The Cryosphere Discussions

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# Comment on tc-2021-135

Anonymous Referee #2

Referee comment on "Impacts of snow data and processing methods on the interpretation of long-term changes in Baffin Bay early spring sea ice thickness" by Isolde A. Glissenaar et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-135-RC2, 2021

In this study, the authors presented a long-term multi-mission assessment of spring (March) sea ice thickness in Baffin Bay from satellite altimetry and sea ice charts. It is found that the snow depth redistribution to represent small-scale snow variability has a significant impact on sea ice thickness (SIT) derived from laser freeboards but is unnecessary for radar freeboards. Baffin Bay, a key area in modulating the freshwater flux, is a marginal sea with seasonal thin ice. However, the SIT related studies in this area is very limited. This study attempted to give a long-term variation of local SIT in the Baffin Bay from 2003 to 2020 for the first time.

In general, this study is well written and organized. It is well within the scope of TC and should be with great interests of the sea ice communities. In my opinion, only some minor revisions are required to be accepted by the journal.

General comments:

- The long-term sea ice variation in this study is limited to March (early spring) rather than the freezing season or all year round. So, to avoid misunderstanding, I would suggest the study period, i.e., March (early spring) should be addressed in the title of this study.
- I really understand that the field observations in Baffin Bay is rather limited, but some ULS-based SIT observations would be helpful. For example, some information can be obtained from Curry et al. (2014, https://doi.org/10.1175/JPO-D-13-0177.1) or Davis Strait Freshwater Flux Array.
- Adding some comparisons (e.g., Figure 5) with the AWI CS2SMOS SIT would be interesting because the present AWI retrival product (CryoSat-2) used AMSR-2 snow depth climatology in Baffin Bay.
- Another suggestion is to add some comparisons with the numerical model results (e.g., PIOMAS), although the CIS charts has been already used. I would also suggest to show

some comparison with an ensemble based estimation of the sea-ice variations in the Baffin Bay (Min et al., 2021, https://doi.org/10.5194/tc-15-169-2021).

- The main findings in this study are significant, however, some deeper explanations/discussions on how the different snow depths influence the different SIT retrievals is also interesting.