

Reviewer 3

This manuscript describes the first analysis of an extensive set of observations in the Baltic Sea. Several ADCP mooring and observations from long term glider deployment. The observations is much needed to improve knowledge of the Baltic Sea oceanography.

I am a bit divided on my impression on the manuscript. On the one hand it is based on an new extensive set of observations that is/will be very useful, The analysis is comprehensive and detailed (although sometimes difficult to follow). On the other side, the main impression is that the manuscript is fragmented without a clear thread. After re-reading the manuscript several times I still am uncertain what I have learned form the manuscript, and the message remains unclear.

Reply: Thank you for the time and review! Indeed, the present study is the first general and descriptive investigation of circulation and current structure based on the CABLE data, but further studies focused on various topics will follow.

Action: We have modified the manuscript according to the suggestions of all three reviewers and hope it is better readable now.

My suggestion is that the authors try to include more discussion on results in section 3 Results. I am aware of different views on how to divide results and discussion on results. But as of now I find that the description/discussion on figures are not very enlightening and does not provide much guidance what figures shows, and how they can interpreted. I find section 3.2 (which is a key section) rather difficult to read and to extract useful information on how the system works/operates. Much information is provided, but very little guidance for the reader. (There is a useful discussion on some parts, but in general I find it difficult to get a clear idea how results compare with other studies and what I can learn from present study)-

Reply: Similar study has not been done on the basis of measurements in the Central Baltic. But the results from numerical models could be discussed.

Action: We tried to include some information from earlier studies to highlight better the results of the current paper. We could not add too many details, as it would repeat the discussion and the results part would be too long. We also modified the introduction to better justify the aims and reasons of the current study.

Major specific points.

Avoid one sentence paragraphs. Try also to avoid paragraphs with few sentences. It gives a fragmented impression of the study.

Reply: We agree.

Action: We changed that in the revised version.

I notice that there are no comparison with results from other studies in the results section. This implies that it is rather difficult to get a clear picture how important the result from the study is, does it agree or disagree with earlier studied. Including some discussion in result section would improve readability ad impact of the study.

Reply: As we mention above, we tried to include some results from previous studies.

Figures are difficult to read:

Figure 1: The stations are difficult to read in the plot.

Reply: We agree.

Action: We improved Fig. 1.

Figures 2, 3, 9: The colorbars are too small to read (at least on paper where you cannot zoom in).

Action: We made the colorbars larger.

Figures 6, 9: The arrows seem to describe current speed and direction. Please clarify what is shown.

Action: We clarified it in the Fig. 6 caption a bit more. These are mean vertical profiles of current velocity, i.e. speed and direction are combined. Fig. 9 shows the angles between the current vector and the wind, and the correlation strength between current and wind velocities.

Figure 6: What is x-axis (guess stations but ...).

Reply: Yes, these are stations.

Action: We added labels to x-axis.

Figure 3, 4 are hardly discussed but take up significant space. Please provide a relevant discussion. It is not clear to what the purpose what the purpose of Figure 4. Would readability increase with a log colorscale?

Reply: The main purpose of Figures 3 and 4 is to present the time series that we analyze later. We agree, the figures are not very thoroughly explained and cited, but we wanted to avoid long descriptions of time series.

Action: In the revised version, we use Figs. 3-4 a bit more, but we still prefer to avoid long descriptions about these time series.

Open access to data. I understand that the team wants to use the observation for more studies. It is stated that observations will be used for e.g. validating ocean models etc. It would be great to write out if data will be publicly available at some point (in, say two years).

Reply: We indeed plan to use the data together with numerical modelling to give better transport estimates in our next study. That would include validation of the model as well. We believe that the data can be published together with our next paper.

Action: We will write about the data availability.

Minor specific points

Line 115. How many time series and at what depth? (mentioned later, but should be clarified here).

Action: We added details there.

Table 1: Table should be adjusted to show date in clearer way.

Reply: We agree.

Action: We adjusted it.

Table 1: Define what EMDB293, any reference to cruise report (assuming it is a cruise).

Action: We decided to remove these.

Line 157: Define what IGRF stands for.

Action: We added the definition.

Line 158: Not sure what 2-sided derivative algorithm is. Do you mean central numerical scheme. Please clarify.

Reply: Yes, we meant central differencing scheme.

Action: We modified the text accordingly.

Line 187 and following paragraph. It is difficult to read. Perhaps using bullet points improve readability.

Action: We use bullet points in the revised version.

Line 207: High P (79-97%) of wind. It is unclear to me, do you mean that wind has high persistence?

Reply: Yes, we mean exactly that.

Action: We changed the sentence to make it more clear: "Periods were characterized by high persistency (P = 79-97%) of wind."

Figure 2: I do not see the point in having the wind speed "attached" to this figure. It would connect better to figure 3.

Reply: We more or less agree with this, but for technical reasons, we prefer to keep it as it is. Fig. 3 is already very large.

Line 249: Spelling peed.

Action: Fixed.

Line 250: "acoustic measurements". I presume it is ADCP measurements.

Action: We changed acoustic to ADCP.

Line 291. You mention "diurnal tidal constituents", but could not 24 h period reflect daily cycle (in, e.g. wind forcing etc).

Reply: You are right.

Action: We added "diurnal cycle" to the text.

Figure 7: It would help if the most important time "periods" is illustrated in the figure (e.g as lines/tics in the "x-axis").

Reply: We agree it would be useful.

Action: We marked frequencies corresponding to 17-h and 36-h periods to in the figure.

Line 414: Please explain how the volume fluxes are consistent with cumulative wind stresses. What assumptions do you make, and what result do you get? Please enlighten the reader.

Reply: These explanations have been given in chapters 3.3 and 3.4. In the previous paragraph, we remind the reader about the strong correlation between wind and sub-halocline meridional current.

"On one hand, considerably high correlation strength  $\rho$  was noted between current in the deep layer at stations M3, M4, M6, and M8. On the other hand, the deep layer flow towards the north at these stations was significantly correlated to the wind from northerly directions (Fig. 9). As a result, one could see two events created by southwesterly wind impulses (July and late September – early October) when the meridional current was directed southward at all mentioned stations (Fig. 11a)."

Action: We complemented the section you cite to make it more clear.

“Despite short-term reversals, the cumulative meridional transport towards the north was approximately 270 km<sup>3</sup> from mid-May to mid-September 2022, while it was slightly negative from October 2022 to mid-January 2023 and 140 km<sup>3</sup> from mid-January to mid-March 2023. These volume fluxes were in accordance with cumulative meridional wind stress, which was approximately 1 N m<sup>-2</sup> d, 6 N m<sup>-2</sup> d, and -1 m<sup>-2</sup> d, respectively during the same periods (Fig. 2a). Thus, during the periods (seasons), when meridional wind stress was southward or close to neutral, the meridional transport towards the north was approximately 70 km<sup>3</sup> month<sup>-1</sup> while the sub-halocline meridional transport was halted during the period of high positive meridional wind stress.”