

Interactive comment on “Changes in the properties of deep and intermediate water masses in the Nordic Seas from 1997 to 2016” by Małgorzata Merchel and Waldemar Walczowski

Anonymous Referee #2

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General comments

The authors presented an analysis of a relatively long measurement time series of salinity and temperature transects in the northern North Atlantic. They presented linear regression analyses, transects and Hovmöller plots to examine the changes in the CTD measurements. The strength of this study is that they focus on intermediate and deep layers of this region, where only few continuous measurements exist. However, there are substantial aspects to improve until it is ready for publication. This affects among others the literature research, statistical significance analysis, text structure and discussion of the results. Moreover, they showed the full amount of the dataset available

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which could be used to proof their conclusions, which are merely assumptions.

Specific comments

Title It says "Nordic Seas" which includes Iceland, Norwegian and Greenland seas, but you used only one transect (according to the map in Figure 1) close to Fram Strait. Thus, you cannot say that you analysed all of the adjacent seas. Additionally the word "properties" seems too general. Maybe you should change it to something like: "Changes in temperature and salinity in a transect close to the Fram strait from 1997-2016 and their impact on the Nordic Seas" in order to get the main point of the manuscript as is. However, if you change it substantially the title may have to be changed anyway.

The Abstract is too general. What is new? 'may' should be prohibited, you could say: "Our research indicates that..."

Introduction The authors used very few references and described the state of the art very poorly. What is the importance of the arctic seas in the global climate? How do they impact sea ice? Please use more references and describe recent findings more intensely.

Methodology You only use data from your institute. Why? Are these the only measurements. Is it due to better consistency? You should explain it once. This way it seems that only your institute has such data, which is definitely not true. Have these data been used before? For what purpose and what are the results (should be part of the more detailed Introduction). You analysed the trends without any significance tests which should definitely be included.

Results The figures and results sound more like an overview of the data than a scientific analysis. Moreover, the presentation of the results are very confused and do not seem to have a clear thread. Your first conclusion in the summary should be your research question for a new submission. You have the data (as it seems from Figure 3) to show

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how the flow of water masses through the Fram Strait have changed, if you use more than one transect.

All in all, in order to make this work worth for publication, the authors should dig much deeper, examine statistical significances and use appropriate figures to show their results. Detailed examples are shown below.

Technical comments

Page 1 l. 9-10: sentence is incomplete. "was/is paid"

l. 11: The period must not be mentioned again

l. 13: "salinity has also changed" How? Why? Write more than a half sentence.

Page 2 Figure 2 from IPCC report can be explained in the text with a direct reference to this picture in the IPCC report. The figure itself can be skipped.

l.6: sounds like, only your institute works with this topic. Generally, it reads like a praise to your institute, which is not scientific.

Page 4 l. 17: Specify that section N is located west of Spitzbergen. Thus it is easier for the reader to follow. Why particularly this transect and not another? Can't you compare different transects?

l.20: which time of the year? Important for discussion and comparison with global rates. (You have written "summer" in l. 14, but you should also specify the months. Are the global values you compared your results with also from summer?)

Page 5 l.11 The authors should start describing the figure briefly before analysing them. Why did you choose potential temperature? What is the difference analysing absolute and potential temperature and what are the advantages/disadvantages (you should put that in the methodology part). Generally you jump from figure to figure without a clear thread.

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Subtitle of Fig.4/5: Trends and their unit (per decade, per year?) are missing. What means "across section N"? Is it a mean value? Are the changes in absolute changes during the 21/20 years? For better comparison it should be converted to K/psu per decade.

Page 9 How did you estimate the heat content, if you only have a transect? Where are the results shown? First, the comparison of heat content changes in the surface and the deeper layers should be shown and then the discussion about the importance can be done. However, the same results could also be drawn from the temperature changes. Moreover, the total heat content is not comparable due to the different layer depths and the bathymetry. Relative changes should be used.

Page 10 Figure 8: Why do you have pressure on y-axis? In the text you always refer to depth in m. The readability would be improved if it were consistent in such cases.

Page 11 Figure 9: The colourbar should be mentioned in the caption, because it is not so clear from the figure itself. Why do you show these theta-S diagrams? Minima, Maxima and changes could also be seen in the figures before, thus the strengt hof theta-s-diagrams has not been used. (What does it mean that the direction of the points is flipped by approximately 90° between intermediate and deep layer? And that it seems to flip in 2017 in the deeper layer?)

l. 10ff.: How do you know that 1) and 2) is happening, it is just an assumption. You could (and should) prove this with the other cross sections shown in Figure 3!

l. 20ff Is the global mean value annually or from summer? It may not be comparable with your observations during summer. Please discuss it.

Page 12 l.7ff: This is a new results and should be part of the discussion of the results. It does not belong to the summary or the conclusions. "May have increased influence on Arctic Sea ice melting and climate change" is very simple and sketchy.

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2018-93>, 2018.

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