Reply to the comments

"Dear Authors, thank you for the careful revisions of your manuscript and for addressing the reviewer comments. I am happy to accept your manuscript for publication, however, only after considering a flaw in your new Figure 1a:

Your figure shows snow ice, as a result of flooding and refreezing of slush, above the water level. However, note that the common assumption is that snow ice forms from slush which by definition (and ignoring brine wicking or other second order processes) must be below the water level. I.e. all snow ice will be located below the water level as well, and the freeboard of slush and/or snow ice is generally considered to be zero. You can easily achieve this by moving you snow and ice column down into the water until the freeboard is zero. Of course, the freeboard of snow ice could become positive if there was subsequent ice growth at the bottom of the ice sheet, without new snow accumulation, however that is a secondary effect as well, as snow thickness will generally tend to increase too.

In your discussion, you could also mention that the zero freeboard of snow ice, or the negative freeboard of ice in case of a slush cover, is the reason for the major difficulties of radar or laser altimetry over Antarctic sea ice. The isostatic equations to convert snow or ice freeboard to ice thickness fail in case of zero or negative freeboards. Commonly, at least with laser altimetry it is therefore assumed that the snow freeboard corresponds to snow thickness, which removes the unknown of snow thickness from the equations. Luckily, you do not attempt to calculate thickness from your data, as for surface topography alone the snow thickness to ice thickness ratio does not play a role, except for the backscatter behavior as you correctly discuss.
Please could you modify Figure 1a and we will proceed from there.
Thank you very much, best regards
Christian Haas."

Dear Dr. Haas,

Thank you very much for the valuable comments and detailed explanations! As suggested, we have modified Fig.1(a) in the revision. Also, in the Discussion (Section 7.3), we have mentioned that the zero freeboard of snow ice, or the negative freeboard of ice in case of a slush cover, is the reason for the major difficulties of radar or laser altimeter over Antarctic sea ice. All the modifications have been marked in the revised manuscript.

Sincerely,
Lanqing Huang,
on behalf of all the authors