

Sea ice cover in Isfjorden and Hornsund, Svalbard (2000-2014) from remote sensing data

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General Comments:

The manuscript has been substantially improved over the original version. The authors have added new data that helps in understanding the sea ice variability, and have provided more information about the potential impact of various errors on the results. I feel that the manuscript should be published after some additional minor corrections suggested below. These changes are mainly to make the manuscript more readable.

Specific Comments:

- 1. P. 1, Lines 1-18:** The authors have added the analysis of atmospheric and ocean data, but have not mentioned this in the abstract. Perhaps the linkages suggested by the analysis with the new data can be briefly mentioned, along with a sentence describing how the dataset could potentially be used in future studies.
- 2. P. 2, Line 30:** Change “also during winter” to “during both winter and summer”, or to “during winter” if it is only true during winter.
- 3. P. 2, Line 44:** Add “(Fig. 1)” after “Spitsbergen” to indicate the specific location of the fjords.
- 4. P. 2, Line 40 or P. 3, Line 66:** As I understand it, the authors don’t intend this paper to be a comprehensive study of the causes of sea ice variability in these fjords. Rather, the paper mainly focuses on presenting the dataset, revealing the variability in sea ice cover that it is able to show, and showing that the observed variability is consistent with other observations and previous studies. Future studies may be able to use the dataset to further understand linkages and drivers of the observed variability. If the authors agree, think these points should be briefly mentioned in one or two sentences in either of these locations to make it clear what the authors’ objectives are.
- 5. P. 3, Lines 70-72:** Also mention the ocean and atmospheric data now included in section 4.
- 6. P. 3, Line 93:** Change “Medium resolution” to “Medium resolution (300-500 m)” for clarity.
- 7. P. 4, Line 96:** Can the authors provide the MODIS product number?
- 8. P. 4, Line 130:** The fact that temperatures were used to calculate degree days, and the calculation for this should be mentioned.
- 9. P. 5, Line 162:** The name of this index still seems to be a bit misleading, since it is not really an index of the number of days with fast ice coverage, but rather indicates of the number of days that the fjord would be covered with ice, if it was completely covered every day. Really it is an index of the cumulative percentage ice cover. Perhaps the name could be changed to reflect this, or the authors can briefly clarify in this section why they choose to include the word “days” in the name of the index.

10. **P. 6, Line 171:** Figure 2a appears to show some anomalously dark areas in the radar image, yet these areas are classified as fast ice. Is this a potential additional source of error?
11. **P. 6, Line 180:** Perhaps change “results in different error estimates.” to “is another potential source of error.”
12. **P. 7, Line 206:** In the response to reviewers, it is mentioned that because errors on monthly timescales are believed to be very small, they are not considered explicitly in the interpretation of results on monthly timescales. Please mention that here as well.
13. **P. 7, Lines 227-228:** Because there is no data before March for the earlier years, it is not really known if the peak is in March or not. But it is known that the peak is either in March or before March. I suggest changing “March” to “March or earlier”, and “the peak in March is...” to “the value in March is...”
14. **P. 8, Line 234:** Mention the maximum is assumed to be March for these numbers. I.e. change “(relative to the value for 2000-2005)” to “(relative to the value for 2000-2005, assuming the maximum occurs in March)”
15. **P. 8, Line 245:** “Higher difference” relative to what? Perhaps say “higher than average difference”. Also the value for 2009 is fairly large for Hornsund.
16. **P. 9, Lines 275-277:** I feel some additional details are necessary: i.e. change “winter sea surface temperature (SST), ocean heat content during autumn and winter atmospheric temperatures, ...” to “satellite-derived winter sea surface temperatures (SSTs) near the mouth of the fjord, ocean heat content from in situ profiles taken at the mouth of the fjord for 25-100m depth, as well as winter atmospheric temperatures from a nearby weather station,...”
17. **P. 9, Lines 288-296:** This paragraph seems out of place. I suggest moving it either to the end of the “Data” section, where the different products used are described, or to follow the 3rd paragraph of the “Error estimates” section following the discussion of the impact of different resolutions.
18. **P. 10, Lines 322-323:** The meaning of this sentence is not clear. Perhaps change to “But care must be taken in attributing changes in sea ice cover to atmospheric variability, as reduced sea ice cover and a warmer ocean can also increase the atmospheric temperature.”
19. **P. 10, Line 338 – P. 11, Line 340:** I still don’t think there is enough data provided to prove definitively that Hornsund is less influenced by AW, as this sentence seems to suggest. Suggest changing to: “A comparison of the DFI timeseries in Figures 8 and 9 suggests that interannual sea ice cover variability in Hornsund may be less influenced by intrusion of AW residing on the shelf.”
20. **P. 11, Line 371:** Change “March to April” to “March (or earlier) to April”
21. **P. 11, Line 374 :** Change “serve for” to “can be used to obtain”.
22. **P. 11, Line 376:** I think the authors are referring to future studies here, but it is not entirely clear. Perhaps change “can be used” to “can be used in future studies” for clarity.
23. **Figure 1:** It would be nice to see some geographic coordinates (even at the four corners of the figure) and possibly a scale bar on this figure, if possible.

24. **Figures 3 and 4:** This is not absolutely necessary, but it would be nice to see the DFI values centered at the center of the short season, rather than at the beginning of the year, to match up with the peak in ice concentration.
25. **Figures 8 and 9 captions:** A lot of the details here were described in the methods section. I think the captions can be shortened somewhat by removing some details.

Technical Corrections:

1. **P. 2, Line 29:** Change “makes eastern Fram Strait contain” to “causes the eastern Fram Strait to contain”
2. **P. 3, Line 74:** Change “like” to “such as”.
3. **P. 4, Lines 96-97:** Change “which allows to download all available images of the considered area and time period.” To “which allows all available images of the considered area and time period to be downloaded .”
4. **P. 4, Line 113:** Change “get” to “obtain”.
5. **P. 5, Line 135:** Change “created by using” to “created using”
6. **P. 5, Line 138:** Change “needs” to “needed” and “this is” to “this was” for consistency.
7. **P. 5, Line 141:** Change “followed” to “follows”.
8. **P. 5, Line 161:** Change “data is” to “data are”.
9. **P. 6, Line 178:** Change “make up” to “be up”.
10. **P. 6, Line 181:** Change “are not varying” to “do not vary”
11. **P. 6, Line 188:** Change “of the satellite” to “for the satellite”.
12. **P. 6, Line 189:** Change “few pixel” to “few pixels”
13. **P. 6, Line 190:** Change “in the same” to “of the same”
14. **P. 6, Line 193:** Change “Hornsund in” to “Hornsund on”
15. **P. 6, Line 198:** Change “polygon,” to “polygon”
16. **P. 7, Line 202:** Change “daily value error” to “daily error”
17. **P. 8, Line 244:** Change “capture well” to “effectively capture”
18. **P. 8, Line 260:** Change “the days with first appearance of drift and fast ice...” to “the days on which drift and fast ice first appear...”
19. **P. 8, Line 265:** Change “have been” to “were”.
20. **P. 9, Line 269:** Change “and beginning” to “and the beginning”.
21. **P. 9, Line 270:** Change “underlays” to “underlies”
22. **P. 10, Line 319:** Change “made the AW” to “caused the AW to”
23. **P. 10, Line 320:** Change “show” to “shows”, change “form” to “from”
24. **P. 11, Line 340:** Change “seem to revert” to “seems to revert”
25. **P. 11, Line 345:** Suggest changing “can serve” to “could serve”
26. **P. 11, Lines 358-359:** Change “merely that some protected side fjord within the larger fjord system have a fresher and colder surface layer that are able to produce sea ice...” to “merely that some protected side fjords within the larger fjord system may have a fresher an colder surface layer, allowing for sea ice production...”
27. **Table 1 caption:** Change “database: list” to “databases used,”
28. **Table 2 caption:** Change “total season refers to” to “ “total season” refers to”, and “short season refers to” to “ “short season” refers to”