

## ***Interactive comment on “The growth of shrubs on high Arctic tundra at Bylot Island: impact on snow physical properties and permafrost thermal regime” by Florent Domine et al.***

**Anonymous Referee #1**

Received and published: 3 March 2016

General Comments: an initial section evaluating the overall quality of the discussion paper

The Conclusion section is informative and validates the contribution of this study. Questions 10 and 13 in the review criteria are the only two that give me pause with regard to this paper. There are too many results, principally from the simulation modelling, presented in the Discussion section, and some material that seems appropriate for the Discussion section is currently placed at the end of the Results section.

There is also not enough discussion on the opposing effects of shrubs on temperatures during the winter and summer. Given that this study is put in the context of changes to permafrost, the authors should consider summer effects at greater length. I have

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recommended two particular studies that are a reasonable starting point for this expanded exposition. Nonetheless, I do think that there is enough new information in this study to warrant publication after some rearrangement and extension of the discussion of alternative processes controlling permafrost dynamics.

Specific Comments: a section addressing individual scientific questions/issues

Lines 44-45: Similar to my comment below, explicitly connect snow thermal properties to changes in soil temperatures. Read the final discussion section of Lantz et al. 2013 *Ecosystems* and also look at Blok et al. 2010 *Global Change Biology* for the counteracting effects of winter and summer processes.

Lines 80-81: I'd like to see you expand more clearly make the case for why "snow physical properties" are critical to relationships between shrubs and ground temperature.

Lines 81-88: Questions that are not explicitly addressed in this study would be better placed in the Discussion and expanded upon there. It is currently unclear exactly which questions are the focus of this study.

Lines 104-106: How much higher than other vegetation (e.g. graminoids) are the shrubs? In other words, how tall is the herbaceous vegetation? I think if you are going to list shrub height, you should also state the height of the other vegetation types.

Line 117: Was the probe inserted horizontally or vertically? Please explicitly state this.

Line 182: Why was this not also done in the other two perpendicular directions? Was there any reason for thinking that winds that redistribute snow could not move along the slope rather than up or down it?

Line 197: I would like to see data or a specific reference that indicates that 2014 was in fact a low snow year.

Line 274: Don't state that something is obvious, make it become obvious to the reader by explaining it thoroughly but concisely.

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Lines 271-280: Merge these paragraphs. There does not seem to be a good reason to separate them.

Lines 286-298: This entire last paragraph seems better suited to the Discussion section. If the authors feel it is most appropriate here, I would appreciate hearing their rationale.

Discussion section: Much of the reporting from the model simulation exercise would be better suited to the Results section.

Line 391: The statement on location and ecosystem context being critical would be more easily accepted if it were supported by a reference.

Lines 400-402: As above, see Lantz et al. 2013 and Blok et al. 2010. This statement on lower thaw that is contrary to the conclusions of this particular study seems to be of vital importance to the general context that this work is supposed to inform.

Line 402: Did the authors actually observe moss to have increased in abundance under shrubs, or was it simply that the authors observed frequent co-occurrence of mosses and shrubs? In other words, is there evidence for making this sound like a causal statement?

Figure 1: It would be tremendously more useful to simply show the location of Bylot Island in the Canadian Arctic as an inset in the figure, which should be a map showing the locations of the sites within Qarlikturvik valley.

Figure 3 caption: If you know the location information (site, bush) for these pictures, include that information here.

It seems unhelpful to the reader that the authors switch back and forth from thermal conductivity (e.g. Table 2, Figures 5b and 7b) to thermal resistance (Figure 8).

Technical Corrections: a compact listing of purely technical corrections at the very end

Line 98: Allard and Gauthier 2014 is not listed in the references.

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Line 137: Change to “not measured either” or otherwise correct the sentence.

Line 389: Myers-Smith and Hik should probably be outside of parentheses.

Line 414: remove comma after “snow density” and replace with “and”

Figure 3 caption: Change to “enhanced with photographic modification software.”

Figure 10: The main title of the plot should either be removed or cleaned up.

Make sure to put a space between the semicolons when multiple articles are cited in the text.

Also ensure there is a space between sentences, as this is sometimes missing (e.g. Line 58).

Multiple references (e.g. Essery et al., Pearson et al.) should be checked for formatting.

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