

Reviewer 2

This paper examines the Eastern European heatwave of 2023 from a long-term perspective. The article selected many extreme heat wave periods in history that were accompanied by similar weather conditions and explained the high-temperature variability well through analysis. Overall, this work is very meticulous, by combining weather scale and climate scale analysis. I suggest minor revisions. Here are my detailed comments.

We thank the reviewer for the constructive evaluation of our study. In the revised version of the manuscript, we will consider all comments and suggestions and we will improve the manuscript accordingly (see detailed responses below).

1. It would help if you highlighted how to quantify the role of natural variability and anthropogenic factors in this paper, especially in the abstract and method part.

In the revised version of the manuscript, we will clarify the quantification of natural variability and anthropogenic factors, and provide a more detailed explanation of our approach and methodologies.

2. Please provide the full name of GHG

The text will be modified to include greenhouse gasses (GHGs).

3. What do the colors of the columns (bars-from yellow to black) in Figure 2 mean?

We will improve the figure(s) and add more information so they are clearer to the reader.

4. You have used many indicators to represent heat waves, but not all indicators are introduced in the methods section.

We will define/introduce all the indicators in the revised version of the manuscript.

5. I noticed that the ground stations you used in the Figures (Fig.2,4, 5, 6...) are not consistent.

Thank you for this observation. We will ensure consistency across all figures by using the same name of ground stations in Figures 2, 4, 5, and 6 for coherence and accuracy.

6. I don't know what specific ERA data you are using, please use the official data name (Thermal comfort indicators derived from ERA5 reanalysis or ERA5 hour data on pressure levels from 1940 to present) instead of ERA_ heat.

The required information will be added in the revised version of the manuscript.

7. What do the sticks in different colors below the yticks refer to?

We will improve the figure(s) and add more information so they are clearer to the reader.

8. Heatwave or HW needs to be consistent.

We will check and modify the text according to this suggestion.

9. In Fig.9, some subfigures show the study area, but some do not. Please be consistent and introduce it.

We will add the study area in all the figures.

10. I can't understand subgraph (a) in Fig8-10. The detailed information is not mentioned (i.e. green line, red area not fully displayed)

We will improve the figure(s) and add more information so they are clearer to the reader.

11. Line 155: I'm not sure if your citation method is correct, please check.

All citations will be checked and modified as suggested.

12. Line 311: please introduce the location of " Carpathian Mountains".

We will improve the figure(s) and add more information so they are clearer to the reader.