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Interactive comment on "Brief Communication: Evaluation and comparisons of permafrost map over Qinghai-Tibet Plateau based on inventory of in-situ evidence" *by* Bin Cao et al.

Anonymous Referee #1

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Permafrost maps were released by various institutes or research teams during the past several decades. They used modeling, statistical, and other mapping techs. Basically, the maps were evaluated during processing. However, the inter-comparison, what this study was done, is required for better understanding. This study collected more than a thousand samples over the QTP. The results of this study would be useful for future permafrost studies on the QTP and broad interest to the permafrost communities.

The manuscript, however, requires a bit more work before it is acceptable for publication. For the most part, the manuscript is well written but some editing is required to improve language and increase clarity. There are a few places in the manuscript where

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more explanation would be helpful.

Although I have made a few comments here that I hope the authors will find useful, dealing with them may not take too much time. The authors should thoroughly proofread the revised manuscript before submission or invite a native speaker in permafrost communities to improve the language. I am willing to review the revised paper.

Major:

- **Unclear description and logic (to the following results) in the Data and Methods section.**

  The authors used four methods to classify permafrost or not. However, it's not enough for understanding, although this paper is a short communication.

  – How deep are generally for boreholes and soil pits? 1 m, 5 m?

  – It looks like this study used only $MAGST + TO_{Max} \leq 0$ as the standard. In your results, you only talked about the sites considered as permafrost. I am not sure whether these classifications (P2, L25-29) are necessary.

  – What is kind of antennas generally used in GPR survey? Also, how deep is accessed?

  – In section 2.3, you used DEM (3 arc second), MAAT (1 km), MASCD (~500 m), and NDVI (~250 m). I guess you extract those variables for each site in your inventory. Is it? You also said (P5, L2-4) "Where original field evidence of permafrost presence/absence is located within the same grid cell (30 arc-sec, 1 km), they were aggregated based on their major value. For a grid with one permafrost site and one non-permafrost site, the nearer site from the grid center was used to represent the grid." (actually, these sentences

should be moved to section 2.3). Why did you have to aggregate these in-situ data to 1 km? How did you deal with DEM, MASCD, and NDVI? Did you upscale DEM, MASCD, and NDVI to 1 km? I guess you were going to avoid conflict sites (permafrost and non-permafrost) in the same pixel. Is it? When you extracted values from different spatial resolution datasets, even if there are probably few sites in the same pixel at 1 km resolution, however, there still are three spatial datasets with higher resolution, which might bring different snow, topography, and vegetation condition to your sites. In fact, there might be different ground thermal states under the same climate and vegetation condition because of different soil wetness, soil properties, and so on. Overall, I don't think the aggregation is necessary. Furthermore, how did you compare with the maps with different spatial scale, e.g., QTP_{Noah} map is 10 km. Those issues were confusing and should be clarified.

- **Misleading indicators.**

PCC_{PF}, PCC_{NPF}, and PCC_{tol} were used to quantify the classification accuracies of permafrost maps. To my sense, PCC_{PF} and PCC_{NPF} are not useful and may be misleading. When the map over-presents permafrost (i.e., much colder), PCC_{PF} would be extremely close to 100%. Can we say this is much better? Vice versa. Thus, the description in Section 3.2 could be misleading, at least to me, and should be more cautious. I suggest removing those parts. Meanwhile, do you consider the effect of the different sample volume? Because in your in-situ sites pool, number of sites with permafrost is twice as large as the sites without permafrost.

- **More discussion?**

This study found different performance in permafrost maps. It's better to discuss a little bit more about the sources of bias, such as different MAAT products. More discussion on the possible sources of the revealed differences would enhance

the scientific significance. Meanwhile, it also is useful for the future permafrost map updating.

Specific:

- P1, title: the title could be "Ground-based evaluation and inter-comparisons of permafrost maps over the Qinghai-Tibet Plateau"?

- P1, L3: the number, 1475, might be misleading although you collected. Because you aggregated to 1040, which excluded about 400 sites. Add a comma to 1040/1475 for consistency.

- P2, L1: "hemisphere" $->$ hemispheric ?

- P2, L10: "2000" $->$ "the 2000s"?

- P2, L16: insert "survey" after GPR.

- P2, L25-29: Where is so-call "high certainty" for permafrost classification? Meanwhile, it looks like this study used only $MAGST + TO_{Max} \leq 0$ as the standard. I am not sure whether these classifications are necessary. If necessary, the authors should clarify.

- P3, L1: The authors should briefly clarify what kind of antennas were used and how deep is accessible.

- P3, Section 2.2: It's worth to note what climate data were used in QTP_{TTOP} and QTP_{Noah} maps. Both used the data merged MODIS temperature products and station data?

- P3, L6: "(1)' $->$ "(i)"

- P3, L7: "(2)' $->$ "(ii)"

- P3, L11: "... the temperature at ..." $->$ "...the mean annual temperature at..."

- P4, L5: " ... outline of QTP ..." $->$ "...outline of the QTP..."

- P4, L24: Is the calculation of "Cohen's kappa coefficient" too complicated? If not, please put equation(s) here and indicate what a high k means. Is there some threshold to roughly classify good, fair, or others?

- P5, L12-13: What's Qxx?

- P5, L15: Cao et al. (?), missing year.

- P6, L14: why is "-3 to -4 C"? Generally, -4 to -3 C?