

Referee #1

I would like to thank the authors for improving the manuscript and addressing all my concerns. I have only two minor suggestions:

Line 566: I think a suitable reference here would be Arntsen et al., (2019). Inflow of Warm Water to the Inner Hornsund Fjord, Svalbard: Exchange Mechanisms and Influence on Local Sea Ice Cover and Glacier Front Melting, as the authors discuss exactly how different hydrographic conditions influence sea-ice cover.

We have replaced the reference as suggested.

Lines 567 - 569: I suggest to remove this sentence, as it is not entirely accurate. Brine release during ice formation drives vertical convection and mixing, which reduces stratification and leads to deepening of the winter mixed layer.

We have removed the sentence as suggested.

Referee #2: Karl Kortum

Thank you for your explanations and the clarifications and changes made to the manuscript. I just have some short remarks about two of the responses.

L. 524 onwards: "Secondly ...". I do not understand this sentence. Stronger correlation between which variables characterise the coverage?

We have modified the sentence for clarity:

"Secondly, stronger correlation exists between winter air temperature and the sea ice and landfast ice coverage (on average 66% contributor to all sea ice) than between winter air temperature and drift ice which supports [...]"

I am afraid I still not sure that I understand this wording. To me it reads like this: "correlation (A, B, C) > correlation (A, D)", and I don't understand what the correlation between three properties is.

Thanks for the comment, we have further clarified it to:

"Secondly, stronger correlation exists between winter air temperature and the sea ice coverage, and between winter air temperature and the landfast ice coverage (on average 66% contributor to all sea ice) than between winter air temperature and the drift ice coverage which supports [...]"

It might be interesting to discuss if, based on your derived statistics, some reasonable predictions can be made for example in autumn about the length of the next ice seasons. Of course, 11.5 years is not a lot of data for such an endeavor, so one should still be careful with such statements.

We mention it twice in the discussion:

"Therefore, it appears that predictions of ice conditions in a specific period can only be made by observing meteorological conditions leading to it, such as autumn air or winter water temperature."

"The statistically significant negative correlation between winter water temperature and the length of ice season could suggest the pack ice lowering water temperature but it may also be a second order

effect of local weather conditions since winter water temperature is dependent on autumn air temperature (lag due to slower heat exchange of the water). If so, the monitoring of the air temperature at PPS Hornsund in autumn could allow an estimation of when the landfast ice forms.”

Thank you for pointing out the respective sections. I realise, I have not worded my original comment clearly. I was actually wondering if it might be interesting to train a small predictor (linear regression is sufficient) based on your derived variables and discuss the results. I do think the paper is complete without it, I just thought it might be an interesting way to show off your results.

Thank you. We have added a sentence in the discussion:

“Our data suggest that a 1°C decrease in the average October-December air temperature results in 19-day longer sea ice season (linear regression $R^2 = 0.53$).”