

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

Anonymous Referee #1

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This is a scientifically significant and useful investigation. The authors emphasise the idea that ecotone form (spatial characteristics) is an important way of understanding the tundra-taiga ecotone, and aim in this manuscript to develop the case that spaceborne remotely sensed data have useful potential to characterise it, specifically by focussing on height distribution at the forest patch scale.

The MS is structured in an intelligible and expected way so it is straightforward to understand at least in principle how the authors have approached the question, though some details could benefit from more clarification. These are almost entirely within the methods section.

The abstract is clear and properly explains what the MS will do.

The introduction sections 1.1-1.2 provide good context to the study. Sections 1.3 and C1

1.4 may benefit from a little restructuring though: 1.3 starts by discussing general principles but then jumps to the implied conclusion that spaceborne LiDAR data will provide the necessary characterisation of height structure. Are there other (perhaps less promising) possibilities that should be discussed here, for example radar (or is this implied within the meaning of HRSI)? Section 1.4 is again general, so I think it logically belongs earlier than the decision to focus on the use of LiDAR data.

2.1 (study area) is fine. 2.2 (data acquisition and processing) is a bit hard to follow at times and needs more detail. Was the NDVI calculated from reflectance data or just from the uncalibrated pixel values of the HRSI data? And if the latter, were they atmospherically corrected first? How was the NDVI threshold determined? I think the processing to roughness needs some more information too. The approach used here is modelled on that used by Johansen et al (2014), but they were working with air orthophotos with a pixel size of 10 cm while the present work uses worldview imagery with pixels roughly ten times larger. How if at all do the different spatial and radiometric properties of the imagery affect the processing – e.g. choice of thresholds, kernel sizes? If different choices were made here than by Johansen et al, how were they informed? The rest of the methods section is clear.

Results are clear and interesting, and their discussion is comprehensive and sensible. The conclusions are properly justified.

Small details (by page/line number)

2/3 'asynchronous' – the word was unexpected here: you haven't said anything previously about structural changes being asynchronous, and I did not really understand what point you were making in using it.

4/1 'in the boreal' – the noun is missing!

4/8 'provide' → 'provides'

5/7 'Spaceborne uncertainty' isn't quite the right phrase, I think, since the uncertainty

hasn't originated in space. Maybe it needs a longer but more precise heading, such as 'uncertainty in spaceborne characterisation of TTE structure'?

5/10 'However... single active sensors...' I was a little puzzled by this phrasing. I don't think the work cited in the previous sentence uses exclusively active sensors (like LiDAR and radar), so am not sure what the 'however' is contradicting.

7/3 'sparse gradient in tree cover' = low gradient in tree cover, or sparse tree cover (or some combination of the two)?

7/26 'of primarily' → primarily of'

8/6 'backscatter power' → 'backscatter coefficient'

8/11 'DSM' I think this abbreviation is used here for the first time, so should be spelt out.

8/13 'attribute forest patches with the mean and variance...' This doesn't seem quite the right usage. Maybe you could say 'attribute the mean and variance... to the forest patches'.

8/29 'kernal' → 'kernel'

9/4 're-binned' → 'resampled'

9/19 'were filtered' → 'was filtered'

9/27 'attributing...with' – see 8/13

10/14 'attributed with' – again

15/24 superfluous 'the'. 'Theses' → 'These'

18/27 'describe' → 'describes'

22/3 'derived from a suite of...' → 'derived from a specific suite of...'

29 'backscatter power' → 'backscatter coefficient'

C3

29 'scale' (in column heading) – would 'spatial resolution' be preferable?

33 figures (a) and (b) have been transposed.

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