The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2022-21-RC2, 2022

Comment on tc-2022-21

Anonymous Referee #2

Referee comment on "Sea ice breakup and freeze-up indicators for users of the Arctic coastal environment" by John E. Walsh et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-21-RC2, 2022

Review of Walsh et al., "Sea ice break-up and freeze-up indicators for users of the Arctic coastal environment," submitted for publication in The Cryosphere.

This manuscript describes a nice study focused on the difference in ice break-up and freeze-up dates between near-coastal locations vs larger scale regional averages. The paper is generally well-written and the figures are clear. The results are convincing and will have an impact on how such analyses are used for coastal sea ice science. I do have some questions and comments, so I recommend for publication with major revisions.

Lines 63-64: As noted below, Bliss does not use this type of definition. So there are a variety of methods.

Lines 77-78: The 25 km PMW products provide the longest time record. However, we have at least 20 years of higher resolution AMSR data as well. Do you think your analysis would differ if you used that? I suggest you acknowledge that higher resolution PMW data are available and that they might be uniquely useful for examining coastal science.

Line 94: You've got a typo here. NSIDC-0051 is the NASA Team data set. You want to write NSIDC-G02202, the CDR data set. And also note that there is a Version 4 available: was this not available when you started this work?

Line 107: "Examples include…" I suggest you clearly write out all modifications from the previous algorithm, so your methods can be potentially reproduced by others.

Lines 110-111: I don't think v4 of the CDR has missing days.

Line 111: "a spatial and then temporal smoothing" Please provide all details.

Table 1: There are a large number of seemingly arbitrary numbers here. Why 25%, or 40%, or 50%? Why two standard deviations, or one standard deviation? Why minus 10%? First, why did you pick these, and second, what if you vary these numbers?

Table 2:

* You are providing the lat/lon of these coastal communities/stations. Why? They are not used anywhere. Instead, perhaps you can provide the exact grid cell numbers of the 3 cells for each location.

* Mestersvig seems to be decommissioned, as far as I can tell. Why did you choose this?

Figure 1:

* Could you rotate all panels so that north is upward, as is usual?

* "Bering Strait coast" is an odd name for this location. Really it is "NE Chukchi Sea," right? Also, these 3 grid cells are farther away from the coast than the other locations. Why?

* I suggest adding distance or lat/lon markers along the horizontal and vertical axes of each panel.

More on Figure 1: It took me a few minutes to understand the basic strategy here, so I suggest that you make this clearer. You show these coastal locations with red dots, but really they are never used. However, this distracted me and I thought you were going to compare coastal station information with these three grid cells. No, in fact you are using these 3 grid cells as proxies for coastal conditions. I suggest you say this explicitly. And

then I am wondering:

1) Why not choose SIC cells right at the coast? Yes, there could be coastal contamination, but I think the CDR has eliminated or much reduced this. At least you should check this.

2) Why not validate these CDR SIC values with coastal information when available? EG Utqiagvik has a sea ice radar, doesn't it?

3) What if you chose a trio of CDR SIC cells that were at another location near the coast within a MASIE region? Do you think you would get a different result? I suggest that you take one or two MASIE regions and test this, ie take 3 different near-coastal locations within a MASIE region and run your analysis. How different are your results?

4) You interpret many results in the context of landfast ice. I think you need to show that the CDR SIC cells you have chosen (because they are offshore) are actually in the landfast ice zone at each location. EG you could add a typical landfast ice contour (when it's there) to each panel of Figure 1. Or better, some kind of interannual min/max measure of landfast ice extent relative to the cells.

Line 163: Typo: "Figure 1" -> "Figure 2"

Lines 165-167: Why did you include MASIE regions that are not near your 10 locations, eg "Central Arctic?"

Line 193: Typo: "Table 2" -> "Table 1"

Figure 3: It might be useful to remind the reader in this caption that break-up start only exists when there's break-up end, and same for freeze-up, thus only two panels are needed in this figure.

Lines 213-216: This is interesting; I think Bliss vs J&E is in some ways analogous to NASA Team vs NASA Bootstrap. IE Team uses fixed tie points, while Bootstrap uses "dynamic" ie time/space varying tie points. There is value in each method (although generally the latter seems to be more accurate).

Figure 4: I had to look up "violin plots" but there is a Wikipedia page so ok. Still, it might

be nice to write one sentence explaining what this is. Also:

* What are the black strips within each histogram? Are they gaps where there's no data for that day of year?

* Perhaps you want to mark the mode or mean on each histogram, and write it as text?

Figure 5: I suggest writing in text the two slopes in each panel within each panel (or you could create a separate table). And this goes for all subsequent similar figures with trend lines. Perhaps one big new table with all slopes for all such figures together?

Line 377: Typo: "…and negative…" ie add "and"

Line 387: Typo: "Figure 12" -> "Figure 13"

Line 411: Here is a main result: The variance at three grid cells within a large region is higher than for the regional mean. This is useful in the context of coastal science, and it is very reasonable i.e., intuitive. I might propose that it is too reasonable, i.e., isn't this expected that variance increases when you focus on a small subregion? Actually, this could be true in some cases and the opposite might be true in others (eg if you picked three grid cells in a "boring" place with low variance). What if you took a MASIE region and made a map of some factor analysis parameter that would illustrate this? Would it show higher variance near the coast and lower variance toward the perennial ice pack? This seems important for you in order to really show that your result is not so obvious.