The authors would like to the referee for the invaluable comments. The following revisions and corresponding replies are made for each comment (in *green italic* font). Also, a revised version of the manuscript is provided as attachment. The replies to comments are as follows, and the revisions are highlighted in the manuscript in red.

**Reply to comments of Referee #2:**

*The paper presents a new and interesting view on covariability in radar and laser altimeter data of sea-ice and its snow cover. The paper is well written and results are presented in a clear way, so most of my comments below refer to what may be typos.*

*Detailed comments: P1L10: despite over 5 years' the time difference -> despite the over 5 year time difference*
Reply: corrected.

*P2L12: perspective -> perspectives*
Reply: corrected.

*P2L17: in-situ observations of sea ice concentration is I believe equally chellenging*
Reply: the authors agree with the referee's comment, and have revised it as: "… thickness parameters are challenging for observations …".

*P2L24: added?? I suppose you mean that the local SSH is subtracted from the local floe's height*
Reply: corrected by changing "added to the floe's height" to "subtracted from the floe's range".

*P2L28: too many "main/mainly"*
*The main backscattering plane mainly resides close to the surface of the snow cover, and the main target is the retrieval of the snowfreeboard (Fs). -> The main backscattering plane resides close to the surface of the snow cover, and the target is the retrieval of snow freeboard (Fs).*
Reply: revised by deleting unnecessary words of "mainly" and "main".

*P2L34:corrected freeboard ice freeboard -> corrected freeboard is called ice freeboard*
Reply: revised as indicated.

*P3L1: effective freeboard -> apparent freeboard*
Reply: corrected from "effective penetration" to "apparent penetration".

*P3L12+13: You should indicate which is for radar and which is for laser*
Reply: revised in the location referencing these two equations.

*P4L17: parameter and its -> parameters and their*
Reply: revised.

*P4L24: sea floes -> ice floes*
Reply: revised with deletion of "of sea floes".

*Figure 1: In the top part there is significant discrepancy between variable names in figure and in the paper text. Check the use of capital letters, subscript and superscript. (h_subscript_s_superscript_*, C_subscript_s etc)*
Reply: this figure is fully revised to use the same variable names as the text.

*P6L6: utilizes -> performs*
Reply: corrected.

*P6L26: footprint -> footprints*
Reply: corrected.

*P6L29: You should refer to Eq 1 here.*
Reply: revised by adding the reference.

*P7L10: that radar -> that the radar*
Reply: corrected.

*P7L15: This is where the discrepancy in nomenclature with Figure 1 is most apparent, for example c_subscript_s should be C_subscript_s according to figure 1). Also explain what c is (speed of light in vacuum?).*
Reply: revised by adding necessary notation explanations in the text.

*P7L18: all these three products adopt threshold -> att three products adopt a threshold*
Reply: revised according to suggestion.

*P7L22: under same -> under the same*
Reply: corrected.

*P8L12: campaigns collocated -> campaigns have been colocated*
Reply: corrected.

*P8L14-15: we use dataset -> we use a dataset*
Reply: corrected.

*P8L20: under certain knowledge of -> under certain assumptions about*
Reply: corrected.

*P8L26: several -> a few*
Reply: corrected.

*P9L1: I suggest that you mention here that the ice drift will be discussed later. Also, there are many versions of the EASE grid. I gather that you are using a 12.5 kilometer EASE grid (or EASE2?)*
Reply : a sentence mentioning tests with ice drift correction is added by the end of the paragraph, as suggested by the referee. Besides, the referee is correct that we use EASE grid (instead of EASE2).

*P10L30: collocating -> colocation*
Reply: corrected.

*P11L8: speed -> rate*
Reply: corrected.

*P11L20: if slow -> if a slow*
Reply: corrected.

*P11L20: can be induced -> can be inferred*
Reply: corrected.

*P12L5: Speckle noise should reduce by sqrt(M) whereas SSH correction will have much longer autocorrelation length scale.*
Reply: the authors agree with the comments from the referee on the different rate of error decrease with scale.

*P12L8: in range -> in the range*
Reply: corrected.

*P12L17-18: This indicates ..... Please explain better. Why does a faster decrease indicate that the snow is relatively more homogenous?*
Reply : when a faster decrease is witnessed for a certain parameter (decrease speed closer to -0.5), then it indicates that there is lower heterogeneity of the parameter, since local average can more effectively attenuate its variability. The information above is added as the revision suggested by the referee.

*P13L7-8: Quite a mix of data sources, why? Have you checked for inconsistencies between the two datasets?*
Reply: the authors would like to clarify that the major reason of using both SICCI and U-Bremen MYI concentration products is that neither of them provides full coverage of 2011 to 2018. As reported by some studies, OSI-SAF MYI coverage product tends to underestimate the MYI extent, while U-Bremen product contains MYI concentration info, but tends to feature over-estimation (due to ambiguity with ASCAT on MYI coverage). Therefore, we use the combination of SICCI and U-Bremen product for the analysis. Since the two agrees quite well for regions where MYI or FYI dominates, we do not expect that the quantitative fittings of noise levels change much with the specific product we use.

*P13L20: Your estimates of noise levels would benefit from an estimate of the errorbars on the estimates. How accurate do you think your estimates are, and is 14 significantly larger that 10?*
Reply: the author would like to clarify that these estimations are based on statistical fittings of Fr variability of OIB and CS-2, and it is challenging to attain an estimation of the uncertainty. They are only provided as another estimations of the noise level of CS-2 for FYI and MYI, which are compared with other estimations (such as Ricker et al., 2014) in the paper.

*Figure 4: In the figure captions (or even better titles on the figures) you should be more clear about the difference between a) and b).*
Reply: Fig. 4 is full revised to include both ESA (a, b and c) and AWI (d, e, and f) CS-2 products. Also the caption is revised according to the referee's suggestion.

*P14 and following you should change the 1000s separator "’" to "," or remove it. It is not necessary.*
Reply: all the “’” are removed, as suggested.

*P15L8: This results -> This result*
Reply: corrected.

*P16L4: You introduce two measurement error terms (e and epsilon). You should explain whet they are/represent.*
Reply: the authors would like to point out that they have been introduced in Eqs. 3. A reference to Eqs. 3 is added here.

*P20L34: have underestimation -> may have underestimation*
Reply: revised as “may have underestimated”.

*P22L4: requires -> require*
Reply: corrected.

*P22L11. systematic observation -> systematic observations*
Reply: corrected.