# Response to Reviewer 8

We thank the reviewer for the positive evaluation and the helpful comments on the context, the terminology and the figures. Reviewer comments are shown in italics; our responses follow in plain text.

***Overview:*** *The manuscript presents a comprehensive and timely analysis of the late June 2026 heatwave event in Germany. It examines several aspects of this extreme heat event, characterizing its severity and significance both spatially and temporally. The event is analyzed using different metrics and utilizing high-resolution gridded observations, long-term station records, and the ERA5 reanalysis. The analysis effectively enhances our understanding of dynamic and thermodynamic impacts of climate change on extreme weather events. The manuscript is generally well-written and easy to follow. It fits the scope of the journal and aims to address the unprecedented nature of the event. The figures, both in the main text and in the supplementary material, reflect most of what is written in the text. Overall, I recommend minor revisions.*

**Specific comments:**

**Section 1:** *Perhaps it is worth adding a small paragraph on how common heatwaves are in Germany and when they mostly occur. This can provide some context on how different this event was compared to the climatological frequency of heatwaves in Germany.*

> **Response:** We will add a paragraph to the Introduction with the required information.

## Section 2.4

**C1:** *For the flow-analogue analysis, I was slightly confused by the use of the term "thermodynamical component" to refer to the "residual" and by what this terminology implies. My understanding is that the residual represents the difference between observed and analogue-composite anomalies, and that it points to a non-circulation component. However, considering that the authors state in the text (L. 340) that the analogue residual "should not be interpreted as a purely thermodynamic effect alone", it could imply that other interactions might be contributing to the extremity of the event – a claim that is not directly supported by evidence in the manuscript. Perhaps this could be presented more explicitly as a hypothesis?*

> **Response:** We agree with this comment. In the revised version of the manuscript, we will change the framing/naming. Moreover, In the Results we will only report what can be quantified. The possible role of dry soils will be presented in Section 4 explicitly as a hypothesis.

**C2:** *Different epoch lengths, as well as different numbers of analogues within each epoch, are used in the analysis. Am I correct in understanding that there are twice as many analogues in the latest epoch (2001-2025) compared to the earliest epoch (1970-2000)? Please clarify this point and explain why this approach was preferred over using epochs of equal length with an equal number of analogues in each epoch.*

> **Response:** Yes: of the 125 analogues (25 per event day), 37 are from 1970–2000 and 88 from 2001–2025, because the analogues are selected by similarity from the whole period rather than by a fixed quota per epoch. Given that late-epoch days make up 45% of the candidate pool, 56 would be expected by chance, so the excess is significant (binomial test, $p < 0.001$), although consecutive analogue days are not independent. We kept this approach because it retains the closest analogues, and, in the revised version of the manuscript, we will complement it with equal-sized samples ($n = 37$), a permutation test and a selection of the 25 closest analogues separately within each epoch; none shows a significant temperature difference between the epochs.

## Technical corrections

Font size in figures 1, 4, 5, 7, and 9 should be slightly bigger for better readability and to also match the font size on the rest of the figures.

Fig. 1:

- Typo “June 226” to “June 2026”;
- Are the label positions indicative of the location of stations? If not, perhaps it might be useful to include the locations of the stations on this figure.

Fig. 2: Maybe the anomalies can be shown with a different colormap? At first glance, I did not understand that the top and bottom rows show different quantities

Fig. 4: It is difficult to see the baseline

Fig. 5: On 5a, the label for Germany could be highlighted or be in bold

Fig. 7:

- On 7a, it is difficult to see the baseline, and it seems that the timeseries with the lowest values is not shown properly – perhaps change the lower limit of the y-axis
- On 7b, it is difficult to see the vertical line
- The caption says “the 2026 values are highlighted” but I am not sure I see it?

Fig. 8: The units are missing

Fig. 13: Caption and text (L. 364) say n=38 and n=87, but subplot titles say n=40 and n=85. Please clarify which is true.

L. 86 – 89: a citation would be useful

L. 90 – 92: The word “consequently” does not really follow the previous statements. Also, I am not sure whether one such event is sufficient to support the claim of “important indicator of the ongoing seasonal shift toward earlier occurrence of extreme temperatures”. The statement could be true if similar events were observed elsewhere across Europe.

L. 128: Change “Heatwaves (HW)” to “Heatwaves (HWs)”

L. 129: There is a typo for the “Hobday et al., 2016” citation

L. 131-132: “daily maximum temperature (TX)” has been previously defined. So, “TX” can be used instead

L. 133-134: Add a citation for the choice of 5 consecutive days

L. 229-230: I am not sure to which region the authors are referring from the statement “…by more than one standard deviation in all but one region…”. Is this shown on Figure 5a?

L. 266-267: “The 2026 values stand at or near the top of these ~180-year records at the majority of the stations.” Is this shown in a Table or Figure?

L. 270: Refer to Figure 7b specifically

L. 353-354: The text says “The late-epoch analogue composite is systematically warmer than the early-epoch composite on all event days…” but Figure 12 shows the opposite for 26-28 June. Please clarify this.

L. 361: It is probably best to change the words “are nearly indistinguishable” to “exhibit similar overall patterns with small differences in position and amplitude” and to state clearly that they refer to the black Z500 contours.

L. 449: Change “soil moisture” to “soil-moisture”

L. 465: Change “In June” to “in June”:

L. 464-465: I suggest altering this sentence slightly, from “…these results imply that the HW event In June 2026 must be expected to recur with increasing frequency and intensity…” to “these results suggest that HW events similar to the recent June 2026 event could become more frequent and intense…”

L. 470-472: I do agree that this event should alarm everyone and that we should start preparing for the possibility that such events might become more frequent. However, I think the sentence “…the occurrence of record-breaking temperatures already in June suggests that preparedness plans, public-health interventions, and early-warning systems should increasingly account for severe heat episodes occurring substantially earlier in the season” might need to be toned down a bit.

L. 473-478: Although it is mentioned that these are provisional data from Destatis, am I correct to understand that these data include deaths that are not necessarily attributed to heat stress caused by this event specifically? If so, please state it clearly.

> **Response:** All the aforementioned technical correction will be implemented in the revised version of the manuscript and the text will be adjusted as suggested.