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Interactive comment on "A new merge of global surface temperature datasets since the start of the 20th Century" *by* Xiang Yun et al.

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Dear Reviewer,

Thank you very much for your comments and suggestions which are very helpful to improve the manuscript. We provided a very detailed response to each of your comments, and revised the manuscript based on all the comments from you. We also provided a revised manuscript in tracked changes mode.

Best wishes,

Qingxiang

Response to your comments/suggestions:

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This manuscript devoted to generating a new merge of global surface temperature anomaly dataset, through merging C-LSAT and ERSSTv5 datasets. However, there are several problems in the manuscript. 1. The global monthly temperature anomaly product of 5 degree seems to be too coarse to serve for investigation of temperature variation, especially for some regions such as the land and ocean convergence zones. Currently, development of climatic dataset should provide data of higher spatial resolution. Response: Thank you very much for the suggestions. This dataset - CMST, is still a global surface temperature dataset used to analyze the surface Temperature change in large scales since the start of 20 century. In this perspective, 5 degree would be enough for the large scale (global/hemispheric/continental) mean ST change due to the good representativeness of surface temperature. The similar global ST datasets like HadCRUT, NOAAGlobalTemp, GISTem are all currently in 5 degree resolution. As you mentioned, higher resolution datasets are very important for regional/local surface temperature variation analysis. In fact, we are developing the higher resolution global land surface air temperature dataset with advanced interpolation methods. But it is also very difficult to develop a high resolution dataset in good quality. Many factors like location, elevation, coastal proximity, topographic facet orientation, vertical atmospheric layer, topographic position, and orographic effectiveness of the terrain should be considered, especially in the construction of the climatology. (Daly et al, 2008). There are some high resolution global land surface air temperature datasets: CRU T4.03 (0.5*0.5), Berkerly Earth (1*1) (Rohde et al., 2013), and WorldClim (only climatology). CRU T4.03 (New et al., 2002) and WorldClim (Fick and Hijmans, 2017) is based on AUSPLINE (climatology) +IDW (anormaly), BE is based on Kriging. But we need to point out that the high resolution data need to pay more attention to the spatial distribution (lower RMSE, AME) rather than the temporal changes, which may lead some inhomogeneities in the grid series and thus affect the detection of the long-term trends. So this would be a different concern in some degree, we will discuss this in the future studies.

Ref: Daly, C., Halbleib, M., Smith, J.I., Gibson, W.P., Doggett, M.K., Taylor, G.H.,

Curtis, J., and Pasteris, P.A. 2008. Physiographically-sensitive mapping of temperature and precipitation across the conterminous United States. International Journal of Climatology, 28: 2031-2064. New M, Lister D, Hulme M, Makin I. 2002. A high-resolution data set of surface climate over global land areas. Climate Res. 21: 1–25. Fick S. E., R. J. Hijmans, 2017, WorldClim 2: new 1âĂŘkm spatial resolution climate surfaces for global land areas. International Journal of Climatology, 37: 4302–4315. https://doi.org/10.1002/joc.5086 Rohde R., R. A. Muller, et al. (2013) Berkeley Earth Temperature Averaging Process. Geoinfor Geostat: An Overview 1:2. doi:10.4172/gigs.1000103

2. In Page 12 and Figure 3, to calculate surface temperature anomaly at 5-degree scale, the authors adopted averaged value of temperature anomaly at 1-degree scale. Moreover, spatial transformation of sea surface temperature anomaly from 2 to 1 degree is not robust. Some geographic statistic methods should be employed to guide these spatial transformations of geographic data, such as Nearest Neighbor, Bilinear, Kriging, and Inverse Distance Weighting interpolations. Response: Thank you very much for the suggestions. You are right when one does the similar downscaling in climatology (climatic normal) field. Due to the spatial inhomogeneity of sea surface temperature (SST), there will be a certain difference when different methods are used. But it will be a little different when downscaling the temperature anomalies (SSTA/SATA). The anomalies always have much better spatial representation especially in SSTA. Here in this manuscript, the purpose of downscaling the SSTA to 1*1 resolution is only for the convenience of merging the land and marine data. We downscaled the 2*2 sea surface temperature anomaly to the 1*1 resolution to match with the land surface air temperature data (C-LSAT) in 1*1 resolution (downscaled in the same method from 5 degree grid box). The slight difference between the simple averaged values with the interpolated values with geographic statistic methods will not matter much in the final CMST dataset. Based on above, we only simple adopt the average values for the SST anomalies downscaling.

3. I noticed that the dataset was stored as txt files. It is better to give product in NetCDF format to provide the longitude and latitude information. In addition, in the "readme.txt", authors stated that -999.99 was set as the missing value; however, I noticed that 999.99 and NaN were used as the missing value in the specific data files. Response: Thank you very much for the suggestions. We have transferred the ASCII code data into the NetCDF and updated the readme.txt. We will update them on the website whenever we can.

4. It is necessary to reorganize the statement of each part and find a professional English Editor to improve the language quality of the ms, because the whole ms is rough to be read. Response: Thank you very much for the suggestions. We have revised the ms as much as we can by the coauthors and some friends from English speaking areas, and will have a professional English Editor to improve it when the review process finished.

Please also note the supplement to this comment:
https://www.earth-syst-sci-data-discuss.net/essd-2019-80/essd-2019-80-AC3-supplement.pdf

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2019-80, 2019.