

## **General Comments**

This study conducted extensive ground surface temperature measurements in the Headwater Area of the Yellow River on the Qinghai-Tibet Plateau, providing abundant and valuable data for permafrost research in the QTP region. Based on the acquired data, the authors also conducted a detailed analysis and provided readers with insights into the possible applications of the current data in soil freeze/thaw research. The paper is well-organized, and the writing is clear and easily readable. However, there are still some issues that should be addressed before final publication.

## **Specific comments:**

1. In page 5, line 121, "local-scale sites are established in a flat peat plateau". In page 6, line 137, "some sites are covered by coarse gravel". Peat soils or gravel soils have distinct properties compared to fine mineral soils, and QTP is generally characterized by widespread gravel soil and generally low soil organic content (SOC). Therefore, more information should be included. For example, are there any measurements of topsoil organic content? Is the SOC in topsoil related to the intra-plot differences at sites all covered by same vegetation? Does the site covered with coarse gravel have any influence on the analysis results?
2. The authors mentioned that this dataset can be useful as inputs or validations for permafrost and SFG models. Given the high spatial resolution of GST monitoring, providing information about soil texture or soil type at each site would be beneficial for model simulations and further analysis.
3. The elevation cross-section is located on the northern side of the Bayan Har Mountains. Is there any information available regarding the slope and aspect of these locations? Does it have any impact on the results?

4. One of the multiscale settings is the "fine scale," ranging from 2 to 16 meters. The authors stated that the fine-scale measurements were set for backup reasons and to identify the variations in GST. What were the criteria for setting two plots at each site? This scale is hardly matching the modeling or remote sensing applications. What are the potential applications of observations at the fine scale?
5. The intra-plot differences at most sites are usually larger during the freeze-thaw transition period (Figs. 3-6), but at site B6 and B7, the same pattern is not observed and the differences are large throughout the entire year (Fig. 5). What are the possible reasons? Is there anything special about these two sites?
6. Table 2. It's not surprising that R or R<sup>2</sup> values are close to 1, but the RMSE or MAE provide more insightful information regarding GST variation at different scales. Additionally, investigating potential relationships between GST differences and environmental factors like elevation might be helpful. Including a figure to visualize these relationships could enhance the clarity of the analysis

**Technical corrections:**

Figure 1: add the lat/lons information, and adding a permafrost map as the background may be also helpful.

line 119-121: are these data from site CLP-1 or CLP-2?

Line 156: "Photographs were taken at each site and plot". I would suggest the authors add some photos to better present sites condition.

Line178: please briefly describe what AIC is.

Line 222: change "both" to "these two"

Figure 3-7: I would suggest the authors using same Y scale to better show the differences.

Figure 7d: the color difference between the two lines is minimal, making it difficult to distinguish the line representing "steppe."

Figure 8: I would suggest sorting the sites in transect by elevation to better present if there are elevation effects.