

General comments

The manuscript describes the update of a valuable dataset of Land Surface Temperature through the inclusion of a significant number of additional stations, and the creation using the TSP method of high-resolution datasets of land surface temperature and diurnal temperature range. The manuscript is clear and scientifically sound. I have two main concerns that should be addressed before publication:

Response: Thanks for your positive evaluation and suggestion. We will do our best to address all suggestions and improve the manuscript.

1. It's not clear whether the trend uncertainties (e.g. Line 230) have been computed taking the serial correlation of the time series into account, as the time series (e.g. Figure 2) seem to display a significant autocorrelation/serial dependence, which biases downwards the uncertainties if not accounted for. This is something that should be clarified.

Response: The serial correlation of the time series has been taken into account in the calculation of trend uncertainties, as referenced in Li et al., 2021. (Lines 230–231)

Li, Q., Sun, W., Yun, X., Huang, B., Dong, W., Wang, X. L., Zhai, P., and Jones, P.: An updated evaluation of the global mean land surface air temperature and surface temperature trends based on CLSAT and CMST, *Clim. Dyn.*, 56, 635–650, <https://doi.org/10.1007/s00382-020-05502-0>, 2021.

2. The quality of the figures should be improved, to make them easier to understand, particularly in case of colour vision deficiencies.

Response: Thank you for your constructive comment. We have revised the figures in the manuscript.

Specific comments

1. Line 138: maybe give some more details on the filtering procedure

Response: The filtering procedure is mainly conducted based on the same core IDs and similar station names. We have supplemented the corresponding content accordingly. (Lines 134–135)

2. Figure 1: The colours in Figure 1 are very similar for some of the datasets and very difficult to distinguish – particularly for I suggest using more contrasting colours and different types of line (e.g. dashed, dotted) to make the figure clearer.

Response: We have modified it.

3. Line 166: maybe use : before “Any anomaly...” to make more obvious that the sentence is referring to the quality control process.

Response: Done.

4. The same notation could be used to denote standard deviation, STD is used in line 177, and sigma in line 184.

Response: We have modified it.

5. Table 1: the caption and text should be improved, to make clear what is exactly shown in the table – maybe instead of results of QC something like number of data values excluded during

the QC procedure? The “unit:station month” could also be made clearer.

Response: Accepted and revised. (Lines 169–170)

6. Line 221: enhance (instead of “ which significantly enhancing”)

Response: Accepted and revised.

7. Figure 2: same as for Figure 1, it’s hard to distinguish the different colours / lines.

Response: We have adjusted Figure 2.

8. Line 230: please indicate if autocorrelation was taken into account in the estimation of trend uncertainties.

Response: Done. (Lines 230–231)

9. Table: Ele was not defined for elevation in the text.

Response: We have defined “Lat” “Lon” and “Ele” in the Table 1 caption for clarity. (Lines 311–312)

10. Figures 6, 7: the figure would be clearer with a slightly larger size of the text in the axis and legend; using different line styles (dashed, etc...) would make the figure easier to perceive in case of colour vision deficiencies.

Response: We have adjusted these figures.

11. Figure 9: the colour scale should be improved, ensuring it is centred on zero and has improved perceptual properties.

Response: Accepted and revised.

12. Figure 10: same as previous figures, using different line styles (dashed, etc...) would make the figure easier to perceive in case of colour vision deficiencies.

Response: The modifications have been made, with C-LSAT 2.1 represented by a red solid line and C-LSAT HRv1 by a blue dashed line.

13. Figures 11, 12: ideally, the diverging colormap scales should be symmetrical.

Response: We have adjusted these figures.

14. Table 5: is the * denoting statistical significance? Was the uncertainty computed assuming any form of linear dependence or just white (uncorrelated) errors?

Response: Thank you for your comment. The * in Tables 5–6 indicates statistical significance at the 0.05 level, and the explanation has been added to the table captions. The uncertainty was calculated with consideration of the serial correlation in the time series, and we have added relevant explanations. (Lines 230–231)

15. Figure 15: the colour scale should be improved – differences in colour between 20-25 °C and 25-30°C are not distinguishable.

Response: We have adjusted the colorbar of Figure 15.

