

Review of the submitted manuscript, “*MMSealce: Multi-task Mapping of Sea Ice Parameters from AI4Arctic Sea Ice Challenge Dataset*”. The manuscript investigates methods enabling the mapping of different sea ice parameters, which were applied in *The AutoICE Challenge*, achieving the first spot on the challenge podium.

Thank you for a well-written manuscript covering interesting results from *The AutoICE Challenge*, including both additional information on the developed method but also additional tests post-competition that verify previous assumptions on key matters that are important for developing deep learning models to automatically map sea ice in the polar regions from, among others, SAR imagery. To summarise the comments, there are very few things that need clarification. Some comments have minor suggestions for grammatical corrections or rephrasing. A PDF with small grammatical suggestions is attached. The manuscript is of high quality, covering an important topic, and is recommended for publication after a minor revision.

Minor Comments

Title: I believe a **the** would be appropriate in the title so that it reads: “*MMSealce: Multi-task Mapping of Sea Ice Parameters from **the** AI4Arctic Sea Ice Challenge Dataset*”

I suggest including a reference to the paper “*The AutoICE Challenge*” once it is available as a preprint in *The Cryosphere*, which should be very soon (it has been accepted but awaiting posting). A reference to this manuscript will be included in the “*The AutoICE Challenge*” article during the initial review phase.

L5: I think “using Sentinel-1 SAR data” can be removed, as this is mentioned in the proceeding sentence.

L32: This sentence is slightly negative. Instead of “it is important to acknowledge the limitations of previously proposed DL-based methods”, I suggest writing: “it is important to acknowledge potential areas for improvements of previous proposed DL-based methods” or similar.

In connection to this on L34, there are also advantages in utilising a singular sensor type, which, among others, simplifies operational aspects and can enable the investigation of how to extract its maximum value.

L48: I suggest you write the abbreviations for SIC, SOD and FLOE here instead of L68.

L54: “a bag of tricks” -> “a collection of strategies/techniques” /

L92: The AI4Arctic dataset in question here is the “AI4Arctic Sea Ice Dataset version 2” (ASID-v2). I think you should add a reference here to.

https://data.dtu.dk/articles/dataset/AI4Arctic_ASIP_Sea_Ice_Dataset_-_version_2/13011134

L104: I think it is important to acknowledge that the ice analysts do not willingly create ice charts in low resolution but rather that it is for the sake of efficiency and lack of time instead of inability. Suggestion: “who have to produce charts in low resolution due to time constraints”, or something similar.

Table 2: “produces the highest accuracy”, perhaps it is the highest combined score, which is referred to?

Table 3: The accuracy scores you report, is it actually the accuracy or instead the default scores for SIC, SOD and FLOE, i.e. R2, F1, F1, respectively? This could be clearer.

L199: A larger patch size does not lead to a larger receptive field in itself. Theoretically, at least, instead, it should allow for training models, which have a larger receptive field effectively. An explanation for not reaching higher scores with larger patch sizes could instead be a consequence of utilising a model with an insufficient receptive field for the patch size. I think this sentence should be revised. Furthermore, I think this could be an area for further improvements to the model, which you could consider adding a sentence about.

Tables in general: I think you should consider adding some more text to describe what is in the tables, as this is very minimal in the current manuscript.