

Interactive comment on “Modeling the Evolution of the Structural Anisotropy of Snow” by Silvan Leinss et al.

Anonymous Referee #2

Received and published: 8 July 2019

This paper by Leinss et al describes a novel method to obtain anisotropy of snow based on macroscopic properties obtained from snow models, possibly with large impacts on modelling thermal conductivity, structural strength and remote sensing. The paper is very well written and clear to follow, with extensive discussion of the study limitations. The methodology is solid and the authors have usefully connected this work to previous studies that have an alternative definition of anisotropy. This is a clever use of remote sensing combined with snowpack modelling to give insight into the snowpack structure.

Comments and questions:

- Could this model be adapted for an Eulerian snow model (see final question)?
- Pg 8 line 24 add in reference to section 4.1

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- Add in introduction (pg 2, line 20) that model is evaluated against micro-CT derived anisotropy.
- Would be useful to put Figure 8 after pg 14, line 10 where it is referenced so it becomes Figure 4.
- Pg 14, line24: What does it mean to enforce the snow height? Pg 30, line 20 states that the snow height is enforced yet is too large.
- Is the 'best' snowpack in Table 3 the one that performs the best over all seasons i.e. same simulation configuration in 2009/2010 as 2010/2011 etc, or the best from each season?
- The purpose of including pc results on pg 21, line 6-13 isn't clear and breaks up the flow of the results. Consider removing them, putting them below line 18 and/or stating here that this is relevant to the discussion.
- Figure 7: could the value of alpha_3 be added to caption to indicate its value relative to alpha_1 and alpha_2?
- It is very hard to distinguish between Tair and Tsoil in Figures 9 and 10. Please change colours and/or line type.
- In the conclusions, pg 33 lines 9 and 21-22 imply that the polarimetric radar measurements are all that are needed to monitor the snow anisotropy. However, a snowpack model will be needed to interpret the anisotropy of the layers so the text should be adjusted accordingly. Extending that a little further, is the role of the CPD then to adjust the relative alpha_1 and alpha_2 per season (cannot be used operationally), is the seasonal fluctuation in these parameters significant (CPD could be used operationally but model needs to be adjusted for Eulerian snowpacks) or are CPD observations needed in the short to medium term to look at different snowpacks / seasons until there is high confidence the snow model can be used to simulate anisotropy without it?

Please correct the following typos:

Pg 5, line 16: always -> always

Pg 7, line 24: independent on -> independent of

Pg 10, line 16: sensors -> sensor

Pg 13, line 11: sufficiently height -> sufficiently high

Pg 14, line 16: intent -> intend

Pg 15, line 20: settling-induces -> settling-induced

Pg 16, line 5: Finish -> Finnish

Pg 16, line 11: estimate how -> estimate of how

Pg 16, line 23: temperatures were -> temperatures, where

Pg 25, line 18: set it -> set in

Pg 28, line 13: later as -> later than

Pg 32, line 28: folowwing -> following

Pg 33, line 22: non-destructive -> non-destructively

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-63>, 2019.

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