Ref. No.: ESSD-2022-79
Title: "HRLT: A high-resolution (1 day, 1 km) and long-term (1961–2019) gridded dataset for temperature and precipitation across China"

Dear reviewer,
We are truly grateful for the constructive comments and thoughtful suggestions you provided. Based on these comments and suggestions, we have made careful modifications to the original manuscript. We hope the revised manuscript will meet journal's standard. Below you will find our point-by-point responses to the reviewer' comments/ questions in BLUE, and the changed text of the manuscript in RED. Please let us know if you have any questions.

Yours sincerely,

Feng Zhang

General comments: This paper introduces a new high resolution dataset of surface temperature and precipitation across China over a long term period. The data is obtained from original coarse (0.5°) resolution meteorological observations and downscaled to 1km using machine learning techniques. The algorithm employes a suite of techniques and the most performing is retained in the final estimate. A validation and intercomparison is conducted using station data and shows the improved score of the present dataset with respect to similar datasets already available. While the temperature downscaling is already very good in all the products, the improvements here are only marginal but more significant for precipitation. Yet even if improved the precipitation remains less well downscaled than temperature in a significant manner. A trend analysis is offered as an illustration of the interest of the dataset.
Overall the paper is clearly written and provide a very complete perspective on the dataset. The algorithm and the input data are well documented so are the intercomparison products. As such the paper is a good realization of a "data paper" and is very well suited for ESSD. I nevertheless have some remarks below that should be adressed prior to publication.

Specific comments:

(1) Figures 5 and 6 are unreadable. Please make these two figures more clear. For instance I suggest to plot the difference between the two variables in the hope it will show more their small departure that the currently useless figures.

Agreed, we showed the cumulative distribution functions of difference between the estimated and observed values for three variables and represent the original figures 5 and 6 as the new Figure 6.

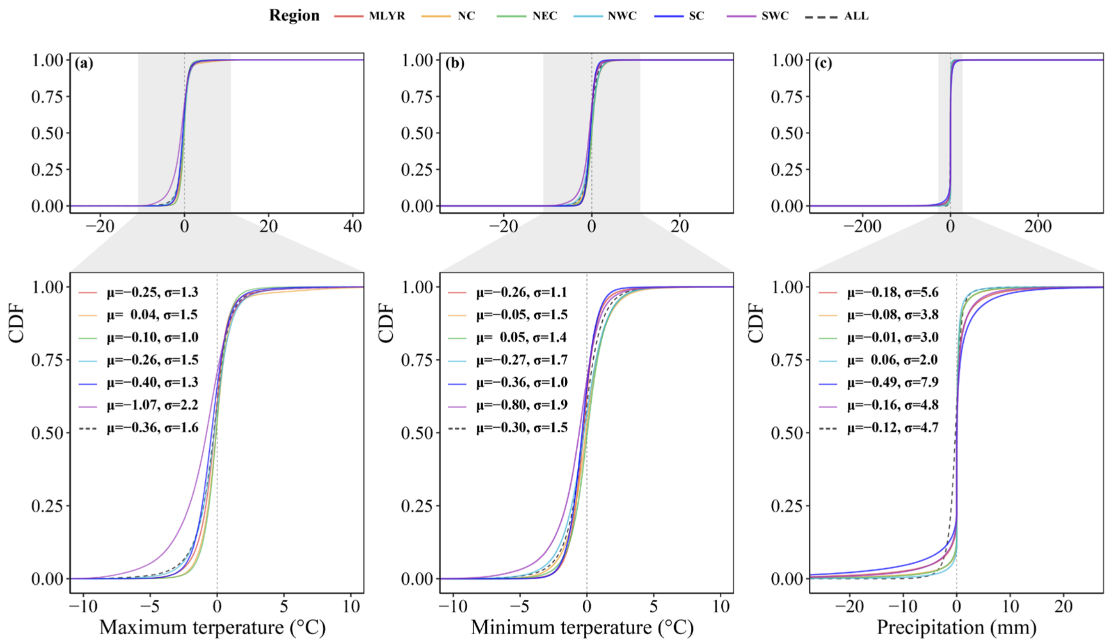

Figure 6. Cumulative distribution functions (CDF) of difference between the estimated and observed values for three variables in all meteorological stations from 1961 to 2020. μ is the mean and σ is the standard deviation. MLYR, NC, NEC, NWC, SC, and SWC are the Middle and Lower reaches of the Yangtze River, North China, Northeast China, Northwest China, South China, and Southwest China, respectively.

The cumulative distribution functions curve trend of difference between the estimated and observed values was always similar for daily maximum temperature, minimum temperature, and precipitation in the six regions, as well as in whole China. The daily maximum and minimum temperatures were all underestimated in the MLYR, NEC, NWC, SC, and SWC (Fig. 5a). The daily minimum temperatures were all underestimated in the MLYR, NC, NWC, SC, and SWC (Fig. 5b). For both daily maximum and minimum temperatures, the lowest average difference between the simulated and observed values occurred in NC and NEC, while the greatest difference occurred in SWC (Figs. 5a,b). Except in the NWC region, the average difference between simulated and observed values for daily precipitation was less than 0 mm in the other regions (Fig. 5c). The largest difference between simulated and observed averages for daily precipitation occurred in the SC region, with a value of 0.49 mm (Fig. 5c). Across whole China, the average difference between simulated and observed values for daily maximum temperature, minimum temperature, and precipitation was 0.36 °C, 0.30 °C and 0.12 mm, respectively.

(2) Also I think there is a geographically distributed bias in the performance of the new products that is barely mentioned and not enough discussed. In particular for precipitation where the correlation map (Figure 4 e) shows a west-east gradient in the scores that is different

from the north-south gradient in the MAE map (figure 4f). This should be discussed in more depths and possible, if not definitive, explanations for such a pattern to be proposed.

Thank you very much for the suggestion. In sections 4.1, we have mentioned the geographically distributed bias in the performance of this dataset . For precipitation, the pattern has been discussed.

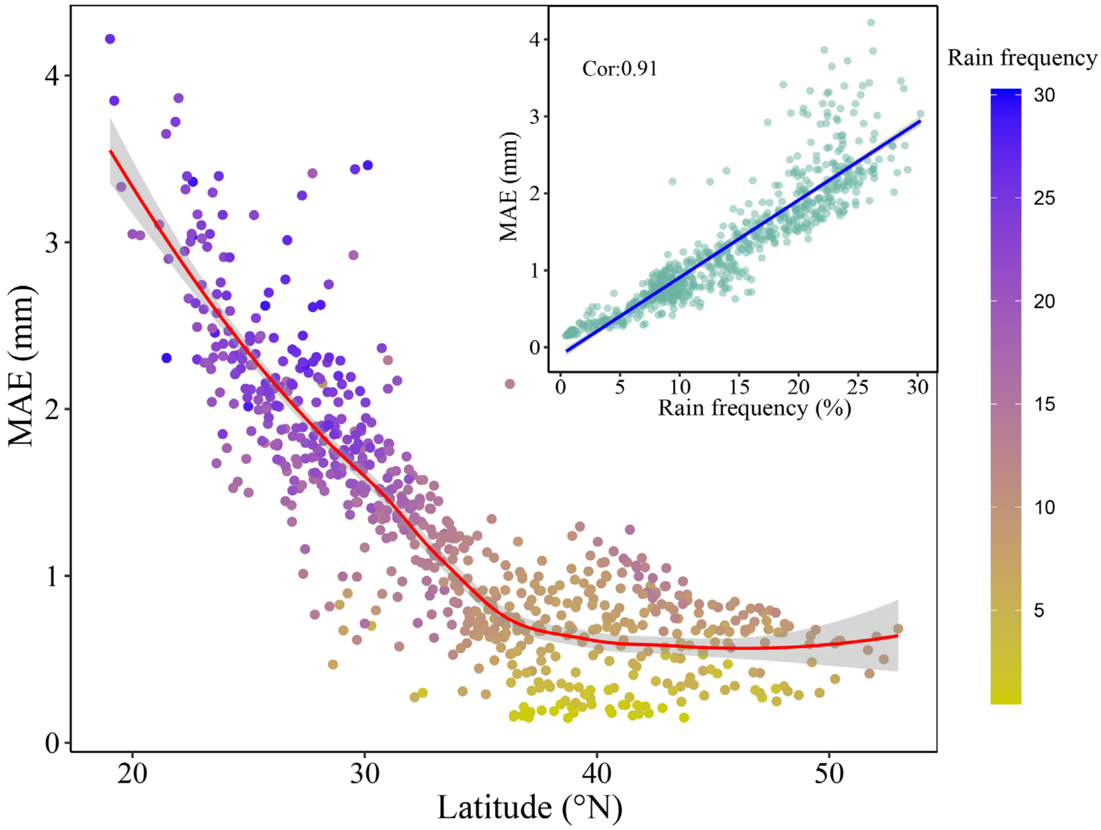

Figure 5. The relationship between latitude and MAE of daily precipitation. Illustration indicates the relationship between rainfall frequency above light rainfall and MAE of daily precipitation. MAE is the mean absolute error, Cor is Pearson's correlation coefficient, Rain frequency is rainfall frequency above light rainfall, which is defined as a daily rainfall from 0 to 4 mm (Alpert et al., 2002)

For precipitation where the R^2 map (Fig. 4e) shows a west-east gradient in the scores that is different from the north-south gradient in the MAE map (Fig. 4f). There are fewer meteorological observation stations in the western region than in the eastern region, which may lead to the subtle east-west gradient of the R^2 value for daily precipitation. The obvious north-south gradient for MAE of daily precipitation could be caused by the rainfall frequency (Fig. 4f, Fig. 5), the MAE of monthly precipitation in China from other study showed a similar pattern (Peng et al., 2019). Rainfall frequency above light rainfall, which is defined as a daily rainfall from 0 to 4 mm (Alpert et al., 2002), is strongly correlated with the MAE of daily precipitation (illustration in Fig. 5), so that the MAE of daily precipitation in the southern region with higher rainfall frequency is larger than that in the northern region with lower rainfall frequency.

Alpert, P., T. Ben-Gai, A. Baharad, Y. Benjamini, D. Yekutieli, M. Colacino, L. Diodato et al. The paradoxical increase of Mediterranean extreme daily rainfall in spite of decrease in total values, Geophysical research letters 29(11):31-1, https://doi.org/10.1029/2001GL013554, 2002.

Peng, S., Y. Ding, W. Liu, and Z. Li. 1 km monthly temperature and precipitation dataset for China from 1901 to 2017. Earth Syst. Sci. Data 11:1931-1946, https://doi.org/10.5194/essd-11-1931-2019, 2019.

(3) In the final sentence of the abstract (line 45), the authors state that such a data is fit for various studies especially for extreme weather related studies. This last statement is not supported by the paper and should be removed. In particular in light of the still weak, even if improved, performances for precipitation for which the more intense rain rates are not well reproduced by the gridded dataset.

Agreed, the final sentence of the abstract have been removed.

On a smaller note I would like to ask for more details on the rain-gauges dataset, in particular about the under catch corrections (if any) that is known to influence strongly the rain gauges estimates and likely the interpolation procedure.

The observed rain-gauges dataset was obtained from the China Meteorological Data Service Center. The rain gauges are sampled at a frequency of once per minute, with rainfall units in millimeters rounded to one decimal point. When the rainfall is less than 0.1mm/min, it will be regarded as no rainfall, which is 0 mm. More detailed information was described in the China's National standard "Specifications for surface meteorological observation-Precipitation (GB/T 3528-2017)".

Overall I support publication of the paper once the major items above are adressed.

miscellaneous: I suggest to add "surface" to the title

"gridded dataset for temperature and precipitation across China"-> "gridded dataset for surface temperature and precipitation across China".

Agreed, we have added "surface" to the title.

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