

## **Author's Response:**

We have made further improvements to the manuscript and provide responses (in bold font) to all points raised by the Referee and the Editor.

### Referee #2:

I am satisfied with the the authors response and have no further comments except a very small one:

p.25 l.10 an -> and

**Done, thanks!**

### Editor:

P3L5: “warming of global climate”. The term “climate warming” is sometimes used but is not correct. The climate is usually defined as “The slowly varying aspects of the atmosphere–hydrosphere–land surface system” or “the weather average over a longer period.” Warming refers to temperature which is only one aspect of the climate. Please write “warming of global atmosphere”, “global warming”, “temperature increase”, or similar instead.

**Replaced by “...strongly impacted by global warming.”**

P3L14: IPCC. You should refer earlier to the current IPCC AR5 and mention that the permafrost processes were not well represented. In addition, it is, to my knowledge, not clear if there will be a next IPCC. Hence, please add “or similar global assessments”.

**Sentence changed to “These processes are poorly represented in the General Circulation Models (GCMs) used for the Intergovernmental Panel on Climate Change report (IPCC, 2013), but considerable efforts are dedicated to better capturing the effects of permafrost thaw in future global assessments.”**

P3L20: Omit “recently”. It is not really recently anymore and especially not in few years when the paper will also be read.

**done**

P3: I agree that permafrost itself cannot be seen. But there are indirect indicators and landforms which provide a hint about permafrost existence. Please add a short statement and one or two references (maybe Westermann et al. 2015 in the Remote Sensing of the Cryosphere Book?)

**Section changed to: “Permafrost is a thermally defined subsurface phenomenon. While satellite sensors can map surface indicators of permafrost presence, such as landforms or vegetation types, remote sensing technologies can not directly measure its physical**

**state variables, in particular ground temperature (Westermann et al., 2015). Therefore, monitoring and mapping of the ground thermal state is restricted to either direct point observations or coarse-scale modeling using atmospheric circulation models.**

Section 2.6: Include the information about the source of the glacier cover. Is it also from the MODIS land cover product or did you use additional sources (e.g. the Randolph Glacier Inventory)?.

**The glacier outlines are from the Natural Earth Data Repository, <http://www.naturalearthdata.com/>. A sentence has been included in the figure captions of all relevant figures.**

P25L10: an -> and

**Done, thanks!**

Figures: It is unfortunately more and more common to mention the meaning of symbols, colours etc. in the captions (e.g. Glacierized areas are shown in white, Black dots: borehole sites...). This information can easily added in the legend and increases the readability of the figures. I would appreciate if you could add this info in the legend, but leave the final decision up to you. However, you must add the unit to each colour bar (e.g. missing in Fig. 1) and the information what the colours represents (e.g. Tmodelled)

**Figs. 1, 4-8 have been revised to show glacierized areas and ocean/lakes in the legend. All colorbars now feature the quantity shown next to it, and the respective unit (unless unitless, such as “fraction”). The figure captions have all been adapted accordingly.**

On behalf of all co-authors,

Sebastian Westermann