General comment

The authors have done revisions and improved the quality of presentation (both text and figures). However, several questions and suggestions were answered only partly. Below I provide a new round of comments.

I asked the authors for the professional proofreading already two times but it seems that authors ignore this suggestion. I see that another Referee made the same suggestion and authors responded: We paid the Elsevier publisher Service for English grammar correction for the 2nd manuscript version....It always worked well for our previous publications. .. Not this time... In new version we corrected many typos, missing words, rearranged the sentences. I hope we detected all catchy errors; Few occasional errors (articles and prepositions) could hopefully be corrected by specialists from journal technical team (what was the case with our last article published by EGU publisher).

I find this response unsatisfactory. I find that the manuscript requires both scientific and grammatic proofreading. I suggest the authors find professional proofreading service for the scientific texts – not only for English grammar but also for consistency and scientific rigor.

Some of the questions are answered only partly or not even thoroughly read and comprehended as it seems:

Fig. 11: For a comparison of ice thickness from 2D product and gauging station, why not to extract the ice thickness exactly at the location of the gauging stations?

339-344: I think you do not need to explain the legend in the caption, it should be clear enough. The information on what stations are in (4 gauging, 20 virtual) is important. The max-min red lines on b) are not visible.
Reply: Number of stations used is provided in the figure caption. The line width was increased. The legend was removed.

Why did you remove the legend? The suggestion was to use legend instead of the caption. Please also refer to the journal guideline and rework all of your legends and captions correspondingly:

A legend should clarify all symbols used and should appear in the figure itself, rather than verbal explanations in the captions (e.g. "dashed line" or "open green circles").

Please distinguish clearly throughout the manuscript when you refer to the visual picking of the phenology dates ("manual") or to the automated algorithm. I am not sure that the manual selection can be called an algorithm (for example, line 436).

Sections 5.4 and 5.5 clearly belong to the Results. The suggestion from the other referee:

2) The method sections should be expanded with a section describing how the results are validated and all the additional analysis performed, which currently is described in the result section.

It means you should describe HOW the results are validated but not the outcome of the validation.

132: do you mean "on average"?

135: how is the **complete** freeze-over defined?

140: when?

142: this statement contradicts with the paragraph below.

143-146: please check the grammar and syntaxis. Add numbers – how much later and how much thinner.

Figure 2: a) and b) are missing. I like the figure more now. I disagree that adding other stations does not provide any additional information. Please add Kazym Mys as well in b) as you did in your response to the review. I think you do not need labels "Date" and "Years" as it is clear. Please use more regular time intervals on a) – first date of the month, for example?

3.2 Altimetry data – you describe here brightness temperature data as well, so reconsider the title please.

For consistency, I suggest to describe altimetric measurements from both Jason-2 and -3 satellites, and then add the AMR instrument description afterwards. Thus, move 175-178 upwards.

163: "used" instead of "considered"?

165: can you provide a number or range?

171-173: should the reference go to the end of the sentence?

182: would it make more sense to move the sentence about ICE1 to the line 185 before the sentence "The ICE1 retracking algorithm…"

210: please add something like "based on our own interpretation of the altimetric data from this study"

237-…: I think the opposition here is wrong – you should oppose calm - rough water surface, not calm - river, as river surface can well be calm as well.

264: avoid saying "Our studies…", just cite them as any other studies.

268: better refer here to the Fig 3c, as, again, in Fig 3a one cannot see anything in detail.

Figure 3a: Why for the TB the labels are 37 and 18? Shouldn't they be 34 and 18.7?

Figure 3c: very nice figure! A question - you mark melt onset at the same point as you mark ice free period. Should it be corrected?

289: retrieved using manual / visual approach?

296-298: you could refer to the Fig 3c here

299: please explain what is spring-summer peak (maybe in Figure 3c) and why its height would be suitable for the freezing detection?

304: please explain why do use the difference between 34 and 18.7 GHz and the value of 2K (any references?)

The formulae 1 and 2 are not mentioned in the text and look useless to me. You describe this all in the text and you provide Fig.4. What is the operator "length"? By max you probably mean local maximum but then it should be reflected in the formula. dTB and ΔTB are the same? I know that you included the formulae after suggestion of the other referee but it does not look mathematically rigorous to me.

By the way, why did not you use the relative backscatter decrease/increase for the phenology dates retrieval as well? Is there any reason behind?

317: please give more details – how, why, etc

Fig.4: ΔTB < 2 in [t-1: t+2] – does your formula imply consecutive dates within this interval?

For the break-up ΔTB I am also not sure that the formula is correct.

344-345: including all years of observations?

Figure 5: include in situ station names in the plots title. VS135 is given twice, please check.

377-381: in my opinion this paragraph belongs to the previous section.

406-409: move this part to the Discussion please as this is your interpretation

Figure 7: please rework the Figure that it fits the style of other figures in the manuscript. Increase the font and line width, give titles to the subplots, remove the unnecessarily fine grid, etc.

448, 458: instead of 249 you mean 240?

535-570: In my view, this part lacks consistency. Why don't you provide figure for the ferry operation stop (535-538) as you do for the ice road dates? Why do you need to correct the prediction for the closing date but not for the opening? Do you conclude that the corrected prediction of the road closing is sufficiently accurate for the forecast as opposed to the road opening date? If you correct the opening date prediction, would you be able to state that the forecast is reliable? In any case, I am personally quite skeptical about such correction. For me it would be enough if you showed not corrected dates for the closing prediction as well.

Describe how do you calculate the leading time of the forecast. Provide the information on the difference between predicted and observed dates (RMSE, max-min) and on the leading time in a consistent and systematic manner for all three cases.

541: do you mean Fig. 12a instead of 11a?

541-547: you can also mention that the predicted dates are consistently earlier than the actual dates of the road opening.

543-547: you should move this part into the Discussion

546-547: maybe not so much of interannual variability but an overall trend for an earlier opening of the road demonstrated by both time series?

541, 563: please be consistent – is it also RMSE for the opening date?

Discussion

7.1 I suggest to name this subchapter "Factors affecting altimetric backscatter signal" or something like that, as it reflects better what you discuss here.

7.2 Here in the beginning you actually discuss retrievals of the phenology dates and ice thickness. Please consider restructuring/renaming.

You could start with ice phenology dates retrievals (manual and automatic), the factors influencing the accuracy of these retrievals, and potential improvements. Would inclusion of SAR data be

beneficial for the phenology dates retrieval? Are there any SAR-based river ice phenology studies you could compare your results with?

Then you could move to the ice thickness retrieval and do the same. You mention two studies in the section 4 (Unterschulz et al and Mermoz et al) which use SAR data for the river ice thickness retrieval – could you compare you results with those?

I also suggest that you give a separate and clearly distinguished paragraph where you discuss your forecast prototypes and their viability.

616, 619: wrong Figure numbers provided

617-…: again, what about the road **closing** date prediction?

627-630: Do you mean that the detection of the first consolidated ice would require another sensor / data? If it is possible with the same dataset, why did not you try it? Please explain in the text.

Could you provide for this subchapter some information on the availability of the in situ observational stations on the other Arctic rivers? That would be a great outlook on the potential future studies in a large geographical context.

Conclusions – I think the title should be in plural

665-666: I would say that a generally low number of in situ observations and their general infeasibility to cover vast areas are the main drivers.

668: freeze-up, breakup **dates**?

669: again, do you refer here to the automated one? Briefly reiterate please the basic principle of the algorithm.

674: please mention that there are 5 stations and 12(?) years of the simultaneous measurements

675: what is it in the percentage of the max/average ice thickness?

681: mean accuracy?

681: please reconsider what you report here based on my earlier suggestions in the Results

683-700: very good!