

Response to the comments of Reviewer

First, we express our gratitude to the anonymous reviewers for their valuable suggestions. Herein, we provide a point-by-point response to address the additional comments provided by the second reviewer.

Q1: *lines 2-3: I don't think that the replacement of the first sentence is an improvement. The freeboard as such is one parameter from which other parameters (thickness, surface roughness) can be deduced, but it does not reflect sea ice dynamics directly. I suggest: "The total freeboard, which is the ice layer above water level and includes snow thickness, is needed to retrieve ice thickness and ice surface topography.*

A1: We have replaced the sentence with the suggested one.

Q2: *line 21: "The sea ice surface topography plays a crucial role for understanding sea ice dynamics and interactions within the air-ocean-ice system. It determines the spatial...*

A2: Done.

Q3: *line 93: ...with only seconds varying between them...? I think you mean: ...image pairs from the same orbit that are acquired with only a few seconds difference.*

A3: Yes, we have modified the sentence as suggested.

Q4: *section 2.4: I would prefer if one ice chart is shown as an example.*

A4: In the revision, a new figure (Fig.3) has been added to visualize the Ice Chart as an example.

Q5: *line 169: not "it's", better "it is"*

A5: Done.

Q6: *lines 215-216: Suggestion: According to Hallikainen and Winebrenner (1992) the penetration depth into multi-year ice varies between 0.3 and 1 m at X-band, depending on salinity and temperature.*

A6: Done.

Q7: *line 254-255: The parameter m refers to... Question: Is it a really a layer-to-layer ratio? This name is misleading in view of equation 9 which tells us that it is the ratio between the backscattered intensities of the upper and lower interface of one layer which you explain following equation 9.*

A7: In the revision, we renamed the parameter m to "layer-to-layer scattering ratio" to avoid confusion.

Q8: *Coming back to my concern regarding freeboard values $> 3m$: It would be helpful to provide the information about spatial resolution. in Fig. 7 and Fig.12. If it is 10 m then a local freeboard of 3 m is realistic in areas of heavy deformation and snow load. If the resolution is > 100 m such a value is not realistic.*

A8: We agree. In the revision, we have added the spatial resolution to the captions of both Fig. 6 and Fig. 8.

Yes, the spatial resolution in Fig. 7 (now Fig. 8 in the revision) is 10×10 m, therefore it is realistic that the values can be above 3m due to the heavy deformation. For Fig. 12 (now Fig. 13 in the revision) from Wang's results, the Icebridge ATM L1B elevation data with a footprint of 1m were used. However, Wang did not mention the spatial resolution for plotting the red dot representing 1.5-2.5m in the figure.

Q9: *line 395: "Furthermore, since..."*

A9: Done.

Again, we sincerely thank the editor Vishnu and the reviewers for helping us improve the manuscript.