

## Comment on **essd-2022-206**

Jan Beutel (Referee)

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Referee comment on "A new 2010 permafrost distribution map over the Qinghai–Tibet Plateau based on subregion survey maps: a benchmark for regional permafrost modeling" by Zetao Cao et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-206-RC1>, 2022

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Dear authors,

this paper develops a refined model for permafrost distribution on the Qinghai-Tibet Plateau (QTP) based on a prior publication in Permafrost Periglac. (Hu et al. 2020). The extensions of the model contain the introduction of further metrics (F) aiming at guaranteeing boundary consistency and ensemble simulation. The paper is very extensive w.r.t. the model description (7 pages) and discussion of the results (15+ pages). The output data, i.e. a permafrost map of QTP as well as thawing/freezing indices and soil clusters in the form of 1km grid raster files are provided as data artefacts. As such this paper is very much a methods paper and not a typical data description paper targeted for publication in ESSD. It is commendable however that this paper makes use of recently published consolidated ground surface data from QTP (Zhao 2021) for model validation.

Concerning the refined model I have the following comments:

- You extend your the model by ensemble simulations. Yet the chosen parameter of 1000 runs seems arbitrarily picked. It is unclear how the number of runs affects your solution (accuracy/performance etc). In order to judge the utility of your proposed method this should be investigated.
- The distribution of ground control data used (weather stations/GST) in QTP is very inhomogeneous with many stations in the East and few in the west. This is nicely illustrated in (Zhao 2021). However your model approach seems to not take this into special consideration. How do you deal with very sparse ground control data?
- There exist a number of other models to estimate permafrost (extent) and thermal regime covering e.g. the whole northern hemisphere and available at 1km grid cell size: Youhua Ran, Xin Li, Guodong Cheng, Jingxin Che, Juha Aalto, Olli Karjalainen, Jan Hjort, Miska Luoto, Huijun Jin, Jaroslav Obu, Masahiro Hori, Qihao Yu, and Xiaoli Chang: New high-resolution estimates of the permafrost thermal state and hydrothermal conditions over the Northern Hemisphere. <https://doi.org/10.5194/essd-14-865-2022>. How does your approach and results derived compare to these "global" models? Especially since when considering the whole

northern hemisphere much more ground data exists?

- You specifically mention that your dataset/model is representative for the year 2010 and tries to not incorporate all historic data but only such observations that are relevant to the specific mapping year. yet in multiple places you incorporate data or discuss processes over longer periods of time, e.g. 2005-2010. How did you arrive at this again arbitrarily picked boundary of 2005? and why not incorporate data beyond 2010?

Concerning the dataset I have the following comments

- You present a number of comparisons of your resulting map with other data (Zhou map). In order to continuously be able to improve this modeling work (and reuse your data) it would be helpful if the comparison data was made available as well.
- It would be very helpful for the community if your code would be made available with this model study.
- Similarly it would be very helpful if you could list the exact sources of all input data used in one place, similar to your data products.
- I have downloaded your dataset and was able to load this into QGIS.

best regards,

Jan Beutel