The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC1
https://doi.org/10.5194/tc-2020-333-RC1, 2021

Comment on tc-2020-333

Anonymous Referee #1

Referee comment on "An improved sea ice detection algorithm using MODIS: application as a new European sea ice extent indicator" by Joan Antoni Parera-Portell et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2020-333-RC1, 2021

Parera-Portell et al present a new method for mapping sea ice extent using MODIS and apply it to the European Arctic Sector. Overall, the new method described appears thorough, robust and of interest to the sea ice community. The methods section is also well-written and easy to follow. However, the introduction is poorly phrased/organized in places, and the discussion section needs a bit more text discussing the broader applicability of the method and why this method should be used instead of other existing sea ice detection approaches (see major comments below). Without these additions, this paper only presents a new method without describing any novel scientific findings or reasons why this method should be used in the future, thus weakening its contributions to the sea ice community.

Major Comments:

- In my opinion, the introduction and methods contain too many references back to Gignac et al. (2017) – while I understand this paper builds upon previous work, it should also stand alone as a piece of science. The discussion of the differences between Gignac et al. (2017) and this work are important in places. but it is not necessary to write "as is discussed in Gignac et al. (2017)" every time something is mentioned that was also discussed in that paper. Also see my comments below about the use of 'we' in the introduction and about perhaps better introducing IceMap250 in the abstract and in the introduction.
- One thing that in my opinion is missing from this paper is additional discussion of why this method (IceMap500) provides better/more accurate sea ice classification than other existing products. The (much) higher resolution of the dataset should enable more accurate delineating of trends, particularly along coastlines, in fjords and places like the Baltic Sea. An additional paragraph or two in the discussion, describing where/how this sea ice mapping method should be used instead of other methods/datasets, would be a useful addition to the paper.
- Relatedly, the authors might also consider providing a figure showing what September

2013 looked like. Something like a multi-panel figure showing an RGB image, the Sea Ice Index and IceMap500 (in an area where there is fragmented sea ice)? I think this would be helpful for demonstrating the value of this method compared to the NSIDC Sea Ice Index.

- Also relatedly, I would suggest adding some additional details (perhaps in the methods and/or in the discussion section) about the broader applicability of this method and in particular the processing time required. To me, this method seems like a neat approach and something that applied at a pan-Arctic scale could lead to some interesting insights into sea ice dynamics along coastal margins, in narrow fjords, in broken up floes, etc – all things that cannot be observed with the 25km resolution products. In many places throughout the manuscript, the authors note that their choice of classification approach was in some ways limited by processing time requirements. A more explicit discussion of these requirements, and whether it would be possible (or what it would take) to use this method to produce a monthly dataset and/or a pan-Arctic dataset would significantly strengthen the paper.

Specific Comments:

L3 (Abstract): Suggest not putting so much emphasis on how the IceMap250 algorithm has been reworked here in the abstract – it is likely that the reader will not be very familiar with the previous IceMap algorithm

L8: Change "are a proof" to "demonstrate"

L10: Delete "on the contrary"

L14: "According to the trends and without taking into account the variability of the sea ice cover" is poorly phrased – what do you mean by "without taking into account the variability?" does this refer to natural interannual variability? I suggest rewriting this sentence

L30: Change sentence to something like: "The dynamism of sea ice and the affect it has on climate, biota and human activities make regular monitoring of its extent/thickness/etc necessary"

L32: What sensors are used to obtain these variables? I suggest providing a bit more background here about the typical sensors used to study sea ice.

L36: Change to "aiming to monitor sea ice…"

L40: I would advise against the use of "we" when describing previous work published by the same group but in a prior paper. To me, it makes it unclear to the reader what work is novel and being presented in this manuscript vs. what work has been previously done. Suggest rephrasing this bit to something like "…the IceMap250 algorithm was built to produce sea ice extent amps at 250 m using a downscaling technique by…" Also remove other uses of "we" in this paragraph

L45: As with above, I am confused by this sentence. Are you stating that you decided based on previous work that 250m is not necessary and 500m band is better? Did you decide that in the previous IceMap250m paper, or is that something you newly decided here? Please clarify

L61: Change "the totality of the processed area ascends up to…" to "the processed area sums to…"

L77: Change to "MODIS is an imaging sensor onboard NASA's…"

Nicely written methods section. Clear, thorough and generally easy to follow.

L231: Suggest starting off the results section with something like "We apply this updated IceMap500 algorithm over 2000-2019 in the European Arctic and Baltic Sea and assess/determine sea ice extent trends over this period." This is a smoother transition between the methods (where lots of time has been devoted to discussing the algorithm) and the results

Suggest not shortening "European Arctic" to "Arctic" in the text and figures – this is confusing to the reader as the results do not represent the entire Arctic.

Table 4 should be combined with Figure 7 – these numbers should appear on the figure itself which would more easily enable direct comparison between numbers/trends

L300 (and Figure 8): The way you define agreement between these two datasets is unclear to me – is this amount of sea ice observed in each dataset that is also observed in the other dataset divide by the total amount of ice observed in each dataset? How are you compensating for the difference in spatial resolution in this calculation? I suggest rewriting this sentence, perhaps including an equation and/or perhaps choosing a more intuitive way of comparing the datasets.

The authors might consider adding subheadings to the discussion section – it's not explicitly necessary, but it might help the transitions between say, Lines 318-324 and Lines 326-336.

L334-335: The sentence "As a result of its application…" is a bit confusing, perhaps rephrase here to clarify that "its application" refers to the MOD35 block correction (which I think is what it refers to, but I could be wrong)

Figure 9: I like this figure, but perhaps you could also add an inset or an additional two panels showing zoomed in versions of this figure? The differences between Sea Ice Index and IceMap500 will be much clearer at higher resolution.