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## ***Interactive comment on “Thermo-erosion gullies boost the transition from wet to mesic vegetation” by N. Perreault et al.***

**Anonymous Referee #2**

Received and published: 24 September 2015

The authors present 2 years of soil moisture, thaw depth, and vegetation characteristic measurements from undisturbed low centered and degraded ice wedge polygons in the high Canadian Arctic. Large difference is found in biomass, species and abundance between all the groups, while it is only the undisturbed low centered polygon that is distinctly different in thaw and soil moisture. The manuscript is mostly clearly written, with clarification only needed at a few places. I was however disappointed at the discussion section as it mostly read as a literature review and did not address the finding above (large vegetation characteristic differences not mimicked in the hydrology and thaw). I think there is a danger in simplifying (averaging) the hydrological characteristics like the authors have done (due to the large seasonal variability) and then performing fancy statistics and make conclusions when the results come out as statistically significant. I would like the authors to address the question (which is based upon observing Figure

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2-4) why is there such a large site-to-site variability in vegetation characteristics while the soil moisture and thaw is nearly identical in most of the groups?

P12196, L8-9: Unclear what the authors mean with “..i.e. with intact rims and non-apparent ice wedges”. If there are rims there should be ice wedges(??)

L7-14: The naming of the sites can be made clearer. I am specifically thinking about 1) the name choice of the “mesic” sites, which if I understand it correctly, has also experienced ground subsidence that occurred much earlier than the “more than five year disturbed polygons”; and consistency in naming of sites between text and figures. I think it would help the readability if the names referred to age or degree or absence of recent ice wedge degradation. I also recommend to expand the description of respective polygon group in general and include the photo of the sites in the manuscript (not the supplemental).

P12199, L17: What does “habitat x date” mean?

L21: I suggest removal of the second portion of the sentence, from “Which was also driven by significant differences between wet polygons and the other habitats. . .”. It is unclear, while the next sentence provides the message much more effectively.

L23-25: This sentence is unclear. Please clarify.

It is rather intriguing that the difference in vegetation characteristics is so large between all polygon groups, while the differences in soil moisture and thaw (as presented) is relatively small. I would like to see the authors expanding on that observation (which is not currently addressed) in their discussion.

P12201: The observations of decreased soil moisture and concur with an earlier model experiment on the role of ice wedge degradation or polygon type on water balance components (see Liljedahl et al. 2012), which is a quite relevant reference for this manuscript.

P12202, L5-7: If you are not presenting this data, then do not add this new information

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to the discussion! Is there a reference for it? Same goes for P12204, L4-5.

P12204, L10: Please be clear. What do you mean with “our results provide a new perspective”?

The discussion is rather long and become a literature review at places. My recommendation would be to build the discussion on the references that are already provided (intro/background) and focus the discussion on integrating those with your results. For example, there is a long description about geese in the discussion, but were they even mentioned in the intro?

P12206, L5-7: What does the authors mean with this sentence? Please clarify.

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Interactive comment on Biogeosciences Discuss., 12, 12191, 2015.

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