GENERAL COMMENTS

The paper presents an assessment of the spatio-temporal variability and trends of hot and dry summers, over the last fifty years, analyzing the physical mechanisms driving the occurrence of hot summers in Romania. For this, the heatwave duration index (HWDI), the Standardized and Precipitation index (SPI) and the compound hot and dry index (DHD) are computed for this region. I consider that this work is interesting, however, I also need to say, that I find the manuscript difficult to read, especially because the reader is constantly referred to supplementary material. Many of the figures in the supplementary material are necessary to follow the results. In this sense, I consider that a reorganization of the Methodology and Results sections is necessary. I think that an improvement of the paper is need previous to publication in order to reach the expected international standards requested by the journal.

R: Thank you for your constructive evaluation of our study. In the revised version of the manuscript we will consider all comments and suggestions and we will improved the manuscript accordingly (see detailed responses below).

SPECIFIC COMMENTS

1. Firstly, I think the authors are wrong in their attempt to extend their work on eastern Europe. All the calculations of the indices are made considering only data from Romania, and all the results shown in the manuscript are based on these indices. Although it is true that Romania is part of eastern Europe, the results obtained for just a country cannot be generalized to the complete eastern Europe. In my opinion this is an error, because from the title of the article the reader expects to find results referring to a much broader region. However, this fact does not detract from the value of the work, since Romania's geographical position, as well as its topographic characteristics, make it a very interesting region from a climatological point of view.

R: The title of the manuscript will be changed to reflect the analyzed region. More specifically the new title will be modified to: Hotspots for warm and dry summers in Romania

2. Other important point is about the use of the standardized precipitation index (SPI) to analyze drought events. I know that the SPI is a robust index widely used since it has a clear computation procedure and multi-scalar character. Nevertheless, the SPI only uses precipitation data to detect drought events. However, in the context of global warming is important to consider the effects of the temperature on drought. In this sense there is a new drought index, similar to SPI, that has the additional benefit of taking it into account. This is the Standardized Precipitation-Evapotranspiration Index (SPEI; Vicente Serrano et al., 2010), which combines the benefit of using the reference evapotranspiration with the simplicity, robustness, and the multi-scalar properties of the SPI. The increasing pattern of evaporation by global warming is not a negligible factor for drought assessment. So, SPEI is relatively better for drought monitoring compared with SPI. Taking this into account, I consider that the comparative study of regional applicability of these indices is highly required for suitable applications.

Vicente-Serrano, S. M., S. Beguería, and J. I. López-Moreno (2010), A multiscalar drought index sensitive to global warming: The Standardized Precipitation Evapotranspiration Index, J. Clim., 23, 1696–1718, doi:10.1175/2009JCLI29091.

R: The dispute SPI vs SPEI is not an easy one. When we drafted the study we wanted to use SPEI, but we decided for SPI for different reasons (see below). First of all, our aim was to compare a precipitation

based index with a temperature based index. Thus, we have chosen SPI on purpose, because if we would have use SPEI it would have meant comparing a temperature based index with another temperature related index and we wanted to avoid this comparison. SPEI is strongly affected by the global warming signal, thus we have tried avoiding using it in our analysis. Since SPEI is highly correlated with temperature it is also, to a certain degree, already an indicator for a compound event. Nevertheless, following the suggestions of all the reviewers involved in the review process of our manuscript in the revised version we are going to perform and show the same analysis by considering also SPEI.

3. About the use of ROCADA dataset, I don´t understand the advantage of using it because it has the same 0.1° x 0.1° spatial resolution than EOBs and shorter temporal cover.

R: We have added also the results of ROCADA dataset mainly because in previous studies we got complains that EOBS might not be suitable to make studies in Romania. But in the revised version of the manuscript we are going to remove the information and figures regarding the ROCADA dataset.

4. Page 1, lines 24-26: Authors literally conclude "that our study can help improve our understanding of the spatio-temporal variability of hot and dry summers, especially at the regional scale, as well as their driving mechanisms which might lead to a better predictability of these extreme events". I think that this cannot be a specific conclusion of this work. I suggest to change this with: "The results from this study can help improve our understanding of the spatio-temporal variability of hot and dry summer over Romania, as well as their driving mechanisms which might lead to a better predictability of these extreme events in the region."

R: The text will be modified as suggested by the reviewer.

5. Page 2, lines 82-88: A first summary about the main objective of the paper is made, and then this sound repeated in the description of the two main objectives. I suggest rewriting this by linking the two paragraphs.

R: The two paragraphs will be modified to make the text more clear and not repetitive.

6. Page 3, lines 97-98: Figure S1, which shows the temporal evolution of the heat wave duration index (HWDI) averaged for Romania for different durations, is introduced without explain the specific definition used for HWDI. Along with this, Figure S1 results are not relevant for the study, so I would suggest not showing this figure, especially considering the high number of figures in the manuscript (plus 12 figures in the supplementary material).

R: Figure S1 together with some other figures will be removed from the revised version of the manuscript.

7. Page 4, line 11: "(values <-1)" is referring to the values of SPI, which is cited later in the sentence. I suggest to eliminate this parentheses.

R: The text will be modified accordingly.

8. Page 4, line 121: the text in the parentheses is redundant. I suggest to change this with only (August SPI3 < -1).

R: The text will be modified as suggested.

9. Page 5, line 139: Figure 2 shows the HWDI averaged at the country level. ¿What is the meaning of that? ¿Is this the heatwave duration index averaged for Romania? If this is the case, the title of section 3.1 (summer heat waves in eastern Europe), must be changed by summer heat waves in Romania. I think that the complete analysis is centered in Romania, not using data from the rest of the countries of eastern Europe. So I think that even the title of the manuscript must be changed in order not to confuse to the reader.

R: Yes, in Figure 2 we have shown the heatwave duration index averaged for Romania. In the revised version of the manuscript we will changed the figure captions to make them more easy to follow and the title of each sub-section will also be modified to reflect the analyzed region, namely Romania.

10. Page 5, line 148: In table S1 results of the trend analysis for HWDI are shown. The trend analysis uses de Mann-Kendall test to detect the trend, but what method is used for trend estimation? All this information should be described in Methodology Section. A review of the methodology section is necessary.

R: The required information is going to be added in the Methodology Section.

11. Page 5, lines: 160-161: the average duration of HWs during the period 1950-1970 shows in Fig. 2g is lesser than 10 days.

R: The text will be changed.

12. Page 7, lines 220-223: This is repeated and was already explained in the methodology section.

R: The text will be removed.

13. Page 7, lines 228-235: I think that there are some errors in Figure 5. For example, in Figure 5a is stated June 2002 as one of the driest years. However I find from Fig. 5a that is 2003. ¿Is this correct? Similarly, from Figure 5g for SPI3, years 2002 and 2018 are stablished as driest summers. I find in this Figure that the years correspond to 2003 and 2012, respectively. Also, the quality of the Figures should be improved.

R: All the aforementioned Figures and years are going to be carefully checked in the revised version of the manuscript. Also we are going to improve the quality of the figures in the revised version of the manuscript.

14. Page 7, line 233: Again authors are referring to the eastern part of Europe. However, the analysis is just for Romania.

R: The text is going to be modified to reflect the studied region, namely Romania. These changes are going to be integrated throughout the whole manuscript.

15. Page 8, lines 264-268: I consider that this paragraph should be in Introduction section, and not in the results.

R: We agree with this suggestion. Thus, the aforementioned paragraph is going to be moved in the Introduction Section.

16. Page 9, line 307: The methodology used for ranking maps is explained in the supplementary material. I suggest to change it to the methodology section.

R: The methodology used for ranking maps is going to be moved in the main manuscript at the Methodology Section.

17. Page 9, line 318: In Figure S6 the location of the 2D atmospheric blocking is shown. The algorithm for the 2D atmospheric blocking index is also described in the supplementary material. I suggest to change it into the Methodology section.

R: The algorithm for the 2D atmospheric blocking index is going to be moved in the main manuscript at the Methodology Section.

18. Page 10, lines 316-324: In this paragraph is stablished that the pattern resulting from the atmospheric conditions is an increase in the number of hot days, especially in the southern and eastern regions of Romania. I cannot see this from figures 10e and S5. The evolution of the Tx anomaly (Figure S5) shows that this is maximum for the northern Romania.

R: In the revised version of the manuscript we will modify and improve the text following the reviewers suggestions and the text will be carefully checked to reflect the proper regions.

19. Page 11, line 374: I suggest to introduce a briefly description of the stability map methodology in the Methodology section. In summary, almost all the methodology used is explained in the supplementary material, which presents almost the same number of figures as the manuscript itself. Also, all the figures in the supplementary material are described in detail in the manuscript text, because they are supporting the results, so it is logical to think that they should be a specific part of the manuscript, and not supplementary material. In this sense, I consider that a restructuring of the manuscript is necessary.

R: We agree with the reviewer and the stability maps and the atmospheric blocking methodology is going to be moved in the main manuscript. Also some supplementary figures are going to be moved in the main manuscript in the revised version. Thus, the manuscript will be restructured as suggested by the reviewer.

20. Page 11, lines 363-368: If Figure S11 shows the composites maps of Z500 and wind for the years when the HWDI index (averaged for Romania) was > 5 days I consider not appropriate the figure caption for it, which establishes the occurrence of monthly heat waves in the central part of Europe.

R: The figure caption will be modified to reflect the study region.

21. Page 11, lines 380-382: The spatial structure of Z500 anomalies (Figure S11a) is indicating advection of air from the north-eastern part of Europe into Romania, not from the south-eastern.

R: The text will be modified as suggested.

22. Page 12, lines 420-427: Conclusion section begins with a paragraph with conclusions from other studies and for other regions in Europe. I think that this information could be appropriate to introduce the need of making this study in Romania, in the introduction section, but not here. Additionally, later in the conclusions the Figures showing the different results found are again mentioned. These figures have been previously described in detail in the Results section, so I consider that they must not be mentioned here again. Also, I suggest to change this section by Conclusion and Discussion section.

R: The manuscript will be substantially revised (e.g. by including SPEI in the analysis) and we are going to take into account the suggestions made by the reviewer regarding the Conclusion part and change the text accordingly.

TECHNICAL CORRECTIONS

Page 1, line 17: "2020and" should be "2020 and".

Page 1, line 18: "HWs" should be "Heat Waves (HWs)".

Page 2, line 40: "favors" should be "favour".

Page 2, lines 80-90: "The paper is structured as follow in Section 2 we give a detailed description of the data and methods used in this study. In Section 3 we…" should be "The paper is structured as follow: in Section 2 we give a detailed description of the data and methods used in this study; in Section 3 we…"

Page 5, line 158: "centuries" must be changed by "decades"

Page 7, line 216: To add (Figure 4c).

Page 7, line 217: to add (Figure 4d)

Page 7, lines 238-239: (Figure 6a) was already indicated at the beginning of the sentence.

Page 10, line 322: Figure S6d-S6g should be Figure S5d-S5g.

Page 10, line 335: In figure 11e contours indicating the countries are in white colour and this does not permit to visualize them correctly.

Page 11, line 370: "map s" should be "maps".

R: In the revised version of the manuscript all the technical corrections will be taken into account and the text and figures are going to be modified following the reviewer's suggestion.

Supplementary material:

In Figures from S6 to S12 the longitude and latitude labels must be indicated, at least in the maps of the lowest row.

In Figure S8, the contour lines indicating persistent atmospheric blocking system are very difficult to appreciate.

R: In the revised version of the manuscript we will try to improve all the figures tacking into account the aforementioned suggestions.