Reviewer 2

The authors investigate the structure and properties of the current field in the Central Baltic Sea using current data from an array of eight moorings in a line at the latitude of the Fårö Sill, seven equipped with a profiling ADCP and one with a classical current meter at a fixed level. These data were supplemented with ERA5 reanalysis wind data to take the forcing into account as well as some bottom temperature and salinity data from three of the moorings and CTD data from several glider surveys in that region to describe the hydrographical situation and calculate salt transports.

In detail, the authors present and examine stratification, current shear, profiles of mean current speeds and persistency, the seasonal variation of current velocity profiles, i.e. dependence on seasonal stratification, profiles of HKE spectra and profiles of HKE content in specific frequency ranges and their share in total HKE, profiles of complex correlation (magnitude and phase) between current and wind, profiles of mean current vectors in periods of nearly constant wind forcing, i.e. dependence on wind direction, to characterise the current field. Additionally, they calculate volume and salt transports across the line of moorings below 70 m and show temperature and salinity sections and mean velocities from glider sections along and across Fårö Sill to illustrate the overflow over the sill.

With this investigation the authors provide some substantial facts on the basis of measurements beyond the existing knowledge from simulations, while the presentation of the results and in particular their discussion unfortunately remain largely rather descriptive than quantitatively explanatory. However, the manuscript covers the primary aims of this work given by the authors in the introduction, which are all of more or less descriptive nature, very well.

The language is good and reads fluently. Some figures would benefit from minor improvements, see specific comments.

Reply: Thank you for your time and suggestions! Indeed, the present study is the first general, descriptive investigation of circulation and current structure based on the CABLE data, but further studies focused on various topics will follow. We modified the manuscript according to the specific comments.

Specific comments:

Figure 1: The coloured and dashed lines in the left map are hardly to distinguish. I suggest to rework this figure to make it clearer.

Reply: We agree it could be improved.

Action: We reworked the figure.

line 128: I think it would be good to give also the spatial resolution of the ERA5 data here, i.e. the area for which the used grid point is meant to be representative for.

Reply: We agree.

Action: We added information about the spatial resolution in the text.

Table 1: From Figures 3 and 4, I guess the starting day of the deployment period of M2 should be somewhat later than 09 May, which seems to be correct for M3.

Reply: Indeed, there was an error in the table. Thank you for noticing!

Action: We fixed the table.

line 154: This has to be lined out more explicitly. Why are the data low-pass filtered in general? What has been done exactly, in particular, for the calculations of HKE? For example, if the data is low-pass filtered, miscalculations of HKE in particular in the BSD are the consequence. Here you state mainly inertial oscillations, tides and seiches are suppressed by your filtering. In line 180 it says these are the main contributors to the BSD. This confuses the reader. I am sure this is not what you did. Please elaborate your filtering (What is done for which purpose and calculation?) in more detail to avoid confusion.

Reply: You are right, the sentence about filtering with a 36-hour cut-off filter is misplaced and confusing. 36-h is used only for Fig. 3 and Fig. 4. Otherwise, 1-h values are used, including for the spectrum and HKE.

Action: We modified the text accordingly to avoid the confusion.

line 184: I think it is useful for the less experienced readers to explicitly give the definition of N^2.

Reply: we agree.

Action: We added the definition.

line 190: ‘zonal’ -instead of ‘meridional’

Action: We fixed it.

line 190: ‘black’ instead of ‘dashed’, see text under Figure 1 and take account of the comment on it.

Action: We fixed it.

line 196: The regression of the volume transport with respect to the near bottom meridional velocity at M3 can be justified assuming a similar (meridional) current distribution over the considered transect cross-section. In addition, the same regression of the salt transport needs the assumption of similar distribution of salinity over the transect cross-section. Can you show to which extend these assumptions are valid and estimate the errors which are introduced by the supposed deviations from the assumptions?

Reply: We have shown the time series of the regression-based estimates and the whole section based estimates in Fig. 11. You are correct about the assumption of a similar distribution of salinity. Horizontal salinity gradient along the zonal transect is minor. Especially, compared to meridional and vertical salinity gradients. We also made measurements of water column properties in the zonal section and in the section from Gotland Deep to the Gulf of Finland. Our conclusion is that some errors result from the assumption of even salinity at the section,

but the major source of errors is the coarse array of moorings. We show the measured distributions in October 2022 below. We agree that these assumptions might be more highlighted in the manuscript.

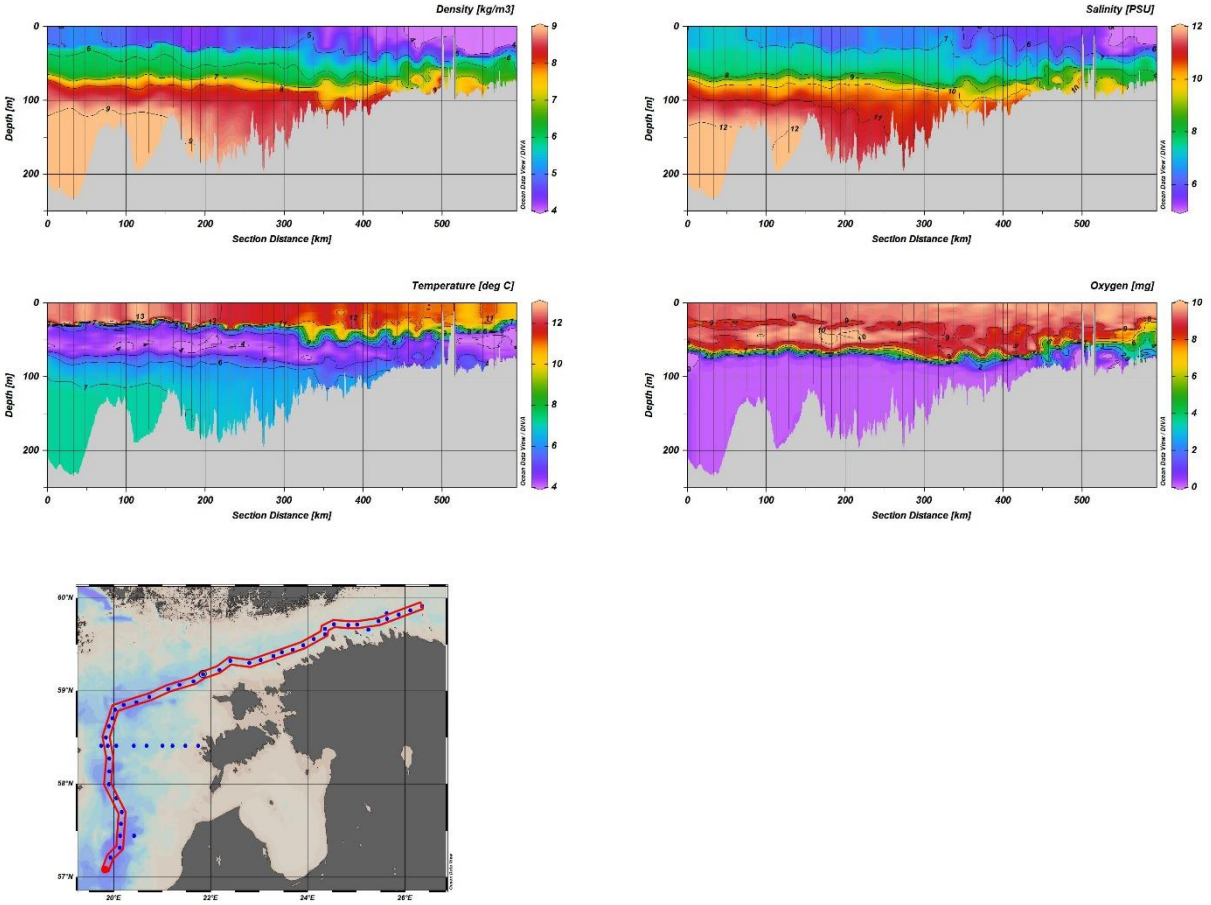

Fig. 1. Section from the Gotland Deep to the Gulf of Finland

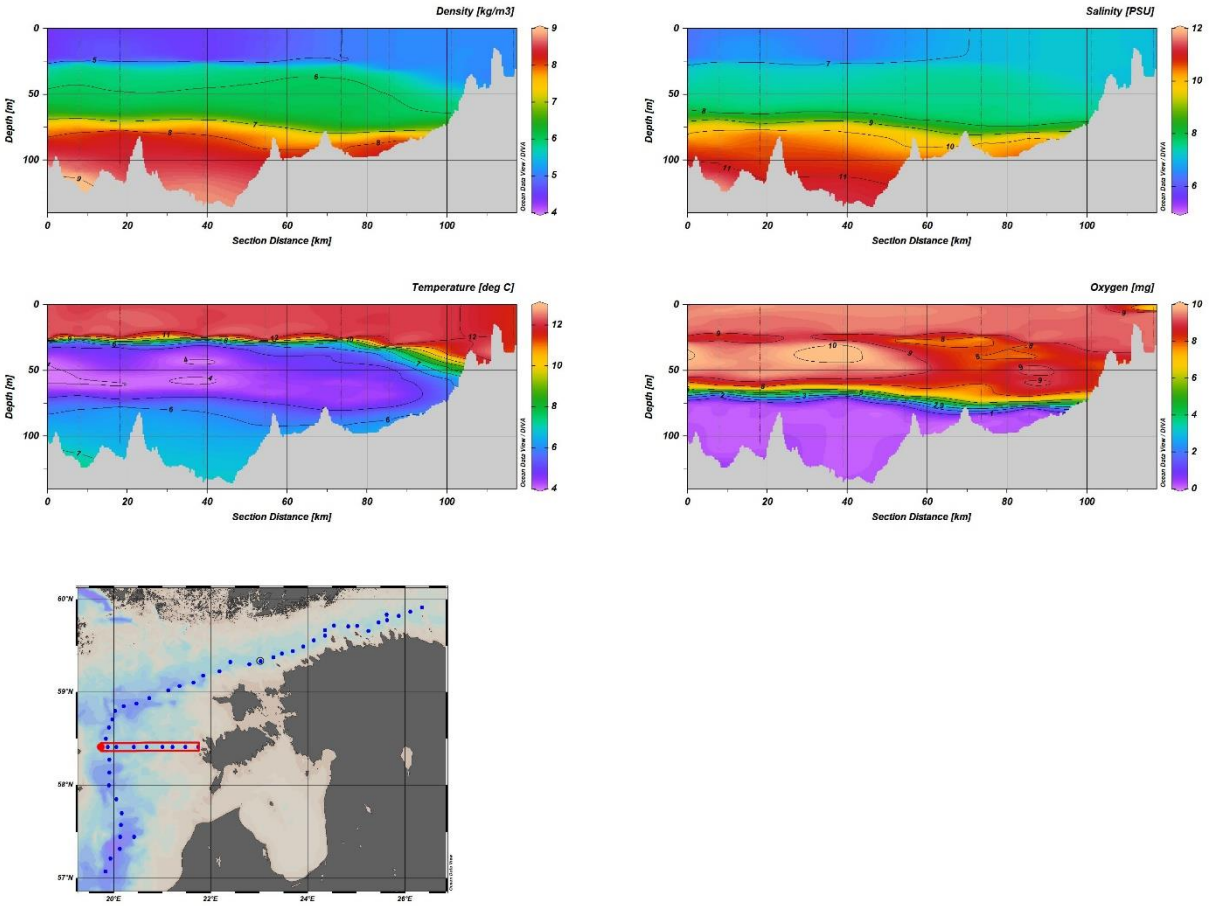

Fig. 2. The zonal section.

Action: We now draw attention to assumptions and potential errors both in the Data and Methods chapter and in the Discussion.

line 250: This statement is certainly correct also for M10, but not very meaningful for the point measurement there. As it is also not an acoustic measurement and therefore implicitly excluded from the list in line 249, I would simply remove it explicitly from the list in line 249.

Reply: Indeed. Thank you for noticing.

Action: We removed it.

line 262: According to Figure 5, the persistency at 58 m in M9 is rather 54 % than 61 % to me.

Reply: Indeed. Thank you for noticing.

Action: We fixed it.

line 263: According to Figure 5, the persistency at the thermocline in M9 is rather 49 % than 51 % to me.

Reply: Indeed. Thank you for noticing.

Action: We fixed it.

line 268: I think I know what you mean, but for better reading you should briefly explain in which respect the cyclonic circulation is reflected by the mean velocity profiles. Else, for some readers, it may be hard to understand what exactly you mean here.

Reply: We agree. It could be a bit more described.

Action: We added a sentence about mean velocities in the eastern and western part of the section.

line 269: I am afraid I have a problem with the wording here. What is the difference between 'interior basin' and 'central part'? Do you mean 'basin rim' and 'basin centre', respectively? Please clarify this wording.

Reply: We agree, there was confusion.

Action: We changed the sentence: „The mean flow was stronger closer to the boundary and weaker in the central part of the basin."

line 303: Beside the technical correction to this line, I have a problem to understand what you want to say with this sentence. Do you mean something like: 'A somewhat higher energy at the bottom in the BSD and BD bands was revealed at the two stations where the sea depth was in the range of the halocline depth (M2, M9).' This is what I interpret. Please clarify this.

Reply: Your interpretation was what we meant.

Action: We replaced the sentence with the one you wrote. Thank you.

line 305: Similar to the preceding comment, this sentence would make much more sense to me if it started, for example, with 'A significantly higher energy …' in addition to the change proposed in the respective technical correction.

Action: We made the change.

Figure 7: In the text to the figure it says in brackets that HKE spectra equal HKE spectral density multiplied by the frequency. I would rather expect that HKE spectra equal HKE spectral densities multiplied by the used frequency step or interval like a finite integration. Please check this and correct if necessary.

Reply: Indeed, we use here the product of the spectral density and the corresponding frequency. This procedure reduces the slope of the spectrum, which is important for better visualization. Furthermore, the so-called variance-preserving spectra preserve the signal variance under the spectral curve (Emery and Thomson, 2004).

line 328: This is quite a simplification. Correct is that the vertical integrated transport is to the right of the wind vector. So, this should be reformulated somehow.

Reply: We corrected it.

Action: It now reads, “the transport in the upper layer was to the right from the wind vector”.

line 338: This is not directly visible from Figure 9 as the depicted vector sticks only show the relative angle between current and wind. Therefore, this statement should be explained some more.

Reply: We agree it needed more explanation.

Action: In the revised version, we first mention that the best correlation with the deep layer current was with the wind from the opposite direction.

Figure 9: In the first sentence, I suggest to replace ‘current direction’ and ‘wind direction’ by ‘current vector’ and ‘wind vector’ as the wording is in the second sentence to avoid confusion as the wind direction is opposite to the wind vector. Furthermore, I would add ‘α’ to ’mean angles’ and ‘correlation strength’ to the variable name ‘ρ’.

Reply: Good suggestions. Thank you.

Action: We changed as suggested.

Figure 9: I am not sure whether the information of plots would be better or easier to get if the vector sticks are coloured instead of an extra row of dots with the colour information. Maybe the correlation strength could also be shown as the length of the vector sticks if a suitable scale can be found, or a combination of both, i.e. coloured vector sticks with variable length. I think it is worth to try this out.

Reply: Good suggestions. We tried both, but it seems the current version works best still.

Action: We removed every second vector for better readability of the figure though.

line 402: Like in Figure 9, I would add ‘correlation strength’ to the variable name ‘ρ’.

Action: We added it.

Line 415: Unit of cumulative wind stress should be [N m^{-2} d] instead of [N m^{-2} d^{-1}] like in Figure 2.

Action: We fixed it.

line 422: According to section 2.2. it should be 22 April instead of 24 April and the link is somewhat different there. Please equalise both or clarify.

Action: We equalised it.

line 427: How does this relate to the Baltic residence times of about 30 years give elsewhere in literature? Is it an extraordinary high transport to that area observed in that year or does the water reside somewhere else before entering of after leaving that region for the rest of the time?

Reply: It was not extraordinarily high. Elken (1996) had similar transport estimates based on temperature-salinity data. Likewise, the wind stress in the particular year was similar to the long-term mean. We have dealt with the topic in discussion.

Action: We added another sentence to the discussion to point out that the particular year was likely close to the long-term mean in terms of subhalocline transport.

line 483: Why was something similar in contrast possible for the surface layer in Section 3.4., lines 360 to 362? What is the difference in consideration and interpretation?

Reply: Line 483 described one-year mean current vectors > 70 m in the sill. Lines 360-362 described the situation during SW wind prevailing in the upper layer.

line 502: I suggest to write 'southwesterly' instead of 'southerly and westerly', because that is what was investigated.

Action: We changed it accordingly.

Line 511: Like before, I suggest to write 'northeasterly' instead of 'northerly', because that is what was investigated.

Action: We changed it accordingly.

line 538: Should be 'NNW-SSE' instead of 'WNW-SSE' I guess, because that are opposite directions and the resulting orientation fits.

Action: We fixed it.

line 538: This statement is wrong what can easily be seen from Gauss's Law as we certainly have a divergence-free current field. Or in other words, the higher current velocity along the channel would be exactly compensated by the smaller cross-section perpendicular to it in comparison to the larger zonal cross-section in combination with the smaller meridional current velocity.

Action: We removed that part.

line 597: I do not see a reversal of the cyclonic circulation in the upper layer in the results presented in section 3.4. for the first (southwesterly wind) and the second (north-northeasterly wind) period considered. The current reverses from north to south in the eastern part of the array from the first to the second period. But in the in the west at M2 in both periods the current is to the west.

Reply: You are right, it cannot be stated like that on the basis of our mooring data. We suspect it is related to the fact that there is an open boundary in the west in the upper layer in the location of M2, which means that the signs of reversal likely could be seen along the mainland of Sweden, i.e. out of our array.

Action: We modified the sentence in a way that it only is about the eastern boundary.

technical corrections:

line 106: ‘… deployed at the same …’ instead of ‘… deployed to the same …’

line 115: ‘… were recorded at …’ instead of ‘… was recorded in …’

line 163: Equation 1: I suggest to remove ‘/n’ in the denominator and to put the fraction ‘1/n’ in front of the summation in the denominator instead for better readability.

line 171: Emery and Thomson (2004) is missing in the references.

line223: add unit ‘m’ to ’60-80’

Figure 4: add unit ($1/s^2$) to the colourbar.

line 249: typo ‘speed’ not ‘peed’

line 298: better: The HKE share of the BD band at the Fårö Sill … , but the HKE in the LF band

line 300: ‘… energy in the LF band …’ instead of ‘… energy at the LF band …’

line 301: ‘… energy in the BSD and BD bands in …’ instead of ‘… energy at BSD and BD in …’

line 303: ‘… energy in the BSH and BD bands was …’ instead of ‘… energy at the BSH and BD was …’

line 305: ‘… energy in the BSD band was also revealed …’ instead of ‘… energy at the BSD was revealed also …’

line 376: better to understand and less irritating: ‘vice versa’ instead of ‘opposite’

Figure 12: Exchange ‘0.1 g kg^{-1}’ and ‘0.1 °C’ to make their order respective to ‘temperature and salinity’ before.

Reply: Thank you for the help!

Action: We fixed all.