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Interactive comment on "Hydrology drives chemical synchronicity in subarctic tundra ponds" *by* Matthew Q. Morison et al.

Anonymous Referee #2

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The study by Morison et al. presents some interesting data on the variability of water chemistry in shallow Subarctic ponds. Authors make a point that most studies in high latitude lakes are based on few water samples taken during the summer and do not account for temporal changes driven by, for example, hydrological events. This is a strong and valid statement, and the dataset presented in this manuscript is certainly unique by showing how variable water chemistry in thermokarst ponds can be during the ice-free season. Authors attempt to relate this variability to local hydrology by calculating index of hydrological dependence that is somehow arbitrary. Perhaps, in the general approach, it would be better to calculate a simplified mass balance for some ions of interests; knowing the catchment area for each pond (run-off) and temporal changes in concentrations through the water column?

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The manuscript lacks context data that would allow better understanding of the processes driving water chemistry. For example, many shallow thermokarst ponds show strong thermal and oxygen stratification; were the 6 studied ponds stratified or mixed? What was the approximate rate of water exchange both vertically and horizontally? Water samples were take from the shore or from the middle of each pond? How representative were studied ponds in terms of nutrient concentration and biological production for other ponds and lakes in the area. Authors discuss biological processed that may be responsible for rapid uptake of nutrients but do not include any indices of the trophic status or plankton biomass in studied ponds. Indeed part of the variability in chemistry between ponds can be probably explained by different patterns of uptake. All these informations are required to better appreciate presented data and would much improve the manuscript.

Authors attempt to compare temporal and spatial variability; Is 6 (5?) ponds enough to encompass spatial variability, particularly if temporal variability is assessed with 12 time points? This would probably bias the entire analysis toward higher temporal variability. Finally, in the Discussion authors provide an outline on how to better plan field campaigns for sampling of high latitude lakes. Such guidelines are much needed and some unification of methods would help greatly to determine effects of recent environmental changes in Arctic freshwaters. However, I think that this can be done with instructive diagram that would be readily accessible for broad scientific community rather than by quoting and refuting methods used by others. Focus on the positives and how much your own research can add to future improvements.

Please find some detailed comments and suggestions attached.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2017-142/bg-2017-142-RC2-supplement.pdf

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