

## ***Interactive comment on “Reviews and Syntheses: Effects of permafrost thaw on arctic aquatic ecosystems” by J. E. Vonk et al.***

### **Anonymous Referee #4**

Received and published: 17 August 2015

This is a critically needed review of thermokarst systems in northern regions. The authors have provided a comprehensive background on how permafrost thaw influences aquatic ecosystems and provided several notes on what is lacking in current literature on this subject. While the manuscript is generally well written, I find several areas that are a major concern.

First, and foremost, I believe the authors do an injustice to the importance and the undoubtedly major effort that was required to put this together by presenting a manuscript of 50+ pages. Indeed, the manuscript reads more like a textbook than a paper with the authors having to refer to various sections in text (e.g., “See Sect. 2.2”). While I understand that this is a large subject, there are several means to reduce the size of this manuscript and better present the information. For example, I would strongly suggest

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splitting lotic and lentic systems into two separate papers. These two subjects are often squished together interrupting the general flow of the manuscript.

Second, the authors generalize large statements without the support of literature or evidence. There is a difference between ecosystems in subarctic Quebec and those of Siberia, Alaska, and the Arctic. Yet, I found several instances of simply incorrect or conflicting statements being made with the use of very regional examples that the authors are themselves familiar with. It is not appropriate to generalize the entire circumpolar north with examples from subarctic Quebec. Indeed, I noted several places in which literature did exist to support some of the statements being made, but were not referenced. The authors are experts in their field, but a wider literature review beyond their own research locales is necessary for a manuscript such as this.

As with any collaborative multi-authored paper I found many differences in spelling, grammar, and style that will need to be harmonized. The oxford comma is sometimes used, sometimes not. English spelling is sometimes used, sometimes not. Referencing order should be oldest to newest or newest to oldest, but it seems to switch around in various sections (I have attempted to note all of these, but my ability to do this over 50+ pages waned in the later sections). It would be helpful if a single person could go through and harmonize the writing style of each section.

Several sections had a very poor writing style in regards to referencing specific examples. Instead of referencing the specific examples presented, words like 'A study showed', 'A synthesis of', and 'Studies found' were used. This is an inappropriate way to discuss a single study. Reference the specific study being discussed so the reader knows what and who you are talking about, especially if it is only one study being discussed. Vonk et al. (2015) found that... instead of "A synthesis study of... (Vonk et al. 2015).

Specific Comments:

Abstract: 10721 Line 2: "The thawing of this permafrost" is an awkward way to start

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the sentence. Do you mean permafrost thaw?

Line 13: replace 'modifying variables' with 'modifying factors'

Lines 14-20 are awkwardly written. Causes a break in the flow of the abstract

Introduction

10723 lines 3-5 and 13-15 are repetitive

10724 line 28 needs a comma after “optical and chemical limnology,” Indeed, here and elsewhere oxford comma's are required in a string to be consistent with other portions of your paper. Sometimes the oxford comma is used, sometimes it is not. Likely a factor of multiple authors.

10725 Lines 10-15 are repetitive

10726 lines 5-6 say that 'thermokarst lake disappearance by drainage into rivers is a widespread scenario in Siberia' – well yes, and also the NWT, YT, and Alaska. Many references could be used here..

Line 14: Description is northern Quebec, but elsewhere in the manuscript it is listed as 'eastern Canadian Arctic'. Actually, after going back through the manuscript, many of the examples are from references in northern Quebec but generalized as the entire Arctic or the eastern Canadian Arctic. I find that many of the examples are from northern Quebec and very few are from the eastern Canadian Arctic.

10727 Line 28: I find the generalization that thermokarst lakes can have profound vertical thermal density gradients and strongly stratified unsupported by literature. Many thermokarst lakes have been shown not to stratify in northern environments (Chris Burn published on this in the NWT). This is due to large differences in CDOM as well as regional climate. Darker lakes in warmer regions will stratify, ultra oligotrophic lakes in colder lakes won't necessarily. Here and elsewhere the authors conflate thermokarst systems in ultra-oligotrophic Arctic regions with subarctic regions.

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10728 Line 3: I find the sentence “strong thermal stratification during summer has been reported in many thermokarst lakes” not to be supported by any evidence other than in lakes in northern Quebec that have a very unique limnology. The references provided for this statement are only from subarctic Quebec.

Line 6-8 is not supported by a reference

Line 10-13: Here the authors acknowledge that some thermokarst systems do not stratify.. however, there are more references and examples of these systems not stratifying than support for those that do. I find little evidence to support the generalizations the authors are making in this section.

Line 20: no reference provided for this statement

Line 28: “Additionally, there may be strong diurnal variation in stratification and mixing”, there is no support for this. Reference the study.

10729: Line 16: Oddly using examples of toolik lake, and char lake to contrast northern quebec examples. Why these two lakes?

- This section is using 'favor' while other sections use the english spelling for several common words, e.g., favour.

10730 line 20, needs an oxford comma after 'play out for nutrients, DOC,'

10731 line 10: I know TEF was introduced earlier, but the paper is so large that it may help to redefine it again..

line 24: requires reference

10737 line 1: remove the word 'remote'

- Capitalize 'Arctic', it is a noun.

Lines 13-17: I actually expected the order of the section to follow the major consequences presented here.. but it seems as if it is an overly small section and then

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contaminants are discussed elsewhere in the manuscript. Seems like it was split up and redistributed..

10738: Line 10: “Few studies have yet”, which few?

Line 18: “One study found” this is a very poor way of writing this. Be specific, if you are discussing a specific study, be specific about it. Deison et al. (2012) found that lakes..

Line 22-26: Run-on sentence, please reword

10739 lines 1-5: Run-on sentence, please reword.

Line 15: need an oxford comma after the word solubility

10740 line 5: This sentence needs comma’s... “Biological processing of DOC occurs prior to, and upon, hydrologic...”

Line 24: Another example of poor writing style. If you are discussing a specific study, be specific about it. “Yonk et al. (2015) found that BDOC in Arctic soils and surface waters...”

10741 line 12: requires comma adrer ‘sources, rates, and’

10742 line 5-7: Unpublished data is not appropriate to use here to support this statement.

Line 26: reference ordering is not consistent. Oldest reference to newest reference. Move Laurion and Mladenov, 2013 before Hong et al. 2014.

10743 lines 3-5: Run-on sentence

Line 12: reference ordering is incorrect, oldest to newest.

Line 18: reference ordering is incorrect, oldest to newest.

Line 22-23 “The many shallow lakes across the Arctic often contain high concentrations of light absorbing CDOM” This is a very sweeping statement and its not true as written.

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Remove.

10744: lines 14: need commas! “though CDOM concentrations, and thus light attenuation, are often...”

10746 line 12: “Some trace metals, but as a source for others” → such as?

Line 13: comma requires after hypolimnia

Line 19: “Studies have shown” such as? As written it seems that this is just a statement pulled out of Tseng et al. 2014 rather than actually outlining the studies that are being referred to. This is not appropriate in scientific writing...

Line 22-24: What about turbidity?

10747 line 5-7 amend to read “Deepening of the active layer increases microbial diversity and allows microbes to speed up the degradation and transformation of some contaminants” (and include a reference to support this statement).

Line 7-8 is repetitive. Integrate with previous.

Line 10-12: where can this occur?

Line 17: “Studies in thermokarst lakes in Siberia (Manasypov et al., 2014) have shown” Again, you are referring to ONE study. Use the singular reference. Manasypov et al. (2014) have shown. This is the appropriate way of writing about a singular study.

Line 25-26: Repetitive from last page

10748

Lines 1-3 So no studies exist that show this?

Lines 4-13: who is doing this? Nothing is published?

Line 13-15: requires reference

Line 22: “A subsequent molecular study combined” WHO? McCalley et al., 2014?

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Then be specific and state that. “McCalley et al. (2014) showed that the abundance...”

10749 Line 24: What does the 'Fall' mean in the Arctic? Actually, again the authors are applying a limited example of a very unique region in northern Quebec as support for processes that occur pan-Arctic? Fall in Alaska is very different from fall in Quebec..

10750 Line 13: The use of unpublished data is not appropriate as support for this section.

- Why are we transitioning to rivers all of a sudden? 10751 line 17: is it necessary to say that methane is a potent greenhouse gas in a scientific publication with an audience such as this?

10752 line 6 requires references

10756 line 12-14: I do not understand what the authors are trying to say here... reword

10759: I find this entire section to be a bit of a scope-creep and could be removed or heavily shortened.

10765 line 6: Why?

Line 12-13: Convoluted sentence, clashes with previous sentence.

Line 15: reference order is incorrect, oldest to newest.

Line 16: Oxford comma required after 'lower DOC concentrations, and'

Line 24-30 is only true if lakes remain clear

10766

Line 13-15 There is no evidence to support the statement “Increased rates of carbon import and decreased O<sub>2</sub> concentrations with further permafrost degradation may particularly affect zooplankton and macroinvertebrate communities in the future”.

- Actually, In this review I find very little discussion of biotic communities at all. Most

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of the focus is biogeochemical and microbial with very very little discussion of heterotrophic community structure of these systems.

10768 line 13: "These communities are generally patchy" - not sure what the authors are talking about here...

Line 18: Why are the authors using southern references to discuss benthic macroinvertebrates. To further my previous point, the biotic discussion in this review is very limited and has almost no northern references to speak of.

Line 19-20: This statement is simply not true in all northern regions.

10769 line 4-6: There are many references that could support these statements.. please review the literature and cite some.

10770 line 11-12: unpublished data should not be used to support this statement.

10770 line 29: The reference is L.G. Anderson? This should be Anderson et al. 2009a.

10771 line 18: reference order is incorrect

line 24-30 run-on sentence, reword.

10774 line 2 comma required after availability, temperature, and prior...

10777 line 10: title says lake ecosystems in it, but I find nothing about lakes in this little paragraph.

Line 17-30: The structure and functioning of Arctic aquatic systems is not poorly studied. There are many examples of studies that examine this in the literature... Indeed, wasn't that a point of this review in the first place? This statement has me a bit in disbelief after reading 50 pages.

10779 line 2: should probably reference Edwardson et al., 2003 when discussing northern hyporhetic zones [Edwardson, K. J., Bowden, W. B., Dahm, C., & Morrice, J. (2003). The hydraulic characteristics and geochemistry of hyporheic and parafluvial zones

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in Arctic tundra streams, north slope, Alaska. Advances in Water Resources, 26(9), 907-923.]

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Interactive comment on Biogeosciences Discuss., 12, 10719, 2015.

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