

Interactive comment on “Increasing transports of volume, heat, and salt towards the Arctic in the Faroe Current 1993–2013” by B. Hansen et al.

Anonymous Referee #1

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Overall comments:

The manuscript treats extensive data from the Faroe Current. It's main purpose is to show that estimates of the flow of Atlantic water with the current can be improved by including altimetry data. Also altimetry data alone can provide the transports with reasonable accuracy without in situ data. This is an important accomplishment since this makes it possible to determine the transports without the cost and effort of using current meters. In this way also the transport time series can be extended backwards in time to 1993. They also calculate the transports up to 2013 so they produce a 20 year long records of the transports which is significantly longer than previous records. This is in my opinion the most important message of the paper. The description of the methods used is very thorough. The results of the analysis are though not very

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different from what had previously been reported on the transports using the in situ data from current meters and CTD for a shorter period.

The authors claim on page 1016 that “the main aim is to resolve, whether any of the transport series exhibit long-term trends, and to quantify them”. The authors do not provide evidence for any long term trend that can be distinguished from natural variability. The time series are probably still too short to make such statements. The authors also state that “The increased heat and salt transports are partly caused by the increased volume transport and partly by increased temperatures and salinities of the Atlantic inflow, attributed mainly to the weakened subpolar gyre” which implies that the trends calculated may well be caused by natural variations in the subpolar gyre that are known to have decadal variability. This should at least be discussed in the paper.

The manuscript is heavily dependent on the technical report which is part of the gray literature:

Hansen, B., Larsen, K. M. H., Hátún, H., Kristiansen, R., Mortensen, E., and Østerhus, S.: Monitoring volume, heat, and salt transports in the Faroe Current 1993–2013, Faroe Marine Research Institute Technical Report No. 15-01, 53 pp., available at: www.hav.fo/PDF/Ritgerdir/2015/TecRep1501.pdf, 2015.

It is actually quite difficult to read the paper and almost impossible to review it without having also this report. I leave it to the editor to decide whether this is acceptable.

My conclusion is that the publication of this paper is justified.

Comments:

Change the title to “Transports of volume, heat, and salt towards the Arctic in the Faroe Current 1993–2013” or it might be also be “Improved estimates of transports of volume, heat, and salt towards the Arctic in the Faroe Current 1993–2013”. From Fig. 6. b) it seems that the volume transport is lower in 2013 than it was in 1993.

Something should be said about how the gaps during summer are treated?

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A more extensive discussion on how the AW is defined is needed. How do the authors account for the mixing with the Arctic water? Part of the reason for lower salinities and temperatures over the northern part of the section might be due to mixing with Arctic water. This was the way the proportion of Atlantic water was calculated in Hansen et al. (2003). Also a discussion of how changes in the properties of the source water i.e. water south of the IFR is accounted for should be included.

Minor comments:

Page 1014, line 12: "has made it difficult to identify trends". This indicates that the authors are convinced that there should be a trend. But is that justified? I suggest rephrasing this sentence.

Page 1014, line 19: Change "trend" to "increase".

Page 1015, line 19: change "profilers" to "Profilers".

Page 1016, line 3-4: change "After some initial experimentation, an ADCP array with three moorings (NA, NB, and NC) started monitoring in summer 1997" to "After some initial experimentation, monitoring started in summer 1997 with an ADCP array with three moorings (NA, NB, and NC)".

Page 1016, line 10: change "in 2003 (Hansen et al., 2003)" to "in Hansen et al., 2003".

Page 1016, line 11: change "in 2010 (Hansen et al., 2010)" to "in Hansen et al., 2010".

Table 1, page 1039: the headings in the table might include more information, (e.g. Bottom depth instead of just Depth), so the reader does not have to rely on reading all the figure text for understanding the table.

Figure 1 should be enlarged.

The figures for the two EOFs and PCs that are Figures 2.4.1. and 2.4.2 in the technical report should be included in the paper.

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