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Interactive comment on "On the Retrieval of Sea Ice Thickness and Snow Depth using Concurrent Laser Altimetry and L-Band Remote Sensing Data" *by* Lu Zhou et al.

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The authors would like to make a further reply to the referee's comments to update a reference that has just been available online. This reference is Zhou et al. (2017), which describes the improved L-band radiation model for the sea ice. This model is applied in the retrieval algorithm which combines L-band brightness temperature (TB) observations and laser altimetry measurements. A multi-layer formulation is adopted in the model, with a sea ice type dependent salinity profile. The L-band TB saturates with the deepening of the sea ice depth (Figure 3 in the reference), which is qualitatively consistent with that in Maaß et al., (2013). We consider the model's performance is

guarantee for its usage in the retrieval algorithm. The referee is kindly directed to Section 4.1 and 4.2 of this reference for the validation with SMOS data. This reference is published online at: http://dx.doi.org/10.1080/01431161.2017.1371862.

The authors would also like to further emphasize that the saturation of TB with sea ice thickness does NOT pose a problem of sensitivity for the retrieval with TB and snow freeboard (measured by laser altimetry). TB saturates under a constant value of snow depth, as mentioned above, but the retrieval is carried out under a certain value of snow freeboard (NOT snow depth). There still exists good retrievability for both snow depth and sea ice thickness even if the sea ice is thick, as shown in Figure 3.c of the submitted manuscript.

References:

Maaß, N., Kaleschke, L., Tian-Kunze, X., and Drusch, M.: Snow thickness retrieval over thick Arctic sea ice using SMOS satellite data, The Cryosphere, 2013, 7, 1971–1989, doi:10.5194/tc-7-1971-2013..

Lu Zhou, Shiming Xu, Jiping Liu, Hui Lu and Bin Wang, Improving L-Band Radiation Model and Representation of Small-Scale Variability to Simulate Brightness Temperature of Sea Ice, International Journal of Remote Sensing, 38:23, 7070–7084, doi:10.1080/01431161.2017.1371862.

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