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Interactive comment on "The influence of surface characteristics, topography, and continentality on mountain permafrost in British Columbia" *by* A. Hasler et al.

Anonymous Referee #2

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This paper presents the first distributed ground temperature measurements from seven field sites with potential permafrost in British Columbia, Canada. The authors describe surface and thermal offsets and aim to estimate the region-specific variation of the temperature offsets dependent at micro- and meso-scale gradients in surface characteristics and topography. Another focus of the study is how the surface offset is influenced by macro-climatic parameters in the light of the large macro-climate gradients found within the study area. The paper also comprises a detailed description of the data processing and provides a method to threat data gaps in ground–surface temperature records. In addition the authors introduce a 3-dimensional heat conduction model for the visualization of the aspect-dependent rock surface temperatures and the

cooling effect of air-ventilated clefts on the subsurface thermal field of one of the field sites. Finally a so-called thermal diode model is introduced and applied to illustrate the reverse influence of two macro-climatic variables, annual temperature amplitude and precipitation (or snow cover thickness).

The study has a great potential to present relevant and valuable results related to how surface characteristics, topography and macro-climate parameters are controlling the mountain permafrost distribution in British Columbia. However, in its current state it is too long-winded and sometimes difficult to follow - mainly due to the fact that too many methods, results, abbreviations and interpretations are included in one single paper.

To be fully appreciated the paper needs to be made more concise and to be carefully structured and some parts related to e.g. the data processing, the thermal diode model and sections in 4.4. could be left out. It is a data-rich paper, and this shows in its length which is significantly longer than normal for TC.

Specific comments: Although being an interesting concept I do not see any big advantages to introduce the "thermal diode model". It is only confusing for the readers and is not necessary to support the conclusions of the study. The model is fully equivalent to standard heat conduction theory and general standard terms used by the permafrost and soil science community for decades. Thus I suggest removing this part to get the paper more concise.

The authors use a lot of space to present the pre-processing and analysis of the ground temperature data sets, and introduce also the outcome of that work as a part of the conclusions. To get the paper more concise and structured this section should be made much shorter and not be a focus of the study. I suggest that the authors could publish their methods related to calculation of mean annual temperatures, its uncertainty analysis and treatment of data gaps in an own short-communication paper etc.

Some of the key-findings related to surface- and thermal offsets, influence of micro-topography and macro-climate influence are very interesting and are sometimes com-

pared with studies from the European Alps. However, the results could also be discussed more carefully in light of previous results from areas having more similar climatic conditions, in e.g. parts of Scandinavia. Some related Scandinavian studies are:

Farbrot H, Hipp T, Etzelmüller B, Isaksen K, Ødegård RS, Schuler TV, Humlum O. 2011. Air and ground temperature variations observed along elevation and continentality gradients in Southern Norway. Permafrost and Periglacial Processes. DOI: 10.1002/ppp733

Gisnås K, Westermann S, Schuler TV, Litherland T, Isaksen K, Boike J, Etzelmüller B. 2014. A statistical approach to represent small-scale variability of permafrost temperatures due to snow cover. The Cryosphere, 8, 2063-2074

Juliussen H, Humlum O. 2007. Towards a TTOP ground temperature model for mountainous terrain in central-eastern Norway. Permafrost and Periglacial Processes 18: 161–184. DOI: 10.1002/ppp.586

Ødegård RS, Isaksen K, Eiken T, Sollid JL. 2008. MAGST in mountain permafrost, Dovrefjell, southern Norway, 2001–2006. In Proceedings of the Ninth International Conference on Permafrost, Fairbanks, Alaska, Vol. 2, Kane DL, Hinkel KM (eds). Institute of Northern Engineering, University of Alaska Fairbanks: Fairbanks; 1311–1315

Abstract: Please make the abstract brief, with aim, scope and findings of the paper clearly indicated. Some of the first text could be shortened.

Interactive comment on The Cryosphere Discuss., 8, 4779, 2014.