

## ***Interactive comment on “Climate warming has led to the degradation of permafrost stability in the past half century over the Qinghai-Tibet Plateau” by Youhua Ran et al.***

### **Anonymous Referee #1**

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Comments on “Climate warming has led to the degradation of permafrost stability in the past half century over the Qinghai-Tibet Plateau”

This is a modeling paper that attempts to explain temperature changes and permafrost stability over a vast area of the Qinghai-Tibet Plateau. It is well-written and well-organized. I have just a few comments.

General comment: I am a strong proponent for the use of the “Oxford comma” in lists. With that said, I recommend the addition of a comma in the following locations: page 2, line 3 after “cycles”; page 3, line 29 after “height”

Abstract: Page 1, line 12: define what QTP is in the abstract before using the acronym.

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Introduction: Page 2, lines 5-6: This does not make sense as written. The area of permafrost is the largest, which should contrast with the higher temperatures. Revise to illustrate that contrast more clearly. Page 2, lines 14-15: It was not immediately clear that the “lower limit” is in terms of permafrost elevation. Explain this more fully. Page 2, line 19: Change “declined” to “deepened”. Also this sentence order should be revised, where the areas of undisturbed permafrost and the permafrost under the embankment are introduced first before introducing the temperatures. Page 3, line 1: Delete the “of” in “and a large of degree” Page 3, line 7: Abbreviate Qinghai-Tibetan Plateau to QTP since the abbreviation was introduced previously. Page 3, line 14: I assume that the temperature unit here is Kelvin. Since everything else in this paper is in units of Celsius, I recommend changing this to be consistent. Page 3, lines 15 and 16: Revise to read: “. . . be used in monitoring degradation; however, . . .” Page 3, line 30: Revise to change the period to a semicolon, then “however, . . .” Page 4, lines 2-4: Revise to read: “In section 2, we describe the permafrost classification system, methodology, and data used.” Change “analyses” to “analyzes.” Methods Page 4, line 7: Change “Using this system. . .” to “In this system. . .” Page 4, line 9: This sentence starts with “Obviously, . . .” The authors really need to make the argument that this paper addresses engineering needs; this was not readily obvious to this reviewer. Otherwise, the authors should tone down this sentence. Page 4, line 11: Revise to “. . . thermal state of permafrost; however, . . .” Page 4, line 15: Delete “in the section”. Page 4, lines 16-18: The reference to the Cheng classification system is not clear. The authors should explain the regions that include cave ice and frozen gravel in elevations lower than the lower limit of permafrost further for those not familiar with this system. General note on equations: The terms introduced in the text are floating above the general lines of text, or the text of the variables is much larger than the rest of the text. Page 5, line 3: Change “include” to “includes.” Page 5, line 13: Here is the first occurrence of the word “altitude.” This term should be replaced with “elevation” for all occurrences in this paper. Page 5, line 15: Change “was” to “is” to keep consistent verb use. Page 5, line 22: Add a colon after “years”. Page 5, line 24: The authors indicate that Y is

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both MAAT and permafrost area. This is not so. The authors use MAAT as a proxy for permafrost, and this should be revised to indicate as such. Page 5, line 25: Revise to read: "...warming rate or degradation rate." Delete the 's' from "warming rates". Page 6, line 13: This is the first occurrence where the authors use a comma after a citation to multiple authors. The comma should be deleted (before the year). Make this change to each location in the paper where it occurs. Change "was" to "is" for consistent verb tense. Page 6, line 19: Change "utilizes" to "utilize". Page 6, line 23: Add an 's' to "produce". Page 6, line 24: Add an 's' to "result". Page 6, lines 27-28: Combine this sentence with the preceding paragraph. Page 7, line 1: What is "Sr"? Also, define ETM+ before introducing. Page 7, line 3: Revise to read: "Data Center in Lanzhou, China..." Page 7, line 6: Change "were" to "are." Page 8, line 2: Define TM/ETM+ before use. This could be tied into what was introduced previously. Page 8, line 16: Revise to read: "...as shown in Figures 2 and 3." Page 8, lines 26-29: The information regarding area of different permafrost types would be better summarized in a table format. Page 9, line 6: Revise to read: "...the total permafrost area has decreased significantly..." Page 10, line 20: After "250 m", and ", respectively," Page 11, line 2: Explain what the distribution presented by Zou et al. (2016) is more, and clarify it in Figure 6. Page 11, line 24: Add a hyphen after "glacier" and between "snow" and "dominated". Page 11, line 26: Delete "the" before "permafrost" at the end of the line. Page 12, line 31-Page 13, line 1: Again, this listing of percentages and permafrost types is tedious. Summarize for easier reading. Page 12, line 10: Revise the beginning of this sentence to read: "The uncertainties..."

Table 1: Why have a "greater than" sign in the bottom cell of the last column? Table 2: Change all "altitude" to "elevation". There is an extra space in the 0.90 R<sup>2</sup> value. Is the significance level truly 0.00 for all models? Table 3: Consider adding a column for net change and include the percentage here instead of listing in the text. What does "except for glaciers" mean in this table? Table 5: Change "altitude" to "elevation" in the table title. Figure 1: Shift the text of places in the map so they do not interfere with the points. This is also true for the following maps of the QTP – Adjust "Xining" text

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to avoid the boundary line. Although only one color is indicated for mountain range systems, multiple colors are used in the map. It is difficult to see all of the different colors representing land cover, and some do not appear to be present. Combine fields to make a simpler legend. Figure 4: What do the white areas represent in the figures in the left column? The individual figure titles and legends need to be larger text, as they are very difficult to read. Figure 5: Change "altitude" to "elevation" in the figure title. The individual figure titles need to be larger text. Figure 6: As in the text, the "new permafrost map" is not explained well. Make sure to explain what this map is.

Please also note the supplement to this comment:

<https://www.the-cryosphere-discuss.net/tc-2017-120/tc-2017-120-RC1-supplement.pdf>

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2017-120>, 2017.

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