

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

**Anonymous Referee #1**

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This paper summarizes a study evaluating aquatic chemistry dynamics in the Hudson Bay Lowlands in northern Canada. The objectives were to determine if temporal or spatial variability in pond chemistry is more prevalent and any variability could be used to infer processes occurring in ponds and their catchments. The paper is certainly within the scope of Biogeosciences. The authors' point is well taken that many synoptic scale studies of aquatic chemistry use very few samples, yet make broad statements about the processes at play to produce these signals. In that respect, the dataset presented for this region is quite good. However, the paper could be improved to substantively deliver on its objectives, specifically the one on relating processes to patterns. The title could be "Hydrology drives chemical synchronicity in subarctic tundra ponds sometimes". Two major issues with the paper that should be addressed. The

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first is that while the data suggests there are some constituents in some ponds that are clearly influenced by hydrological processes (e.g., evaporation), there are no data presented on pond hydrological fluxes or states besides pond stage. There is a diversity of responses that are interpreted through the lens of this drawdown, and the authors make some, what I think are unsubstantiated classifications of their data. For instance, what defines "consistent" in the relationship between pond stage and concentration? Another interpretation of the data in Table 5 could be that each pond has hydrologically driven chemical species, but these species may not be hydrologically driven in all ponds; "hydrologically driven if necessary, but not necessarily hydrologically driven" so to speak. There needs to be data provided on basin area, pond:catchment ratio, etc., because these may allude to runoff fluxes into and through the ponds, that may help explain these differences. This would help address a feeling the reader gets that the authors use the literature too much to help interpret their results. The paper does show how hydrology does and does not drive chemistry in these ponds, but it needs more hydrological data, and this could elevate the paper. The second issue is related, and it relates to the difference between "synchronicity" and temporal coherence". First, synchronicity is not a word, but that is an argument for another day. Because the hydrological process discussed in the paper is really just a drawdown process, it is likely correlated with time, so are some of the terms really hydrologically driven, or are they just exhibiting temporal coherence? This is why discussing other hydrological processes is necessary. Also, I agree with the authors that there are landscape scale factors at play, but this relationship between time and hydrology needs to be better thought through and expressed in the paper. Doing so, and gleaning why some species seem to be hydrologically driven, in some ponds sometimes, but not all, could bring it all together quite nicely. This could also allow the authors to better deliver on objective #3.

Some minor issues include a lot of misreferenced tables and figures. The authors use "between" when they should use "among". Also, while great data for context, I'm not sure the higher frequency data adds that much to the manuscript. I've attached a marked up pdf version of the manuscript.

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Please also note the supplement to this comment:  
<http://www.biogeosciences-discuss.net/bg-2017-142/bg-2017-142-RC1-supplement.pdf>

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