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18-Nov-2024

Dear Dr. Shi

Manuscript ID TRES-PAP-2024-1355 entitled "Assessing gap-filled Landsat land surface temperature time series data using different observational datasets" which you submitted to the International Journal of Remote Sensing, has been reviewed.

The comments of the referee(s) are included at the bottom of this email.

The referee(s) suggest that the submission may be publishable, but only after some major revisions have been made to your manuscript. Therefore, I invite you to respond to their comments and revise your manuscript.

IMPORTANT: In order to avoid delays, if your paper is finally accepted for publication, I would earnestly encourage you to make absolutely sure that you have fully complied with the Instructions for Authors and the Further Notes on Style that apply to this Journal. PLEASE SEE THE ATTACHED FILE which contains a summary of these Instructions.

You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using a word processing program and save it on your computer.

PLEASE MAKE SURE THAT THE CHANGES YOU HAVE MADE ARE CLEARLY IDENTIFIED, PREFERABLY BY USING YELLOW HIGHLIGHTING OR BY USING RED TYPE.

To submit the revised manuscript, the Submitting Author should log into https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fmc.manuscriptcentral.com%2Ftres&data=05%7C02%7Chshi%40contractor.usgs.gov%7C00f8a8750db04a8d46d908dd07e6cbe5%7C0693b5ba4b184d7b9341f32f400a5494%7C0%7C0%7C638675410027893240%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIlAiOiJXaW4zMiIsIkFOIjoiTWFpbCIsIldUIjoyfQ%3D%3D%7C0%7C%7C%7C&sdata=lCjD9jALeR1vK9y7%2FaJs7XFJiPTTfSmV85%2F1UDZBbrk%3D&reserved=0 and enter his/her ”Author” centre, where he/she will find the manuscript title listed under "Manuscripts with Decisions." He/she should then click on "Create a Revision." The manuscript number has been appended to denote a revision.

PLEASE INCLUDE A RESPONSE TO THE COMMENTS OF THE REFEREE/S that explains how you have revised the manuscript. In order to expedite the processing of the revised manuscript, please be as specific as possible in your response. A short response (less than 15 lines) can be entered in the Author's Response field (a text box) on the submission form at the time of submission of the revision. A longer response should be uploaded as a separate file attached to the Author's Response field. Please give it a meaningful name such as "Response-to-referees".

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to the International Journal of Remote Sensing, your revised manuscript should be uploaded as soon as possible, but no later than in 45 DAYS. If it is not possible for you to submit your revision in that time, we may have to consider your paper as a new submission.

Once again, thank you for submitting your manuscript to the International Journal of Remote Sensing and I look forward to receiving your revision.

Yours sincerely

Prof. Jian Peng

Editor, International Journal of Remote Sensing

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ATTACHMENT: "Summary of Instructions to IJRS Authors"

Referee(s)' Comments to Author:

Referee: 1

Comments to the Author

General Comments: High-quality LST data are important for studying the surface urban heat islands and urban thermal environment. This study utilizes a developed gap-filling method to fill in the missing values of Landsat LST data and explore their performance and uncertainty. Overall, I think there are many issues that need to be addressed with this manuscript. The introduction is too general and does not provide a good overview of the current state of research and highlight the contributions of this paper. English is not my first language, but I think that the writing of the manuscript may be improved. I give my major Comments as follows.

Major Comments:

1. Line 52 (Page 10): Abbreviation SUHI is not defined in the place occurring firstly in this main text.

2. Line 25-46 (Page 11):

Did you answer the question of the current methods used to fill gaps in LST data? Is the content of “To achieve accurate gap-filling, several methods have been proposed, including interpolation, regression, and machine learning algorithms (Zhu et al. 2010; Zhu et al. 2016; Zhou et al. 2022).” in Line 3-8 (Page 10)?

What is the basis for these hypotheses?

3. Line 15 (Page 16): “in tree study” Is “tree” or “the”?

4. Line 45-46 (Page 16): Should “M” be lowercase?

5. Line 31-36 (Page 17): “We used a high-resolution digital camera to take photographs of the sites, and then used the photographs to estimate temperature and SUHI intensity using image analysis software.” I didn't find the corresponding analysis.

6. Line 15-24 (Page 24): The results presented in Figure 9 do not lead to full conclusions. These sources of uncertainty are actually obvious to any multi-source data fusion algorithm.

7. Line 21-22 (Page 28): change “gap-filling data” to “gap-filled data”

8. Table 3-6: Many abbreviations are very difficult to read.

9. This manuscript overly mentions SUHI research, but doesn't pay for the practice. LST is an important source of data for SHUI research, but is not representative of SHUI.

10. Is the gap-filling method performed on areas where the original Landsat LST data is missing, and why do the values in areas where the original Landsat LST data is not missing change after applying the method (Figure 2, 3 ,4)?

Referee: 2

Comments to the Author

The manuscript evaluates the accuracy of a land surface temperature (LST) reconstruction method proposed by Zhou et al. (2020), with uncertainty analysis conducted using air temperature stations and other LST products in urban areas. Exploring evaluation methods in urban environments is valuable, especially when focusing on high-resolution data. However, the current results and methods presented in this work are not convincing.

A major concern is the appropriateness of the reference data used. The difference/relationship between surface air temperature (SAT) and LST varies under clear and cloudy conditions (Gallo et al., 2011). Although the authors state that air temperature is only used as a baseline and the results focus on the relative magnitude between clear and cloudy conditions, the difference between SAT and LST in these conditions is distinct, making the RMSE values incomparable. Theoretically, under cloudy skies, LST is closer to SAT, and the difference between them should be smaller.

Other LST products could be used for validation, but the passing times of different sensors (e.g., VIIRS, ECOSTRESS, and Landsat) vary significantly, complicating direct LST comparisons. Upscaling the data to weekly or monthly does not remove my concerns as they are still aggregated from different passing times. Moreover, ground-based SAT data are not instantaneous either. Additionally, the authors should consider using the latest MODIS version (C6.1) instead of the outdated C6 version.

In the introduction, the reconstruction papers for LST and surface reflectance are conflated, despite their distinct physical properties. Even though some models may overlap, I recommend focusing on high-resolution LST reconstruction and widely used methods for LST reconstruction. Jia et al. (2024) discuss radiative temperature-based and artificial gap-based validation methods, which may provide insights. Even though radiative temperature data may not be available for urban areas, such validation—regardless of location—could still demonstrate the model's reliability. More importantly, the LST reconstruction work in urban areas should be emphasized and critically reviewed.

The reconstructed LST shows a significantly different magnitude compared to the original Landsat data, as seen in Figure 5 (10), indicating that the method may be unreliable.

Gallo, Kevin, et al. "Evaluation of the relationship between air and land surface temperature under clear-and cloudy-sky conditions." Journal of applied meteorology and climatology 50.3 (2011): 767-775.

Jia, Aolin, et al. "Advances in Methodology and Generation of All-Weather Land Surface Temperature Products From Polar-Orbiting and Geostationary Satellites: A comprehensive review." IEEE Geoscience and Remote Sensing Magazine (2024).

Zhou, Qiang, George Xian, and Hua Shi. "Gap fill of land surface temperature and reflectance products in landsat analysis ready data." Remote Sensing 12.7 (2020): 1192.

Referee: 3

Comments to the Author

This is a revised manuscript. I see the authors have addressed the comments from previous reviewers. Actually, although there are many papers published on this topic, I still do not think LST is a surface variable that can be well reconstructed because it is generally considered that LST is a highly sensitive variable with significant temporal variability (this is not like soil moisture, soil moisture changes much slower unless unexpected precipitation or irrigation or land cover change, etc., although there are also many studies for filling soil moisture gaps.) The only possible way at present I think is to use passive microwave observations to fill LST at the cloudy pixels. Anyway, the study conforms to the specification of the article, since many similar studies have successfully published, but I think not much innovation can be found.

I disagree with some of the explanations from the authors.

(1) the authors say there are no field observation LST data available for evaluating gap-filled LST over the study area. Even no radiation measurements? LST can also be calculated from radiation data (the so-call R-based method). If there are no data at all, why chose this study area?

(2) It may be appropriate to validate LST using air temperature over cloudy conditions. So, I think the authors only need to assess the constructed pixels. No need to prove how accuracy the clear-sky pixel, because accuracy of thermal-based LST over clear pixels have been well assessed in many previous literatures.

(3) the authors are encouraged to provide a flowchart for better understating the key steps for the proposed method.