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Interactive comment on "Spaceborne potential for examining taiga-tundra ecotone form and vulnerability" *by* P. M. Montesano

Anonymous Referee #2

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This paper tries to use multiple sources of remote sensing data particularly high resolution space borne imagery along with ALOS and GLAS LiDAR dataset to predict tree heights in taiga-tundra ecotone. This, if rigorously developed and clearly presented, may make significant contribution in understanding and modeling the horizontal and vertical heterogeneity in canopy heights, reducing the gap between remote sensing community and ecology community through datasets at the scale ecologists can use. This manuscript still needs clarification here and there to reach its potential for further interdisciplinary research.

The title of this manuscript is to examine the ecotone form and vulnerability. But the author did not specify or provide definitions in the paper what the form and vulnerability are (vulnerability was mentioned until the end of the manuscript). The form and vulnerability needs to be clearly specified in this study. For example, Page 3 line 20,

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Discussion paper

"recent work notes that rapid growth changes forms. . ." It is vague what the form here means. Does it refer to individual stand or patch scale increase in height? In some other places, it reads as the form of patch size and distribution. Additionally, the authors need to specify what factors the TTE may be vulnerable to.

Page 3 line 26-27, depending how extensive Taiga vegetation distributed, the height and relation with permafrost temperature actually varies (Roy-Levillee et al 2014). Double-check with the reference please.

Page 8 line 11, first time DSM is mentioned here, please spell out.

It seems that NDVI was used as a mask to determine whether the land cover is vegetated or not. It is not clear how the threshold was selected though. It will also be good to discuss/introduce roughness based on panchromatic HRSI image. Also discuss why this method can be useful without modification based on Johansen et al 2014.

For study region, the authors mentioned that the study area was exclusively covered by one single boreal species Larix gmelini. Please clarify if this is also the case for the verification and validation sites. It will be good to note what the tall shrub species/tundra plant communities are. This study looks at forest-tundra ecotone, but shrub species are just left out, which might also be tall and these may be the ones respond to warming and changes patch dynamics.

The Patch-based analysis sounds very straight forward and will reveal the local scale dynamics in TTE patches. However, it will be good to include a clear definition of patch as well. Maybe based on remote sensing texture characteristics "patch" seems to make sense. But how does it correlate to ecological meaning?

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