In their manuscript „Spectral attenuation of gravity wave and model calibration in pack ice", Sukun Cheng and colleagues present results of an analysis of wave energy attenuation based on data obtained from a set of SAR scenes from the Beaufort Sea. The analysis includes: (i) derivation of spectral wave characteristics in the area of interest, divided into two sub-regions with different ice types and morphology, (ii) computation of linear attenuation coefficients for a large number of pairs of points located in both sub-regions, and (iii) calibration of parameters of two selected models of wave attenuation, by Fox and Squire, and Wang and Shen, to the observed spectral attenuation. The manuscript also includes a discussion of possible sources of errors in the analysis, data deficiencies, as well as a more general discussion of problems with model calibration related to a large number of unknown coefficients and with the fact that a multitude of different physical mechanisms contribute to the net attenuation observed in the field.

It is relatively easy to point out limitations of this type of analysis, but – as the Authors rightfully remark – our limited understanding of the processes involved, combined with limited availability of data for model calibration and validation, restrict our ability to develop complex, physics-based models and justify development of simplified, but practically applicable parameterizations (like those implemented in the WW3 wave model). Therefore, in my opinion, the work presented in the manuscript is very valuable and has several aspects practically relevant for spectral modeling of wave propagation and dissipation in sea ice. I think that the results are worth publishing in "The Cryosphere". My comments on the manuscript are listed below.

General comments:

1. The text of the manuscript contains a lot of (mostly small) grammar, punctuation and other language mistakes and should be carefully corrected before publication.

2. I'd suggest modifying the title of the paper. I understand the Authors wanted the title to be short, but in my opinion they overdid it. "Model calibration in pack ice" – what kind of a model? It might mean anything. I'd also suggest changing "gravity wave" to "gravity waves".

3. The location of FAL – and its very existence – is crucial to the analysis presented in this paper. The Authors first introduce this term on page 3 (lines 75-76), suggesting that it was used (or defined) by Stopa et al. (2018b). It should be Stopa et al. (2018a) – see also my technical comment no. 1 below. But, more importantly, even if that information is provided in the previous papers, I'd suggest adding it to the present manuscript as well: how was the position of FAL determined? How does the ice cover differ on both sides of the FAL-line? In the present form, the FAL seems rather "mysterious". For example, further on page 3 we read: "…the FAL (black dots) presumably marks the separation between discrete floes and a semi-continuous ice cover with dispersed leads". (A bit further, in line 120, again: "presumably a semi-continuous cover".) Presumably? Does it mean those features cannot be unambigously identified in the analyzed images? How then was the position of FAL determined? What was the criterion? What is the uncertainty associated with the location of FAL? Very importantly: was the location of FAL determined independently of any information on wave characteristics?
   Could the authors add a figure showing fragments of the analyzed images on both sides of FAL (not necessarily in the main text, but in the supplement)?
   To make it clear: I'm not criticizing the analysis nor the way FAL was defined/identified, but the presentation in the manuscript.

4. As far as I know from other studies (I'm not an expert in satellite data analysis), the satellite algorithms used to determine ice concentration and thickness perform relatively poor in thin,

"new" ice types (frazil, grease, pancake ice). Could the Authors comment on the reliability of the concentration and thickness maps (Fig. 1b,c) in the region south of FAL, where the thickness is 10 cm or less? Is the apparent west-east gradient of ice concentration and thickness in that region really present or is it possible that in fact it is a change of ice type? Those questions are important for some aspects of the analysis, for example, in line 118, where the Authors say that the wavenumber "varies with ice concentration but is insensitive to ice thickness variation…".

Other, mostly technical comments:

1. Lines 69-70: "… (refer to Figure 1 in Stopa et al. (2018b))". It should be 2018a, shouldn't it? 2018b is about the Amundsen Sea, not the Arctic.
   I'd suggest checking the references to those two papers throughout the text.
2. Line 74: contaminated -> contamination
3. Line 94: "This work is to…" Change to "The purpose/goal of this work is…"
4. Line 95: "(<0.3 m)" – I'd suggest changing to "(thickness<0.3 m)" (and similarly in line 247). Further in that line: "dominant region". In which sense is that region "dominant"?
5. Figure 1: panels (b) and (c) are marked, but "(a)" is missing from panel (a).
6. Line 165: "… based on the sensitivity of the number of selected pairs depending on these values". I don't understand this sentence.
7. Line 167: 10^{-4}
8. Lines 188/189: correspond -> corresponding; indicate -> indicating
9. Line 205 (caption of Fig. 4): Geological? You mean geographical?
10. Line 217: As Eq. (2) is time-dependent, it should be $E(k_r,\vartheta,x,t)$
11. Lines 231-233: It is worth mentioning that those parameterizations were formulated for open water.
12. Line 258: histograms of k_i^m, not α
13. Line 266: "In both models, k_r, k_i…" It would be nice to introduce those variables (as well as $k=k_r+ik_i$) much earlier, because they (especially k_r) are used from the beginning.
14. Lines 363-365: The low-pass filtering mechanisms described here has a strong influence on the *average* wave period (and length), less so on the dominant period – unless attenuation takes place around the peak of the spectrum.
15. Line 412: "Thoughts of…" -> "Thoughts on…"