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The Cryosphere Discussions

Interactive comment on "Present and LGM permafrost from climate simulations: contribution of statistical downscaling" *by* G. Levavasseur et al.

Anonymous Referee #2

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This paper did not convince me entirely. The basic aim of the paper, to assess how statistical dowscaling methods can improve the representation of permafrost extent and type by large-scale climate models, seems rather hopeless to me: How should any physically meaningful method correct for large-scale errors of climate models so typical for the high latitudes? Large areas of Siberia are extremely flat, but small-scale topographical variability is certainly the main reason for permafost extent and type variability. Under these conditions, it is not clear how any downscaling method should lead to better agreements with the data if this improved agreement is to be physically meaningful. Applied to a small mountain region, one would expect the methods used here to yield much improved results, but on the large scale here, there is no reason

to expect downscaling to yield anything useful. I still find the paper interesting, but I wonder whether it should be restricted to, say, the Himalaya or some other mountain region.

I found this paper quite hard to read, partly because of the unrestricted use of acronyms. The authors should try to find ways to change this. It seems to me that the English might be improved in some places (but I'm not a native speaker).

Specific points:

- P; 2235: "... the permafrost representation depends on the resolution of climate models which cannot reflect the local physical processes involved" : The resolution is certainly not the only reason for the insufficient physics of climate models.

- The large errors for the LGM permafrst extents (even in the initial fields) might be due to the fact that LGM precipitation rate were probably very low. This means little snow, and might therefore lead to a larger permafrost extent than what you would expect using a simple temperature-index method developed for the present.

- The basic hypothesis that permafrost depends solely on temperature is very strong (p. 2239). The authors acknoledge this by stating that future research should include snow cover, and that at least mountain permafrost is influenced by snow cover, but I think this could be stated more clearly.

- p. 2241 : "The calibration is the fitting processes of the splines on present climate." What splines?

- p. 2242: The procedure used to construct the LGM topography is not clear to me. What does GRISLI do in this?

- p. 2242: The two different types of continentality are not clearly defined. They do not seem to used anyway, so either cut this or define the variables correclt if I missed something.

- p. 2248: "a study on the predictors choice ... could be an interesting prospect but is not the purpose of this article." Strange. To my mind, it should be one of the main purposes of this article.

- p. 2272: Figure 5 should be explained more clearly. What are the percentiles used in the diagram?

Interactive comment on The Cryosphere Discuss., 4, 2233, 2010.