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Interactive comment on “Permafrost soils and carbon cycling” by C. L. Ping et al.

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General comments

This paper gives a great review of the current literature and geomorphologic phenomena of permafrost soils. It is a much needed compilation of the growing number of papers concerning permafrost and carbon. I recommend publishing the paper after implementing following minor revisions.

Specific comments

Page 710: Please add a conclusive sentence to the abstract sentence

Page 710, line 23: After Zhang et al 2008 (doi: 10.1080/10889370802175895) permafrost underlies 24% of the landmass of northern hemisphere, not Earth. The

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22.79×106 km² permafrost described by Zhang et al 2008 would be ~15% of the Earth landmass (assuming an land area of 148940000 km²).

Page 710, line 25: ice-free land areas could be misunderstood as there is a lot of ice in the sediments (but not above. . .) Please change to e.g. unglaciated or non-ice-covered.

Page 715, line 23-24: The water, which fill the thermal cracks, are refreezing immediately and not in the following winter. Add “Lachenbruch 1963” to this paragraph and “Lachenbruch, A. H.: Contraction theory of ice-wedge polygons: A qualitative discussion, in: Proceedings of the 1st International Conference on Permafrost, edited by: Woods, K. B., National Academy of Sciences - National Research Council, Washington, 63-71, 1963.” to the reference list

Page 717, line 17: Add the review chapter of Grosse et al. 2013 (Grosse G., Jones B., and Arp C. Thermokarst Lakes, Drainage, and Drained Basins. In: John F. Shroder (Editor-in-chief), Giardino, R., and Harbor, J. (Volume Editors). Treatise on Geomorphology, Vol 8, Glacial and Periglacial Geomorphology, San Diego: Academic Press; 2013. p. 325-353.

Page 724, lines 4-7: Ice-wedge polygons are note restricted on Arctic coastal plains. Such patterned ground also dominate river floodplains, valleys, lowland areas and thermokarst depressions of e.g. Interior Alaska and Central Yakutia.

Page 725, line 3: Thaw lakes with ice-rich permafrost are note restricted on Arctic coastal plains. The also exist in Interior Alaska and Central Yakutia and beyond.

Page 725, line 16: “kg C m⁻²”: it is hard to understand how a weight (kg C) fits in an area (m²). Of course, you are giving the missing depth dimension afterwards, but to be consistent with the units (kg C m⁻³ later on), I would recommend to calculate this carbon density of the 0-3m interval to kg C m⁻³ as well.

Page 725, line 26: It is debated if Yedoma is “mainly” windblown dust. I would recommend to delete mainly and insert references showing the Yedoma

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genesis opinions (e.g. Kanevskiy et al. 2011 (doi:10.1016/j.yqres.2010.12.003), Schirrmester et al. 2011 (doi:10.1016/j.quaint.2010.04.004), Strauss et al. 2012 (doi:10.1029/2011GB004104) and Schirrmester L., Froese D., Tumskey V., Grosse G. and Wetterich S. (2013) Yedoma: Late Pleistocene Ice-Rich Syngenetic Permafrost of Beringia. In: Elias S.A. (ed.) The Encyclopedia of Quaternary Science, vol. 3, pp. 542-552. Amsterdam: Elsevier.)

Technical corrections

page 710, line 8: please introduce the abbreviation C here

Page 711, line 13: comma before “but rather”, not afterwards.

Page 713, line 28: a word is missing in this sentence, like e.g. “structures”. Moreover, to my mind, the term “massive” is often misunderstood as massive ice (a term which you use in the paper as well) and not as massive cryostructure. I would prefer that you use, according to French and Shur (2010) and Murton and French (1994), the term “structureless” instead.

Page 714, line 22: Change freeze to refreeze

Page 715, line 3: Please change “massive” to structureless

Page 715, line 6: change to ice-lens formation

Page 718, line 7-9: “lower, higher, cooler” compared to what? Change to low, high, cool

Page 719, line 24: insert a comma after “as mentioned above”

Page 720, line 3: delete “most” and avoid “massive” as description for “structureless” cryostructures. E.g. like “The cryostructure of the upper permafrost deposits is often structureless”

Page 720, line 19-23: This is a very long and complex sentence, which would be easier

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to understand in 2-3 separate sentences

Page 726, line 7: change “regions” to deposits

Page 726, line 7: As 1 Pg = 1 Gt, please decide which unit you want to use (Pg on page 711, 726, 727, 733) or Gt (page 726). Both units are not related to the SI base unit for masses (kg). Terra kilogram (Tkg) would be the right unit, but is not introduced as a carbon inventory unit so far.

Page 726, line 26: change Stoblovoi (2002) to Stolbovoi (2002) as in the reference list.

Page 753, Figure caption: change arctic Canada to Arctic Canada

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