Biogeosciences Discuss., 12, C7059–C7062, 2015
www.biogeosciences-discuss.net/12/C7059/2015/


Biogeosciences Discussions
Open Access



# *Interactive comment on* "Biogeochemical and suspended sediment responses to permafrost degradation in stream banks in Taylor Valley, Antarctica" *by* M. N. Gooseff et al.

**Anonymous Referee #2**

Received and published: 26 October 2015

This manuscript chronicles empirical evidence of the biogeochemical and suspended solids response of an Antarctic stream to a permafrost degradation event. The data presented are novel and potentially warrant publication in-and-of themselves. The written is to the point and precise making for a refreshing read. It is appreciated that the authors have not over-stretched their analysis and interpretation of these data. With that, there are some minor concerns with regard to a lack of quantitative interpretation to be considered before this manuscript should be published. These comments are intended to help raise the general impact of the study since the current presentation may be considered a bit on the site/event specific side for this journal In the following, general comments highlight these concerns followed by Minor/Editorial comments.

At first read, one could recommend a modeling study to parallel the assertions of the impact of permafrost degradation on stream chemistry. However, my guess is that given the data limitations, any modeling would be finessed into fitting the prevailing theory (or so impacted with uncertainty that nothing concrete is gained). This defeats the purpose of a model to test hypothesis of the general shift of interacting hydrology and biogeochemistry. Personally, I think the authors have been wise to skirt the temptation of providing a modeling companion to these data. Of course, other reviewers and researchers might make more compelling arguments with regard to modeling that should be addressed.

All that said, there is a certain site/event specific flavor for this study. To help relieve that feeling, it would be good for the authors to provide a bit more consideration of how representative this landscape is to the region of consideration (e.g., provide some percent of the Antarctic that is similar to the landscape of Taylor Valley). Is it representative of 5% or 95% of Antarctic landscapes? Further, how much of the terrestrial Earth is covered by such landscapes? These types of numbers (rather than qualitative comparisons stating things are 'typical') help to give a feel for the importance of the landscape and event observed and the likelihood of change over large scales.

In addition, could some evaluation of the percentage of land area or stream run that has been impacted by permafrost degradation be provided? This could be a simple back of the envelope estimation or a more 'robust' remote sensing characterization. For example, how representative is the event being considered? Is it the first of its kind (with more to come) or has this stream and region already experienced similar thawing type events over a significant portion of the total length/drainage area? These types of estimates would help the reader get a better feel for the uniqueness or ubiquity of the event showcased.

On another line of thought, there is an assumption regarding the comparison of East and West Forks. I fully accept the lack of pre-event observations and the need for an allegory comparison. What is a struggle is the real degree of similarity (or difference)



BGD
12, C7059–C7062, 2015





between the two reaches. Why not provide some historical data comparison between the two sites (simple versus plots for paired samples collected at similar flows – even averages over ranges of flows with standard deviation bars)? My feeling is that this would help the reader accept the referencing between the two streams. Given the length of data available, this seems like a possible comparison to make.

The last general comment is to provide some more statistical rigor to the comparison of historical data and the post-event sampling. I am guessing that tests of significance for the difference between the population mean and post-event samples fail or are invalidated due to limited data (although n=47 seems sufficient). Still, some more quantitative information would be nice. For example, what percentage of the chemistry samples due the post-event measure represent? Are they in the 65th or 95th percentile? This is just a simple example of a potential statistical analysis (and there may be better tests to use.

The point of this (and all previous comments) is that bringing in some more quantification of (1) representativeness of the site, (2) representativeness of the event, (3) similarity or difference between East and West and (4) uniqueness or significance of the chemistry shift would really help place this study in a clear and relevant context beyond the uniqueness of place (which of course no one can argue with given the difficulty of polar work)

Minor/Editorial comments

P14775L16: Any chance to quantify the percentage of ice content implied with poorly saturated?

P14775L20: What percentage of Antarctic does this type of region represent? Quantify how typical it truly is for the reader to have context.

P14775L25: What is the rate of melt?

P14776L10: 'two-ten-fold' is awkward for me. Does that mean 'twenty times' or 'two



BGD

12, C7059–C7062, 2015

orders of magnitude'? Consider rewording to avoid confusion.

P14776L22: Could you make an estimate of the total percentage of streams in the region or the percentage of total length of the West Fork impacted by permafrost degradation? It seem possible through either rough aerial photo interpretation, full on remote sensing, or even a Google Earth guess?

P14780L15: Seems that with 20 years of data, you should be able to make a quantifiable case for the degree of similarity between the two streams. What does it look like when you plot similar data sampled under similar conditions for the two streams against each other? This would help support your claim for referencing with the East Fork data.

Section 4.3: This section comes across a bit too qualitative. There must be some comparison statistics you can use to state how different post-event chemistry and suspended solids are from what is assumed as pre-event conditions at similar flows. I understand that data limitations put full statistical analysis out of reach, but a little quantification here would go a long way.

---

Interactive comment on Biogeosciences Discuss., 12, 14773, 2015.