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

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The manuscript of Vonk et al (Reviews and Syntheses: Effects of permafrost thaw on arctic aquatic ecosystems...) was examined regarding its suitability for Biogeosciences and was found fully satisfactory from the view point of novelty and scientific quality. The overall added value of this manuscript is extremely high. It clearly represents a reference work in its genre, fully up-to-date, state-of-the-knowledge of aquatic systems in the permafrost-affected regions.

The majority of cited references are dated 2010-2015 showing highly attractive research topics discussed in the paper. The summary, feedback and future research needs can be especially appreciated.

The organization of the paper is logic, thoughtful and the Discussion is well developed.

The Abstract represents fundamental approach of high academic value, thorough and insightful.

The only major shortcoming of this work (which does not necessarily require serious revision) is that "Wetland processes are not specifically discussed in this review" (L 25-26, p.1072). The wetlands represent significant coverage of the permafrost surface and contain huge stock of potentially vulnerable soil carbon. In addition, they contain significant water stock, much larger than that of the slopes.

In this regard, it would be important to clearly distinguish 1) slopes, 2) river deltas, 3) river valleys, and 4) watershed divides (plateau). In each of these elementary landscapes, the permafrost development is different and often unique. This is highly pertinent to what is stated in L 24-27 of p. 10775. As such, the status of aquatic systems related to thawing permafrost will be different among different landscapes. A synthetic cartoon of various water landscapes subjected to permafrost thaw would be very welcome but probably too difficult to produce at this stage...

Minor comments (in the order of their appearance) p. 10725, L 11: The number of lakes requires definition of the lake size range

p. 10726, L 6: Lake drainage into rivers: rather, into larger lakes and finally to the rivers (hydrological network), see Kirpotin et al (2008) for western Siberia case (One of possible mechanisms of thermokarst lakes drainage in West-Siberian North. International Journal of Environmental Studies, 65, No 5, 631-635. doi: 10.1080/00207230802525208).

p. 10728, L 2: Note the possibility of full freezing of shallow thermokarst lakes in winter and pronounced solute concentration process (Manasypov et al., 2015, BG)

p. 10728, L 28: diurnal variations are unlikely to be pronounced during May-July, probably only in August p.10731, L1-4: Is it possible to provide some details on this issue?

p. 10733, L 9-10: Consequences of "Thermokarst expansion into new soils at the lake margin" for water chemistry are also discussed for western Siberia frozen peat (Shirokova et al., 2013, Biogeochemistry)

p. 10733, L 27-29: Permafrost thaw induced by forest fire and the consequences on stream water chemistry are discussed for Central Siberia zone (Parham et al., 2013, Biogeochemistry)

p. 10734, L 4-14: DOC (and DIC) fluxes in Siberian rivers across the permafrost gradients are discussed in Prokushkin et al (ERL, 2011), doi:10.1088/1748-9326/6/4/045212.

p. 10736, L 8-13: Consideration of local conditions for permafrost thaw is very important remark, often neglected in global estimations. As such, GIS-based evaluation of type of landscapes in the permafrost-affected region is highly needed.

Section 2.3. Metal contaminants in thermokarst lakes of different stage of development are addressed in a seasonal scale in Manasypov et al (2015, BG), and the average concentrations of metals in t/k lake waters across the gradient from discontinuous to continuous permafrost are discussed in Manasypov et al. (2014, The Cryopshere, doi:10.5194/tc-8-1177-2014)

p 10740, L 28: less degraded? Explain, why are they less degraded than deeper soils? Corg may be tightly linked to minerals in deeper horizons and thus very poorly bioavailable

p. 10741, L 5-6: Kawahigashi et al demonstrated an increase (not decrease) of DOC flux northward, with the increase of the permafrost coverage on the Yenisey watershed, with the explanation as given below in L 7-10.

p. 10742, L 5-7: Specify, that this is relevant to mainly mountainous regions, not on flat surfaces.

p. 10743, L 25-28: Why 320 nm? Normally, this is 280 or 245 nm!

p. 10746, L 23: is it possible to provide a reference?

End of section 3.3: Potential bioavailability and speciation of metal contaminants changes progressively, in the sequence of t/k lakes development, from small depressions and thaw ponds to large thermokarst lakes the concentration of metals decrease whereas the molecular weight also decreases thus increasing metal – OM complexes bioavailability (Pokrovsky et al., 2011, BG; Shirokova et al., 2013, Biogeochemistry)

Section 4.1.2, L22-25: Similarly, both CO2 and CH4 concentrations were found to be higher in smallest thaw depressions at the beginning of permafrost thaw (Shirokova et al., 2013, Biogeochemistry)

p. 10765, L 14-17: What is the mechanism, coagulation of DOC?

p. 10768, L 20 & 21: 2 times "overall", may be re-phrase

p. 10769, River export to the ocean. L 19: this sentence is not totally true: PARTNERS (Arctic GRO) provide such measurements, which are fully compatible with previous and on-going measurements by RusHydromet (concerning Ca, Mg, Cl, SO4, Cl, Si, DIC and DOC, see Gordeev et al., 1996 Am J Sci; Pokrovsky et al 2010 Chem Geol).

p. 10770, L 16-19: This sentence is too general to be supported by unpublished data. Explain what exactly S. Tank found for the Mackenzie catchment.

p. 10770: The variation of riverine DIC flux across watershed with different permafrost coverage is thoroughly discussed in Pokrovsky et al., 2015 BGD.

p.10772, L 6: In much of the Russian Arctic, organic carbon transport from land to ocean. . ." – relative to the Canadian Arctic and the Mackenzie River?

p. 10773, L 21: higher OC input? rather, OC export?

Ref. Kirpotin et al. 2008, not easily available to readers, can be replaced by one of those Kirpotin et al. (2009) West Siberian wetlands as indicator and regulator of climate change on the global scale. International Journal of Environmental Studies, 66, N 4, 409-421, DOI: 10.1080/00207230902753056.

Kirpotin et al. (2011) West Siberian palsa peatlands: distribution, typology, hydrology, cyclic development, present-day climate-driven changes and impact on CO2 cycle. International Journal of Environmental Studies, 68(5), 603-623, doi: 10.1080/00207233.2011.593901.

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