

## ***Interactive comment on “Sensitivities and uncertainties of modeled ground temperatures in mountain environments” by S. Gubler et al.***

### **Anonymous Referee #2**

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The work by Gubler et al, is an certainly interesting and publishable study about sensitivities and uncertainties of ground temperatures related to mountain permafrost. They used the physically-based land surface model GeoTop, which cope with both thermal and hydrological processes in the soil. There were than run numerous experiments for different ground types, energy forcing etc, and target variables such the ground temperature and the melt-out day of snow were evaluated in relation to forcing parameters. The study then identified some variables, which influence these target variables more than others, such like the ground albedo etc., and give some clear recommendations, e.g. in relation to parameter- and time discretisation.

So, I find the study enhances our knowledge of how ground temperatures are influenced by different environmental factor, and as far as I know, the paper comprises an

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innovative and necessary analysis. Not being a model developer, I have some major deficits to evaluate everything about the model itself and some of the parameterisations. I guess a colleague with model development experience will also review the manuscript. From my perspective therefore, I will provide the following comments:

1. I read the review of M. Hoelzle as he provided the review early. I agree with his major points, such as that blocky material is not part of the analysis. This choice should at least be discussed and mentioned, why this important substrate for mountain environments is not part of the study. It is probably difficult to model because of air advection etc, but this should be discussed or mentioned. As with clay or thick layers of organics above mires, which are probably not the most common material in steep mountain environments. On the other hand, organics are important in Arctic environments or in relation to sporadic permafrost (palsas), but then topography normally is gentle.

2. Abstract. The abstract is far too long and should be shortened to the major points and results of the paper.

3. The result chapter is important but not very exiting to read, give the major results and illustrate them properly. Some of the figures are hard to read, like fig. 5, fig. 7, fig 8 and fig 9 because of small annotations etc. I would suggest reorganising the figures somehow; maybe you do not need to show everything, but restrict you to some major points.

5. Give clear conclusions and recommendations based on your study, and not a summary.

6. Consider removing the Outlook, such comments could e.g. be given in the discussion section.

Some minor comments:

p. 797, l4: The target variable is here MAGST, later you use MAGT and ground temperatures in several depths. Please check.

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p. 802, l. 21: Ground type, see comment above and by Hoelzle

p. 803: Target variables, now MAGT. And: 10 m depth, how deep is the domain, and how is it initialised?

p. 806, l 3: lapse rate units seem wrong Fig. 11: I struggle a bit with the Fig 11, probably I do not understand, but 13 C at 10 m depth is somewhere at least quite far outside high-mountain environments. I guess the density is frequency?

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Interactive comment on Geosci. Model Dev. Discuss., 6, 791, 2013.

**GMDD**

6, C298–C300, 2013

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