements) on it.

We agree. We will move formulas and the NDVI maps in the on-line supplements

2.5 Line 167- 182 rather belong in introduction than in methods. By this time, it should be established, why the species *S.biflorum* is of interest.

Thanks for your suggestion. We will modify the text accordingly.

2.6 For me, a map of the location of the carried out fieldwork is missing. Overall, the part about the evaluation of stem density (Line 182-187) was not clear for me: did you collect

this data? If you collected the data for this study, I would expect more information on the field sampling (transects? plots? distance between the unburned/burned patches which are compared? How will you compare them? When did you sample it? Location?). You mention the time of field sampling only in the description of figure 3.

We will add methodological details on the fieldwork and the location of the sampling sites

Overall, the method part would benefit from a table including what data was used (which satellite images from when/drone images/field data?), what analyses were done with it (dNBR, NDVI...) and for what purpose (map fire intensity/extent/recovery..). Right now, there is not all the data mentioned in the method section for which results are shown/described. Additionally, more information on the fieldwork and the location of the sampling sites would be beneficial.

We will add a table (or a flow chart) in the methods part

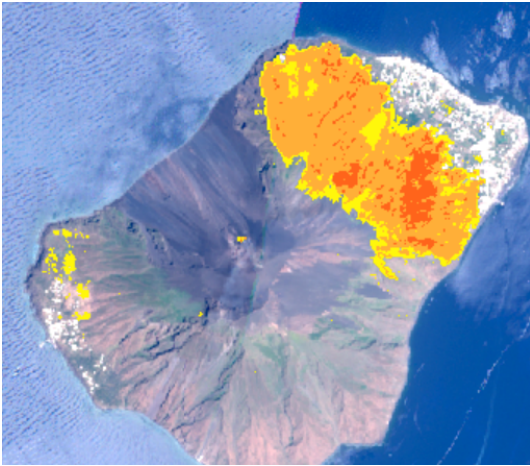
3. Results

3.1 Line 189 f: The part about the fixed threshold should be moved to the methods and explained better. Why exactly this threshold? What made you decide on it? References? Your own assessment?

We agree this should have been better clarified. We actually started from the widely used definition of burns severity classes from Keeley (2009): <https://pubs.usgs.gov/publication/70032718>

We used then the following reference to obtain our first map with hard classes (not reported in the paper)

Severity Level	dNBR Range (scaled by 10^3)	dNBR Range (not scaled)
Enhanced Regrowth, high (post-fire)	-500 to -251	-0.500 to -0.251
Enhanced Regrowth, low (post-fire)	-250 to -101	-0.250 to -0.101
Unburned	-100 to +99	-0.100 to +0.99
Low Severity	+100 to +269	+0.100 to +0.269
Moderate-low Severity	+270 to +439	+0.270 to +0.439
Moderate-high Severity	+440 to +659	+0.440 to +0.659
High Severity	+660 to +1300	+0.660 to +1.300



As it can be seen, false alarms appear in the urban area and in the west side of the island. As the division in classes of damage should be adapted to the case at hand, we considered that a conservative threshold should be applied, in order to identify an area which was damaged for certain. The value in the middle of the “Low Severity” class and rounded to the second decimal digit, 0.19, was selected as the lowest value without visible false alarms in the results.

3.2 Line 200-206: Rather belongs in methods

We agree. We will move it there

3.3 Line 209 f: You describe using Satellite images from August 15th-17th to calculate a new dNBR- those images are not mentioned before in the methods.

We will provide these details in the methods

3.4 Line 227f : You describe the usage of Satellite images from September 2022 (which again are not mentioned before in the methods)

We will provide these details in the methods

3.5 Line 232: How did you verify the patches being *S.biflorum*? Visually?

We combined spectral fingerprinting with field surveys and photointerpretation

Overall, the results seem to be a little shallow. I would expect some more analyses investigating a potential relationship between fire intensity and recovery for example. Also the vegetation before the fire compared with the vegetation after the fire (based on NDVI / NDRE maps) could be interesting in terms of vegetation recovery. Additionally, the ground data mentioned in the methods are only plotted, but not analysed/no analyses shown (testing for significant differences eg?). It is not clear to me, to which extent the field work is connected to your remote sensing analyses.

We will test the homogeneity of variance and the correlation between vegetation types and the fire intensity. As for the vegetation recovery, in order to provide a more circumstanced response, we went to Stromboli in the first half of September 2023 to make additional surveys in the study area. We are now checking whether the data collected have enough resolution to implement the paper with an analysis of the variation in the area of occupancy of the native vegetation and of the target species (*Saccharum spontaneum*) one year after the previous survey. This would substantially improve the content of the paper and make it much more focused.

Additionally, in the results are often parts mixed in that belong in the methods. Reread and streamline the part with that in mind, that in the results section only the results derived from analyses described in the methods should be presented.

Ok, we will do so. Thanks for noticing

4. Discussion

4.1 Lines 234-240: Move explaining/justifying your method to another part of the discussion. Start with discussing your results in context of other literature.

Ok, we will do so

The discussion focuses on the role of *S. biflorum* on vegetation recovery. However, the results focus on mapping fire intensity and extent and map recovery. Your field data is simply plotted, no analyses for this data is shown and the field data simply provides proof, that *S. biflorum* grows quickly after fire in the affected areas. Apart from the short part in the beginning, you don't talk about your methods for mapping anymore. I would expect some comparison to other literature/studies also mapping fire/fire intensities (e.g. Weiser et al. (2021) (also on an oceanic island) or Gibson et al. (2020)) additionally to the in depth discussion about the recovery dominated by *S. biflorum*.

We will add a comparison to other studies in the discussion

5. Conclusion

5.1 Line 293 -298 : You introduce new information, which maybe fits better in the discussion. In the conclusion I expect to find the main takeaway message from the study, not an entirely new idea (*S. biflorum* being desirable to provide erosion protection).

We will modify the conclusion accordingly

Figures:

Figure 1

The maps need to be reworked. Basic necessities for maps are missing (no direction (north arrow), no legend, no scale etc). Additionally, there is too much unnecessary ocean/land mass that is of no interest.

Suggestion: Include an overview map to show the location of the island, and then zoom in and show only the parts of interest (the northeastern part of the island). As those maps are the heart of your study right now, they should be much more informative and better.

We will modify Figure 1 according to your suggestions

Figure 2

Again, no north arrow, no scale, no legend. Additionally, to be able to compare, the zoomed in drone image without the overlapping dNBR results added would make the reader able to really compare the damage map with the drone image.

We will modify Figure 2 according to your suggestions

Technical corrections

Line 64: unprecise phrasing. It sounds like the Island of Stromboli is the volcano, but as I understand, the island is called "Stromboli" and the volcano on it is Mount Stromboli.

The Island of Stromboli is actually the summit of a volcano that rises from a seabed at a depth of about 2000 m. The Island is 925 m a.s.l. and consists of a single cone. So, it is not so common to distinguish between Stromboli and Mount Stromboli

Line 102: mentioning of holm-oak, but missing the scientific name (*quercus ilex*)

We will add the scientific name

Line 147 f: Rephrase, unprecise phrasing, verify, if "whose" is the right word to use here.

Ok

150 f: not good English, rephrase

Ok

Line 151: capitalize the first letters for Normalised Difference Vegetation Index (as you did for the NBR).

Ok

Line 191: you talk about, how close the fire gets to the inhabited area according to figure 1. However, Figure 2 would be more of a fitting example, as it is easier to see.

Ok

Line 484: spaces are missing in-between words

Ok

References mentioned:

Gibson, R., Danaher, T., Hehir, W., & Collins, L. (2020). A remote sensing approach to mapping fire severity in south-eastern Australia using sentinel 2 and random forest. *Remote Sensing of Environment*, 240, 111702.

Weiser, F., Sauer, A., Gettueva, D., Field, R., Irl, S. D., Vetaas, O., ... & Beierkuhnlein, C. (2021). Impacts of forest fire on understory species diversity in Canary pine ecosystems on the island of La Palma. *Forests*, 12(12), 163

...Thank you so much, again, for the thorough review!