

Interactive comment on “Brief Communication: Future avenues for permafrost science from the perspective of early career researchers” by M. Fritz et al.

Anonymous Referee #1

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Review of “Future avenues for permafrost science from the perspective of early career researchers” by Fritz et al. Submitted as Brief Communication to The Cryosphere Discussions

The paper by Fritz et al. reports on the outcomes of an Early Career Researcher forum aimed at identifying permafrost research priorities. This paper is submitted as a brief communication for the The Cryosphere, which can include reports or discussions of matters of policy and perspective or information on topical events. The paper would therefore fall within the scope for communications and be suitable for publication in the journal. The paper however is rather long with many references and may not fall within the length requirements for a brief communication.

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The paper gives a good overview of the objectives of the project, methodology and the results of the survey. A number of comments are however offered for the authors' consideration that will improve the paper.

The effort to identify permafrost research priorities, described in this paper is not occurring in isolation. The paper mentions (in the Introduction) that the International Permafrost Association (IPA) highlighted the need to identify research priorities in 2012 but the authors do not mention that the IPA is also leading a project to identify permafrost research priorities which contributes to the ICARP III process. The final outcome will be based on input from both the ECR and IPA processes. The authors should place their activity and its outcomes in the context of the larger effort to identify permafrost research priorities.

In the Supplement, a very good summary of the results is provided including a list of all questions submitted, results of voting and ranking of questions. However, the highlighted questions presented in section 4 do not match exactly any of the original questions submitted. It is assumed that questions that were similar may have been combined or grouped according to theme and reworded. The authors could briefly mention in the text (section 3 or 4) any grouping/modification of questions that was done prior to the voting.

If this exercise is largely a contribution to ICARP which focusses on the arctic, then perhaps some of the text in section 4 should focus more on arctic issues. This might also make these sections a bit shorter.

The authors' should consider reducing the paper length especially if it exceeds the requirements for a brief communication. Reduction of background information and some editorial revisions might help. Some suggestions are provided in the specific comments below.

Specific Comments Abstract Page 1211, line 7-8: “spatial analysis of permafrost types”
Do you mean characterizing the distribution of permafrost (or ground ice)?

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Introduction Pg 1211, line 13: suggested revision "...the cryosphere underlying 24%...." (Permafrost underlies the surface rather than occupying it) Pg 1212, line 12 – Shouldn't reference be made to PYRN here as this was a permafrost event.

Section 2 Page 1212 line 25 to page 1213 line 6: Is all this information necessary? To reduce length you could focus on what is required to define the process of generating and voting on questions with additional information on workshop provided in the supplement.

Section 3 Page 1213, line 14-20 – Be careful with use of the term "trend". This might imply that an analysis of research topics over time has been done especially when referring to carbon research being a younger trend. Page 1213, line 20-23 – These topics are not really independent of the other ones mentioned, i.e. there are linkages between them (eg. links between ground ice and hydrology or process)

Section 4.1 This section is fairly long and could perhaps be made shorter. Page 1214, line 24: should this be "at the ground surface"

Section 4.2 Page 1215, line 13: suggested revision "...effect on the environment and human..." or "...effect on environmental process and..." Page 1215, line 19: suggest you delete "presently" Page 1215, line 23-28: Isn't one of the key issues here the lack of adequate information on ground conditions (i.e. soil properties, ground ice etc.) Page 1215, line 25-26: Suggested revision – delete "Hereby" and just say "In particular, the thermal evolution..." (I assume you are referring to the thermal evolution here)

Section 4.3 Page 1216, line 19-20: Revision suggested – "The description of environmental processes by the non-scientific community, including indigenous people, often differs from that by the scientific community."

Section 4.4 Q4 – Do you mean amount of ice rather than types. Perhaps you should just say "spatial distribution of ground ice". Page 1217, line 18-19: Revision suggested – "The presence of excess ice, including massive ice, is a key factor affecting the

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thaw sensitivity of permafrost to warmer temperatures and mechanical disturbance as ice melt can result in thermokarst topography (subsidence and collapse)" Page 1217, Line 25: Suggest you use "ice-bearing permafrost" (i.e. delete "ground") Page 1218, Line 1-3: Researchers can submit databases to the Frozen Ground Database so it isn't clear what the issue is here. Note that this is also more of a data rescue issue as this information probably exists in less available forms such as engineering reports etc. Page 1218, Line 3-5: Note that the objective of GTN-P is to monitor ECVs (permafrost thermal state and active layer). It is not meant to be an archive of all permafrost information. Within site descriptions (metadata) information is provided on soil conditions including ground ice. More appropriate references for GTN-P would be Burgess et al. (2000) or Smith and Brown (2009). Smith, S.L., and Brown, J. 2009. T7 Permafrost: Permafrost and seasonally frozen ground. Global Terrestrial Observing System, GTOS 62, Rome 2009, 19 pp. Burgess, M.M., Smith, S.L., Brown, J., Romanovsky, V., and Hinkel, K. 2000. Global Terrestrial Network for Permafrost (GTNet-P): permafrost monitoring contributing to global climate observations. Geological Survey of Canada Current Research 2000-E14 (http://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/download_e14)

Section 4.5 Page 1218, line 16: Revision suggested – "...transportation systems often rely on the..." (whether infrastructure relies on frozen conditions will depend on its design). Page 1218, line 22: McGregor et al 2010 should probably be referenced as Transportation Association of Canada 2010. (this is the correct citation for Transportation Association of Canada documents). There was also a similar document for community infrastructure by Canadian Standards Association (CSA): Canadian Standards Association 2010. Technical Guide - Infrastructure in permafrost: a guideline for climate change adaptation, Report Plus 4011-10.

Page 1218, line 25-26: There is integration already as engineers do conduct terrain mapping and also sensitivity mapping for major projects.

Page 1219, line 1-5: More recent papers could be referred to here such as Lepage

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et al. (2010, 2012) for the Beaver Creek test section and overview by Burgess et al. (2010) for Norman Wells Pipeline. The 2012 AMAP update of ACIA would probably be better to use than the ACIA report. Lepage, J.M., and Dore, G. 2010. Experimentation of mitigation techniques to reduce the effects of permafrost degradation on transportation infrastructures at Beaver Creek experimental road site (Alaska Highway, Yukon). In GEO2010, 63rd Canadian Geotechnical Conference & 6th Canadian Permafrost Conference Calgary. GEO2010 Calgary Organizing Committee, pp. 526-533. Lepage, J.M., Doré, G., Fortier, D., and Murchinson, P. 2012. Thermal performance of the permafrost protection techniques at Beaver Creek experimental road site, Yukon Canada. In Tenth International Conference on Permafrost Edited by K. Hinkel. Salekhard, Russia. The Northern Publisher, Salekhard, Vol.1, pp. 261-266. Burgess, M.M., Oswell, J., and Smith, S.L. 2010. Government-industry collaborative monitoring of a pipeline in permafrost – the Norman Wells Pipeline experience, Canada. In GEO2010, 63rd Canadian Geotechnical Conference and the 6th Canadian Permafrost Conference. Calgary, Sept 2010. GEO2010 Calgary Organizing Committee, pp. 579-586. Callaghan, T.V., Johansson, M., Anisimov, O., Christiansen, H.H., Instanes, A., Romanovsky, V., and Smith, S. 2012. Chapter 5, Changing permafrost and its impacts. In Snow, Water, Ice and Permafrost in the Arctic (SWIPA). Arctic Monitoring and Assessment Program (AMAP), Oslo, Norway.

Section 5 Page 1219, line 10-19: The key thing here is the interactions which makes it difficult to categorize the questions. Q1 and Q2 deal directly with the permafrost aspects of determining the carbon fluxes so perhaps are the relevant permafrost questions. For carbon there are permafrost and non permafrost aspects.

Page 1220, line 3: APECS and PYRN need to be defined. Page 1220, line 9: replace “identifying” with “identify”

References Page 1223, line 4: Define IPCC Page 1223, line 3: see earlier comment re McGregor et al. (should refer to Transportation Association of Canada as author)

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