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Discussions

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 #1

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This manuscript presents observations of temperature and salinity over 20 years along a section in the southwestern Fram Strait. The authors show the increase in temperature and salinity below 500 m. Besides this, the paper does not present further scientific results or discussion and I am very much wondering if this justifies publication in OS. Furthermore, even the limited content is poorly presented. Hence I do not recommend publication. However, since the authors show in Fig. 3 the existence of a very valuable larger data set, I highly recommend extending the ms. to the full data set, substantially revise text and figures, and submit it to Earth System Science Data.

The ms. refers to the extensive temperature and salinity data set obtained by the Polish

IO PAN, but it does not present these data (at least it seems so, but I am not sure, see below). From the single section that is presented, the authors show an increase of both parameters, but other than stated in the abstract and the summary, no further analysis on causes or impacts are given. Raise in temperature of deep Fram Strait/Greenland Sea temperatures and salinities have been shown before and analyses of causes have been discussed for example by Langehaug et al., 2012, Somavilla et al., 2013, von Appen et al., 2015. None of these papers or others on this topic are referred to. (The paper by Langehaug et al., is referred to, but only because the authors use their circulation sketch! Apart from that, they do not even mention this extensive study on exactly the same topic!) In the abstract and the summary, the authors make some statements (but no analysis) that are either very general (global ocean warming) or highly speculative. It is unclear why the authors do not use more of their own data, not to speak of other available data, to put their findings into a context. The ms. contains a lot of unnecessary information; the text has several repetitions; it is often imprecise, and can be shortened substantially. On the other hand, important information is missing. Hence, even before submitting anything to ESSD, the ms. should be revised substantially.

A few detailed comments might illustrate the problems:

Title: No water masses are analyzed.

Abstract: The 1st paragraph is repetitive and can be summarized in one sentence. It promises analysis of potential drivers, but the ms does not contain such analysis. The second paragraph can be skipped entirely – it speaks about the impact of the findings but no in-depth consideration is given in the ms.

The introduction largely reads like a working report of the IO PAN (1st paragraph), or like a justification for the funding request for further ocean observations in general. The second para speaks about recent studies without citing them. The last sentence of para 3 (p 2 line 19) is a bizarre statement – how would intermediate layers absorb heat from the surface layers (surface is here, by the way, defined as reaching down to

500 m!)? No arguments or explanation for such a process are given later. Fig. 2 can be skipped. Page 3, Line 10: This statement is again bizarre. Purkey and Johnson (2010), a key paper on ocean warming (that the authors do not refer to), or Desbruyeres et al, 2016, use high quality data after 2005 in all oceans.

Data and methods: Fig. 3: Most of the shown data are not used. Why are they shown? Page 4, line 13ff says that data from 1997 until 2016 are used. Then the authors mention 15 sections that obviously are not used. Para 2 says that section N (the one which finally IS used) provides the longest time series. What does that mean? Is that longer than the 20 years mentioned above? Why do the authors not give the simple information about the data used (time and location) in one clear sentence? Line 20ff speaks about water masses (AW) and branches – what does this explain in the chapter "data or methods"? On the other hand, neither here nor later in the ms., any information is given on the definition of water masses or where any branches can be seen in the data or why they are of importance here. So what shall we do with this information? Line 26ff) introduces three layers, although the title and the results deal only with two layers. In line 23, the authors write that AW extends to 800 m. Hence it forms part of the so-called "intermediate layer" between 500 and 1000 m. Hence there must be another water mass contributing to the "intermediate layer". No information is given about that one. The authors should make up their mind whether they want to deal with water masses, yes or no.

Take just the one sentence (page 4, line 30) "The mean values of the water mass properties were calculated for the whole region as well for the Arctic and Atlantic Water domains." At least four questions arise: 1. What are Atlantic and Arctic domains? 2. Which water masses are the authors talking about? 3. How could they possibly compute a mean value of water masses if the layers contain fractions of several water masses (see above)? 4. What means the "whole region"? Is that the region covered by the whole data set presented in Fig. 3?

I do stop here, since I hope enough comments are given on where the problems are

and what should be done to improve the ms. for a possible submission to ESSD.

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