Reviewer 1#:

The reviewers all agree that it would be crucial to have a dataset representing the soil organic carbon for the Tibetan Plateau, where a large amount of organic carbon is stored and could be a risk driving by climate change. The dataset provides a high-resolution and consistent dataset for the SOC in the region and could be helpful to many applications. I believe the authors did a good job presenting the dataset in the manuscript and have properly addressed the concerns and suggestions from the review in the revision. However, I did notice issues in the current manuscript and suggest the authors could address those to further improve the manuscript.

Thank you very much for your time and effort regarding our manuscript. We have carefully revised the manuscript according to your comments. Detailed responses are in blue, in-line with reviewer input below.

Specific comments:

1) The title can be further optimized. The term "scale" usually refers to distance instead of area, for example, 1 km stead of 1 km2. I would suggest the authors add "depth" to "0-3 m" to clarify what it refers to. The word "Regions" seems redundant following "the Third Pole".

Response: Thanks for your suggestion, we have changed the title to “Soil organic carbon distribution for 0-3 m soil depth at 1-km resolution of the frozen ground in the Third Pole”.

#2) There are many writing and formatting issues, for example, "the Third Pole" has been written as "the third pole", "the Third pole"; missing hyphen in "1-km resolution" and "8-day", ... I would suggest the authors carefully check for grammar and formatting issues through the manuscript. I think it would be very helpful if the authors could consider using help from professional language services to improve the writing and address these issues.

Response: Thanks for your suggestion, we have carefully checked and modified the format errors in the manuscript. In addition, this manuscript has been professionally polished by a language editing service, we believe the quality of manuscript has improved, and the proof from the editing service as follows:

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Language Editing Services

The following article was edited by Elsevier Language Editing Services:
"Soil organic carbon distribution for 0-3 m soils at 1 km2
scale of the frozen ground in the Third Pole Regions"

Authored by:
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#Line 113. The phase is not accurate because the desert is usually not considered as a type of vegetation.

Response: Thanks for your suggestion, we have changed the "vegetation" to the "ecosystems".

#Line 192. "from 2010" change to "for 2010".

Response: Changed.

#3) The notations SOCS 0-100cm/0-200 cm in equations 2 and 3 are the same and could be confusing. I would suggest adding proper subscripts to distinguish the notations for grassland and desert ecosystems. The same suggestion also applies to Figure 4.

Response: Thanks for your suggestion, we have added proper subscripts to distinguish the notations for grassland and desert ecosystems in equations 2, 3 and 4.

$$\ln SOCS_{G(0-200\text{cm})} = 0.9708 \times \ln SOCS_{G(0-100\text{cm})} + 0.3128 \quad (2)$$

$$\ln SOCS_{D(0-200\text{cm})} = 0.8690 \times \ln SOCS_{D(0-100\text{cm})} + 0.7649 \quad (3)$$

$$\ln SOCS_{G(0-300\text{cm})} = 0.9521 \times \ln SOCS_{G(0-200\text{cm})} + 0.3296 \quad (4)$$

where $\ln SOCS_{G(0-100\text{cm})}$, $\ln SOCS_{G(0-200\text{cm})}$ and $\ln SOCS_{G(0-300\text{cm})}$ are the natural logarithms of the SOC stocks ($kg \cdot m^{-2}$) in grassland ecosystems at the depth intervals of 0–100 cm, 0–200 cm, and 0–300 cm, respectively; likewise, $\ln SOCS_{D(0-100\text{cm})}$ and $\ln SOCS_{D(0-200\text{cm})}$ are the natural logarithms of the SOC stocks ($kg \cdot m^{-2}$) in desert ecosystems at the depth intervals of 0–100 cm and 0–200 cm, respectively.

#The colors in Figure 3 and Figure 5 can be improved. The color in Figure 1 would be proper for a dark background presentation but making it hard to read on a white background paper. For Figure 5, I would suggest using a stronger color to replace the light green, which is hard to read.

Response: Thanks for your suggestion, we have modified the Figure 1, Figure 3 and Figure 5, as shown below.

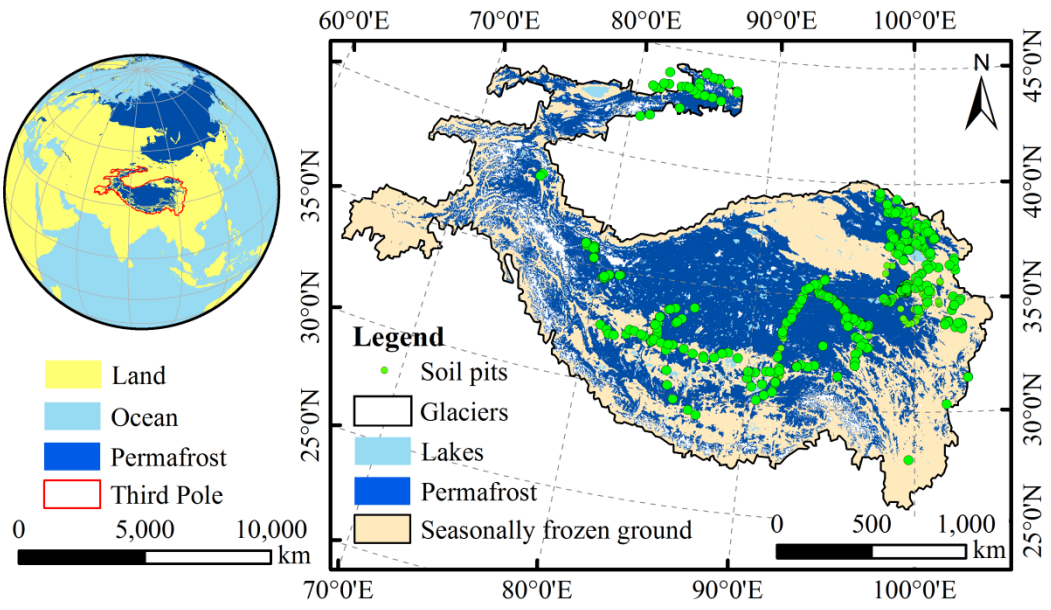

Figure 1. Distribution of soil pits in the Third Pole region (the frozen ground map is derived from Obu et al., 2019).

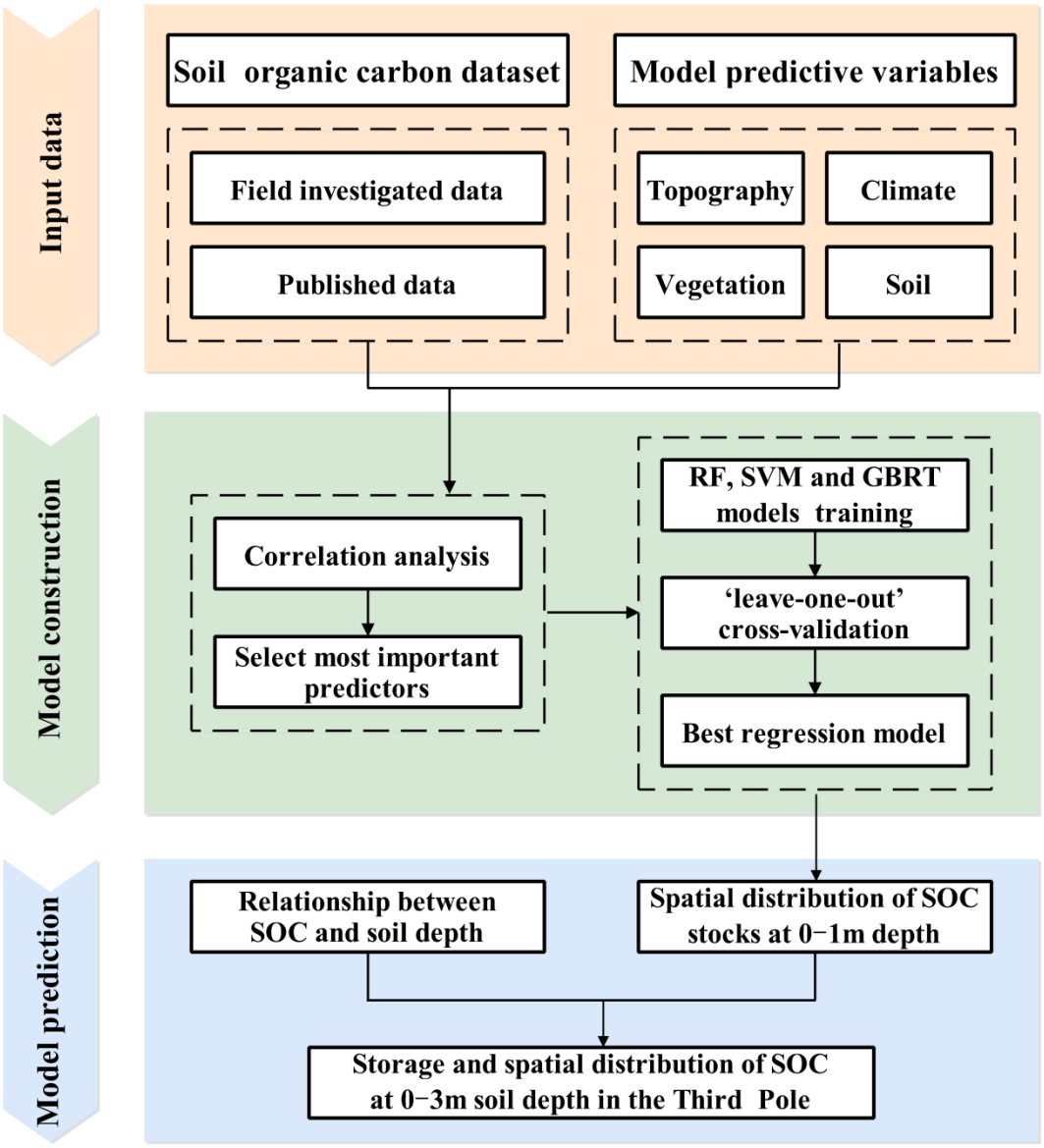

Figure 3. Workflow diagram for predicting SOCSs in this study. RF: random forest; SVM: support vector machine; GBRT: gradient boosted regression tree.

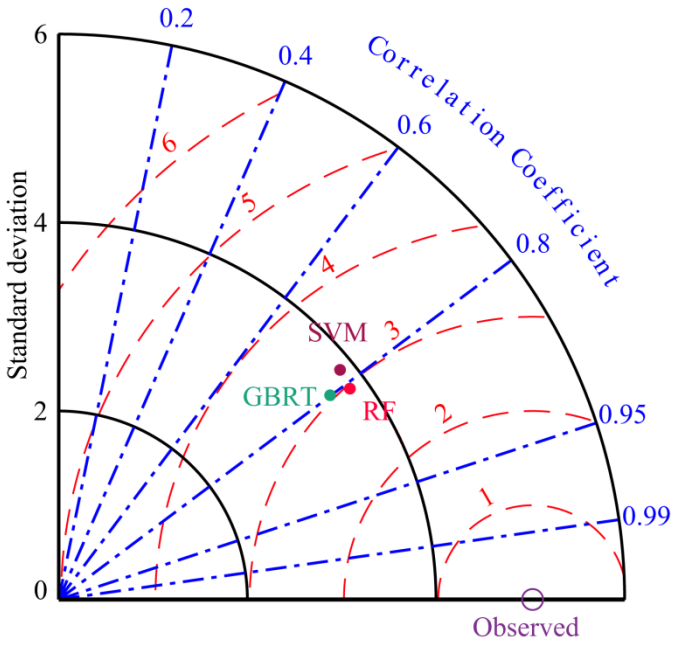

Figure 5. A Taylor diagram used to evaluate the model performance of random forest (RF), support vector machine (SVM), and gradient boosting regression tree (GBRT) models, which were used to predict the SOCS in the upper 30 cm of soil profiles across the Third Pole. The contour centered on the observed indicates the root-mean-square error (*RMSE*, kg·m^{-2}) between the predicted value and observed value.