Earth Syst. Sci. Data Discuss.,
https://doi.org/10.5194/essd-2020-99-AC2, 2020

Open Access Earth System Science Data Discussions

Interactive comment on "High-resolution mapping of circum-Antarctic landfast sea ice distribution, 2000–2018" *by* Alexander D. Fraser et al.

Alexander D. Fraser et al.

adfraser@utas.edu.au

Received and published: 19 August 2020

(Responses separated into general comments to Reviewer 2, "R2A" through "R2C" as a response to the general notes, then "1)", "2)", etc for specific minor comments)

General comments to Reviewer 2: We thank Reviewer 2 for their encouraging, constructive and detailed review. It's particularly heartening to see similar comments to those of the other reviewers, especially Reviewers 1 and 3. We are generally happy to address all of Reviewer 2's comments as detailed below.

R2: General notes:

R2A) I think the spatiotemporal dimensions of the landfast ice datasets you create (1km, 15-day interval) could be better justified. It's entirely reasonable to cite

Printer-friendly version

Discussion paper

the data product and repeat interval of the satellite as reasons for these dimensions. However, because the purpose of this publication is to present a novel dataset for others to use, it would be a good idea to include some discussion of the advantages/disadvantages of these spatiotemporal dimensions.

Good point – we are happy to elaborate a little on this in the text.

As you indicate, our spatial resolution was indeed influenced by the sub-satellite (i.e., nominal) resolution of the thermal infrared channels. Our previous work using fewer swaths per compositing period was limited to a 2 km spatial resolution, but here with more swaths, we were able to get good results with a 1 km spatial resolution.

Regarding the temporal resolution of 15 days, we were driven by a desire to get a finer time-step while still precluding pack ice temporarily advected against the coast from being counted as fast ice. Another factor limiting a finer time-step is cloud coverage. We find that with a 15 day window we are generally able to build high-quality cloud-free composite imagery. We think this is near the limit though – a finer time-step is likely to result in "holes" in the cloud-free composite imagery corresponding to persistently cloudy regions.

R2B) I understand you are intending to apply this dataset in an analysis for future publication. I would advise you either discuss how these dimensions apply to your intended use of the dataset, or how you envision others using your dataset.

This would be a good addition to the discussion section. We plan to add a couple of sentences around this.

R2C) In your results section, for example, you observed an 8.3% increase in fast ice extent compared to Fraser et al.'s (2012) study, which you attributed to the switch from a 20 to 15-day stationary criterion used to identify fast ice. How do these differences in outcomes due to changes in temporal window affect what this data might be used for?

An extremely good point! We are happy to elaborate on this.

This work has shown that a finer time-step is likely to produce a larger fast ice extent, as expected. This has implications not only for the current work, but also for the next generation of SAR-based observations of fast ice, which, depending on the algorithm, can rely on two observations obtained in subsequent repeat passes. In the case of ESA's SENTINEL-1, this involves a 12-day repeat cycle. TerraSAR-X is shorter still at 11 days, although it has yet to be exploited for fast ice retrieval. Other SAR algorithms which don't rely on exact repeat orbits are able to retrieve fast ice extent over even shorter baselines (e.g., feature-tracking algorithms can deal with any baseline, as long as features are present). These are all likely to retrieve higher fast ice extents than the product here, simply due to the shorter observational baseline.

As you indicate, this probably has implications for end users. This is probably particularly true in regions of ephemeral or volatile fast ice extent. We can mitigate this to some extent with a temporally-continuous dataset such as that presented in this work. For example, we can assess the presence of fast ice across several contiguous time-steps to assess whether a particular region is likely to have volatile fast ice. In such regions, we might suspect that the reported fast ice extent in the region is likely to be higher for a finer time-step.

We plan to add discussion around this to the revised manuscript.

R2 - Minor comments:

1) Line 67: Perhaps provide some examples of these scientific and operational uses?

A good idea – will be added.

2) Line 81: The use of parenthesis to clarify the imagery dating back to the year 2000 seems out of place. It would help the flow of the introductory sentence to this section to find a way to integrate this into the sentence without the use of

parenthesis.

Agreed – will be amended.

3) Line 96: I'm unsure of why "(coastline)" and "(change in)" were inserted into this sentence. Please edit the sentence to make their purpose clear.

Agreed.

4) Line 98: The wording of this sentence is a little redundant. You can change it to "Temporal compositing was carried out to create cloud-free. . ." or "Temporal compositing is required to create cloud-free. . .". Since this is the methods section, the reader will already assume this is what you've done, so I would recommend the latter. It is also in keeping with the present tense used in the writing.

A good point – will be amended.

5) Line 106: Because the authors are the same for the two studies cited, you can change the in-parenthesis citation to Fraser et al. (2009, 2010).

I will investigate why my reference manager didn't do this automatically!

6) Line 107: If you are referring to both cited Fraser et al. studies, say "The earlier works", if you are referring to only one of the cited studies, specify which one.

Thanks – this is a good way to clarify.

7) Line 110: Per my comment on line 107, if Fraser et al. 2010 is the work being referenced, make mention of it earlier. Perhaps move this parenthesis citation to the end of the previous sentence that starts with "The earlier work".

OK – will be clarified.

8) Line 111: Overall the writing in this manuscript is well done. However there is the tendency to use parenthesis when they are not necessary. The clarification

that cloud cover is a challenge for optical remote sensing in polar regions can either be integrated into the sentence, or stand as its own sentence. I would recommend the latter, as this would allow for the inclusion of study citations where optical remote sensing was challenging in polar environments.

Thank you for suggesting we revisit our use of parentheses. We will make sure to take a more considered look at them all in the revised manuscript.

9) Line 118: Please integrate parenthesis into sentence, or create new sentence.

OK

10) Line 123: Please integrate parenthesis into sentence.

Yes, agreed.

11) Line 126: Please change to "thin clouds" or "thin cloud cover".

OK – this is in line with Reviewer 1's comment too.

12) Line 168: Figure 1 is really well done, and does a good job complimenting the written description of the data collection process.

Thank you! We will also incorporate a flow chart as suggested by Reviewer 3, to further improve comprehension.

13) Line 182: Parenthesis integrate or remove

OK

14) Line 187: Parenthesis integrate or remove

OK

15) Lines 192 - 205: I am personally a supporter of numbered lists in publications, especially methods sections, as they are a great help for the audience. However I would recommend some consistency in how these numbered lists are used.

From lines 192-205 there are two numbered lists, the first list is independent from the text in a line-by-line format. The second list is integrated in the text. I advise you pick a method of numbering and stick with it. If you choose to integrate both lists into the text, I suggest you separate them into different paragraphs so the readers do not get them confused.

Good idea. We'll change the format of the second to match the first.

16) Line 215: Add a space between the final word and the parenthesis containing the citation.

Thank you, will do.

17) Line 220-223: This sentence needs work. I would advise either choosing between "ground-breaking" and "new" to avoid redundancy. Remove the parenthesis (across East Antarctica) and integrate into text. Rearrange to improve the flow. For example: "We restrict our presentation of results to the illustration of key attributes in this new pan-Antarctic fast ice dataset, and evaluate its improvements over earlier datasets created for East Antarctica (Fraser et al. 2012).

Thanks for your help with this paragraph, we agree.

18) Line 223-224: Remove parenthesis and integrate into text, or delete it. In this case I would advise the latter because the audience already knows you are talking about the dataset you created. Also, the comma separation breaks the flow of the sentence. Try something like: "More in-depth analysis of spatial-temporal patterns and drivers of fast ice distribution is outside the scope of this journal, but is underway for future studies (Fraser et al., in prep.)."

Thanks – that sounds better.

19) Line 227: I would remove "important new" adjectives in this sentence when you are referring to the data. The importance has already been demonstrated in the intro and discussion sections, and the purpose of the article is to introduce

a novel dataset, so the audience already knows it is new.

OK

20) Line 230: Please integrate the parenthesis text into the sentence.

OK

21) Line 233: Please integrate the parenthesis text into the sentence

OK

22) Line 236: Please integrate the parenthesis text into the sentence

OK

23) Line 259-260: Can you specify any ongoing or anticipated study topics of the Antarctic coastal environment this dataset is expected to help? It's okay if there aren't any that can be specified at the present time, but it would be interesting to include if there are.

I'm happy to add some examples in the text. These examples include behavioural ecology of charismatic megafauna (e.g., emperor penguin colony presence/absence), the effects of fast ice on the physical oceanography of the continental shelf (e.g., influencing coastal polynya location, and subsequent sea ice production and water mass modification).

24) Line 260: As I make clear in my summary of this manuscript above, I have no doubt this dataset is a very important contribution to Antarctic fast ice research, and will be heavily cited for years to come. However there is a certain promotional tone in this manuscript that seems out of place in a scientific article. In line 260, "major high-level" is used to emphasize the importance of IPCC reports. However, readers of ESSD will already know the importance and weight of IPCC reports, and will not need these adjectives. Unless "major" and "high-level' are established terms used to organize IPCC reports by importance, I would ad-

vise leaving them out. Throughout the manuscript you qualify mentions of your data with terms such as "new" and "ground-breaking". While this dataset is indeed new and ground-breaking, it would be better to reserve these terms for sentences when the actual importance of the data is directly addressed, rather than somewhat indiscriminately throughout the manuscript. I understand the purpose of this paper is to make the availability and utility of this new dataset known to the scientific community. I would argue, on your behalf, that the importance of the dataset you created is already evident in your paper, and the scientific community will readily understand this without the need for promotional adjectives.

Thanks for this perspective. On reflection this language does seem a little out of place here, and would be more suited to a press release, for example. We will rework the text to tone it down.

25) Lines 263-267: Previously you used numbers when listing steps taken to accomplish a goal. I suggest using numbers here instead of letters, to maintain consistency in the paper.

OK, we'll adopt this suggestion.

26) Line 269: In this paper you use the terms "spatial-temporal patterns" and "spatio-temporal patterns". Both are valid terms, but for the sake of consistency I would pick one and use throughout.

Thanks for picking up on this inconsistency. We'll address it in the revised manuscript.

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2020-99, 2020.