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Interactive comment on "Nonlinear thermal and moisture dynamics of high Arctic wetland polygons following permafrost disturbance" *by* E. Godin et al.

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Comments by Anonymous Referee #2 were to the point. We were able to address most of Referee's suggestions in the manuscript. We will enumerate hereafter each issues raised by Referee #2 and explain how we will address it.

First, regarding the scattered form of the manuscript and the weak English sometime used in the text. We acknowledge that this may be an issue and we agree to implement recommendations by Referee #2 so we could improve the manuscript. We will consider a substitution for the title as well, considering that we had some very good feedback from both referees - elements we will use as a basis to choose an alternative.

For the last sentence of our abstract we mentioned "The heterogeneous nature of disturbed terrains impacts active layer thickness, ground ice aggradation in the upper portion of permafrost, soil moisture and vegetation dynamics, carbon storage and terrestrial green-house gas emissions." One eroded polygon indicated a significant permafrost aggradation and active layer thinning - therefore fixing previously thawed carbon. We agree that we do not have the data on the ground carbon fraction and the GHG emissions at the site but it is quite organic rich. We propose to remove mentions of GHG and focus on the carbon. In any case we will reformulate to meet Referee's request to that effect.

We agree to change as suggested what would improve the consistence, the clarity, the precision and the form, such as changing 'centre' to 'center', include the Supplements in parenthesis (etc...) and other minors modifications, such as most of page C5702.

The references proposed by the Referee are relevant - we will take knowledge of the suggested papers and include the references in our manuscript.

Regarding the figures, the Referee suggested that we could combine together the Figures 2 to 4. We agree to make the figure more compact / concise - by changing the layout of Fig 4 by using the template used for Fig. 3 and therefore merging Fig 3 and 4 to Fig 3a and 3b. We think that Fig 2 have a different role, presenting the type of landscape, the gully, the disposition of the instruments used in the study and would not help by being merged with the local DEM we prepared for Figure 3a and 3b.

Also, in the figures and in the text we changed the sites names for a more intuitive naming as suggested by the Referee.

Further, we will put more details in the caption of Figure 6.

Figure 7 will have symbols changed - the intact polygon site will have its unique symbol.

Figure 8 was not clear or readable in its current form in the Referee's opinion. We agree - and we changed the figure to address the problem. We picked a temperature

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$\sim$ 20 cm in depth for all sites and will be comparing this reading instead of interpolating between depths as the original figure presented. We will adjust and rewrite the relevant results sections and discussions while considering the contents of the updated figure. We think it could be relevant to include the original Figure 8 it in the Supplementary material as a high resolution image - as it provide some good overall temperature characterization of the near surface for the site, which is quite essential to support the discussion.

The Referee suggested that we should strengthen our discussion around the evolution of ground moisture by using more thoroughly our data from Figure 5 and 6. The Referee provide some pointers that would contribute to a more in-depth discussion on the question of ground moisture. We entirely agree, we will consider the suggestion and strengthen this topic in the manuscript. In particular, we would address this issue by extending the section on the response of the near surface to precipitation, such as ground moisture levels changes during and between rain events between intact and eroded polygons – similar to the remark of Referee #1 regarding thermal dynamics (Question #1 in the 'Response to C4720').

Another suggestion proposed to us was to present our soil moisture data per percent saturation, similar to what was presented by Hinzman et al. (1991). We agree to change (or add) the percent saturation representation of the data, possibly in parallel to the Volumetric Water Content %, as presented for example in the Fig 2 of Liljedahl et al. (2011).

In the discussion (P13-15) the Referee suggested that the discussion is not well supported by the results. Further the style 'literature review' for (P14-L1-14) may not be ideal for this part of the paper. We propose to remove the section that read like a literature review - and remove repetitions. Also we will rewrite parts of the discussion based on the reworked results following the comments by the Referees. The objective of this rewriting is to be more concise and to refer to supporting elements of the discussions using figures presented in the results. We further agree to remove the part that read

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like a side story as suggested (P15-17).

Finally, for our conclusions (P17 L20-22) we will reword and reconsider following this relevant remark; effectively, as written, we have a low n.

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