Reviewer 1:

Thank you for taking the time to review our work and for your valuable comments, which have helped us enhance the quality of our study.

1) Why did authors use the 15% threshold for showing missing data points "less than 15% of missing data in the period 1971-2024 are identified with a black dot and the name?"

   We used a 15% threshold for missing data to balance data quality and station coverage across the state. We clarified this in the text and added a supplementary figure S1 to show the temporal evolution of missing data at Itaperuna (the station with the highest percentage of missing data in the period 1971-2024), as well as explanations about how these missing data might affect the results.

   Lines 287-293: "Our findings indicate an increase of ~0.3°C per decade in TXx, with Itaperuna exhibiting the most pronounced trends within the state. However, it is important to note that a time interval of its series (1983–1989) was infilled using data from neighbouring stations. Although the infilled data lies in the mid years of the time series—preserving the observed endpoints and thus supporting the integrity of long-term trend estimation—uncertainty remains regarding the accurate representation of local extremes during this period. Consequently, while the strong trends observed at Itaperuna are robust in terms of sign, results for extreme values within the infilled interval should be interpreted with caution."

2) The second warmest day in 83738 Resende appear to be around 1976 (Figure 2) however it does not match with Table 1 with its reporting in 2023. Similarly, peaks in temperature appears much before as shown in Figure 2 than its reporting in Table 1 (83718 Cordeiro).

   The apparent mismatch between Table 1 and Figure 2 arises because they present different types of information. Figure 2 displays only the *annual* maximum temperature (TXx) for each year at each station, so it highlights the single hottest day per year. In contrast, Table 1 lists the two highest daily temperature records over the entire period (1971–2024), regardless of whether they occurred in the same year or different years. This means that if both the first and second highest temperature records at a station happened in the same year, only the highest will be shown in Figure 2, but both will be reported in Table 1. Therefore, it is possible —and expected— for Table 1 to show record dates that do not appear in Figure 2.

3) The ENSO is itself impacted by climate change, then how do authors decouple the separate impact of climate change and ENSO. In addition, without a scientific evidence it is vague to say or quantify how they both impact extreme heat.

   Thank you for the comment. We acknowledge that climate change can influence ENSO behavior, and the interactions between these processes remain an area of active research, being subject to considerable uncertainty. Therefore, disentangling the effects of climate change and ENSO on extreme heat events is inherently challenging. We recognize the complexity of these interactions and have taken methodological steps to minimize confounding effects as much as possible. In particular, we addressed this issue statistically by applying a LOESS filter to the global mean temperature series to remove interannual variability, thereby isolating the long-term climate trend. Similarly, we removed trends from the ENSO indices to focus on their interannual fluctuations. Furthermore, we found no significant correlation between the detrended global mean temperature and ENSO indices, indicating that, within our framework, their impacts on extreme heat events can be considered largely independent.

To assess the separate influences of climate change and ENSO on extreme heat, we performed a structured statistical analysis. First, we identified the meteorological stations in Rio de Janeiro state that exhibited significant trends in annual maximum temperature (TXx). We then calculated correlations between TXx and various ENSO indices (e.g., Niño 3.4) to evaluate the potential influence of ENSO phases on temperature extremes. Following this, we applied the Generalized Extreme Value (GEV) distribution to model TXx, testing several versions of the model: a stationary GEV (no covariates), a time-dependent model, and fully non-stationary models incorporating both a long-term trend (as a proxy for climate change) and ENSO indices as covariates. Model comparison using information criteria (AIC) and goodness-of-fit diagnostics showed that the non-stationary GEV models provided better performance, indicating that these two independent covariates (climate change and ENSO) contribute significantly to the behavior of temperature extremes. Therefore, the results presented in the original manuscript offer quantitative evidence of the individual influences of these two factors, which together lead to an improved representation of extreme heat in the region.

4) Mortality is heavily driven by extreme heat in combination with higher humidity which is not at all explored.

We fully agree with the reviewer that humidity, in combination with extreme heat, plays a crucial role in influencing mortality rates. Unfortunately, the inclusion of relative humidity in our analysis was not feasible due to substantial data gaps in the INMET records for the studied weather stations. As shown in the table below, the percentage of missing data for both daily mean and minimum relative humidity is unacceptably high at most stations, particularly at Alto da Boa Vista, where over 87% of the data are missing. Given these limitations, any analysis incorporating humidity would be hampered by the lack of data, thus preventing reliable conclusions. Note that none of the stations satisfy the aforementioned 15% threshold for missing data. We have added a comment about this limitation in the Discussion section and a Supplementary Table.

Lines 530-532: "We did not include relative humidity in the current analysis due to substantial missing data across stations (Table S7), which would have compromised the reliability of the results."

Station	Variable	Missing Data [%]
Alto da Boa Vista	Daily mean relative humidity	88.20
	Daily minimum relative humidity	87.11
Itaperuna	Daily mean relative humidity	22.72

	Daily minimum relative humidity	22.02
Campos	Daily mean relative humidity	30.00
	Daily minimum relative humidity	25.33
Cordeiro	Daily mean relative humidity	46.73
	Daily minimum relative humidity	31.86
Resende	Daily mean relative humidity	33.02
	Daily minimum relative humidity	27.19

Table S7: Percentage of missing data in relative humidity variables for the five stations studied in the INMET dataset.

5) The figure qualities are also inadequate and not suitable for scientific standard publications.

   The conversion of the file to pdf decreased the quality of the figures. We will try to improve it in this new version and/or include the figures in individual files with high resolution.