

Interactive comment on “Wind driven snow conditions control the occurrence of contemporary marginal mountain permafrost in the Chic-Chocs Mountains, south-eastern Canada – a case study from Mont Jacques-Cartier” by Gautier Davesne et al.

Anonymous Referee #2

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In the manuscript (MS), Davesne et al. explored how the thermo-physical properties of snow affect the spatial distribution of ground surface temperatures and permafrost on the summit of Mont Jacques-Cartier, Canada. The authors used extensive field data on snow properties and ground temperatures. Based on the results, snow conditions controlled the small-scale spatial variability of ground surface temperatures. The snow properties were determined by wind conditions, local topography, surface roughness and vegetation cover. The results of this study are useful in the exploration of per-

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mafrost in alpine environments, where permafrost can be marginal and thus sensitive to the changes in environmental conditions. Consequently, the topic of the MS fits well to The Cryosphere.

In general, I consider this MS to be a good contribution in investigating snow effects on ground temperatures. However, I have one major and several smaller suggestions to improve the presentation. An additional concern is the rather local and descriptive nature of the paper i.e. is the MS innovative enough for the journal? I suppose the novelty value is not a critical issue and the MS is suitable for the planned special sections of the journal. After all, I recommend publication of the MS in The Cryosphere after moderate/major revision.

Major comment: My major concerns are related to the results section 4.3 and discussion section 5.2 and partly 5.3. The first paragraph of the section 4.3 is a mixture results and discussion. Thus, it is somehow difficult to be sure which results are from this study and which are derived from the literature. On the contrary, the sections 5.2 and 5.3 (lines 385-390) included completely new results. To my opinion, the above mentioned sections of the discussions should be in the results.

Specific comments:

Title: Why is there a full stop in the end?

Abstract: The abstract is partly incomplete. It presents the aims and results but lack conclusions.

Line 13: It would be nice to see the absolute elevation of the studied mountain (in the brackets after the name).

Line 20 and 23: Please be consistent in the use of space between numbers and °C. Moreover, use minus sign instead of soft hyphen (-) in relevant places throughout the MS.

Line 31: To my opinion, the Table 1 is not needed and could be deleted because there

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already are many tables and figures in the MS (and Table 1 is the first to remove).

Lines 37-38 (Howe, 1971): Can the presence of permafrost be based on an over 40 year old reference in this marginal permafrost environment (especially considering what is presented in lines 96-99)?

Line 49: Spell out MAGST.

The section 2: Relative elevations could be presented somewhere (relevant when considering temperature inversions).

Line 90: A bracket missing.

Lines 108-109: How typical were the meteorological conditions of the studied years compared to the long-term climate conditions (based on data from the nearest met station)?

Line 116: Why didn't you use freely available Landsat scenes of the study years to explore the general patterns of snow ablation and accumulation?

Line 144: Reference to a wrong table? Also line 153.

Lines 193, 196 and 199: I think "Fig. 3, Photo 1" could be "Fig. 3A" etc.?

Line 198: Gelifluction? Or rather solifluction (gelifluction + frost creep) in this environment?

Line 261: Rather alpine than tundra (please check and be consistent throughout the MS).

Line 274: Amazingly low minimum temperature considering the measurement site (summit and ground surface)?

Lines 419-422: It would be nice to see a bit more discussion on this topic (the results of this study—sensitivity of marginal permafrost—climate change indicator)

Conclusions: In the end of this section, there could be a more general conclusion(s) of

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the study results—permafrost sensitivity—climate change interface.

References: I recommend the authors to carefully check the list for minor inconsistency (e.g. full journal names vs. short versions).

Table 4: Please spell out/explain abbreviations and symbols. Tables and figures should stand alone.

Figure 5: Please spell out/explain abbreviations and symbols (ps, lambda and R).

Figure 6: Please spell out MAGST and ACR and explain the meaning of numbered locations (also Fig. 8). Why there are two values separated by backslash in the legend (check also other comparable figures)?

Figure 7: Please spell out MAGST. How was the PISR variable computed (not mentioned in the methods section)?

Figure 9: Please spell out GST, DDF and DDT. Maybe LTs should be explained as well?

Figures 11 and 12: Please spell out MAGST.

Appendix A: Please spell out abbreviations.

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