General comments

The manuscript deals with the complex surface and deep ocean circulation in the Iberian-Biscay-Ireland (IBI) region of the Northeast Atlantic Ocean, highlighting the importance of examining the currents for various applications such as climate research, marine navigation, fisheries and marine renewable energy. The study proposes a methodology for the creation of ocean monitoring indicators (OMI) to assess the interannual variability of the main ocean currents in this region.

The methodology involves defining specific monitoring windows based on existing literature, dynamic vertical density boundaries, and using Copernicus Marine products and ensemble methods to calculate annual volume transport anomalies within these windows.

The results show the variability of regional currents, with positive anomalies indicating either intensification or weakening of currents. Despite the uncertainties, some OMIs successfully detect periods of high or low current activity, and reveal significant trends.

The work is clearly presented and illustrated. As far as I know, this substantial work appears to take into account the main ocean currents in the region, and the whole seems worth publishing. However, a number of questions remain concerning the definition of the boundaries of certain sections, and these need to be clarified. In particular, it would be essential to specify the extent to which transport uncertainties for certain sections are linked to the choice of vertical and horizontal boundaries.

Specific comments

SC1 → Figure 2: To which reanalysis (es) and for which period do the current fields shown in this figure correspond?

> The figure caption will be modified including this information.

SC2 → Figure 2 and table 2: The upper isopycnal limits chosen correspond roughly to the main thermocline. Have you tested the sensitivity of transport to the choice of this isopycnal value?

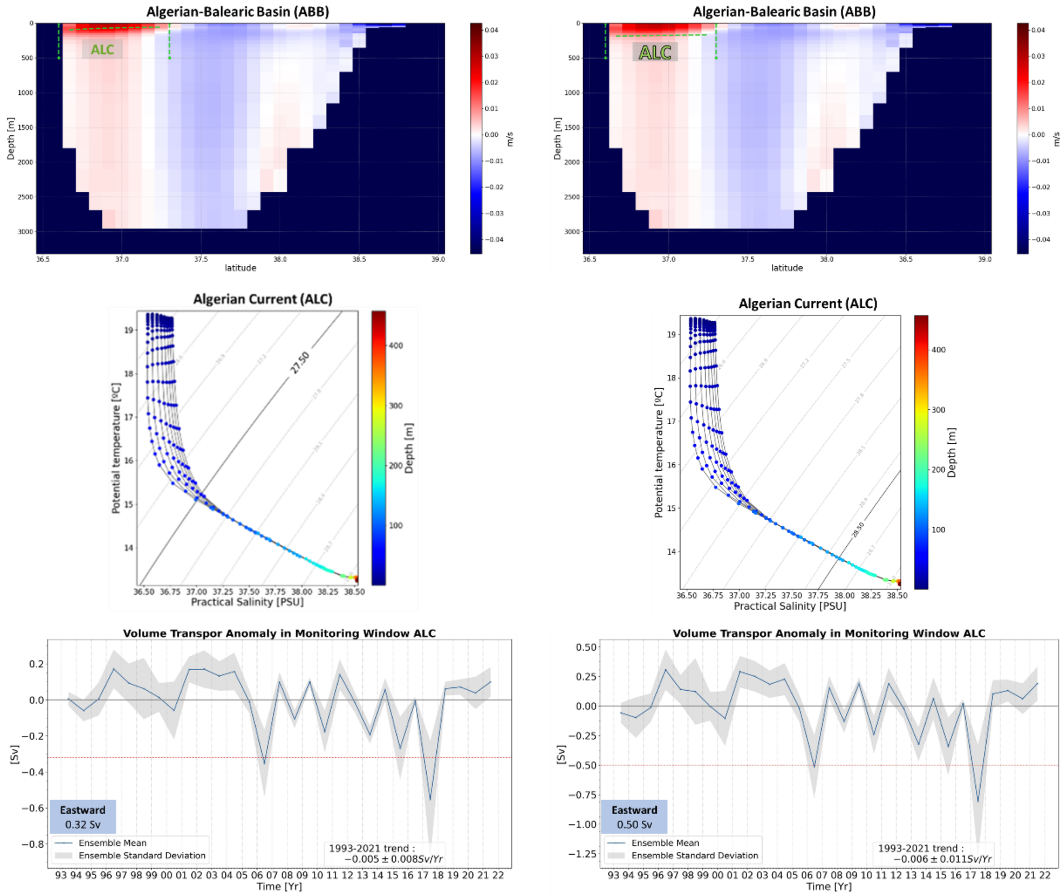
> Yes, we have conducted sensitivity analysis of the boundaries for all monitoring windows (both vertical and horizontal).

The analysis revealed that the correlation of the results is high when modifying each of the boundaries, particularly when the modifications entail small variations in the total surface area of the monitoring window. Thus, for all boundaries of the monitoring windows, it is observed that small changes in the parameters defining the window (latitude, longitude, or density) result in equally small changes in transport anomalies.

This is because the time series presented in Figure 4 are expressed as anomalies; therefore, changes in the time series are only noticeable when the monitoring window is modified to include other oceanographic processes distinct from the current intended for monitoring.

This observation also applies to the selection of density boundaries in cases where it marks the thermocline. Modifying the chosen isopycnal value to delineate this boundary constitutes a small percentage of the total surface area of the monitoring window.

In the following figure we show an example that arise as a result of a suggestion of the other referee of the work:



On this example the result of modifying the lower boundary of the monitoring window ALC can be observed. The isopicnal limit was modified from 27.5 gr/m3 (panels on the left column) to 28.5 gr/m3 (panels on the right column). This alteration results in a lowering of the lower limit of the monitoring window by approximately 100 m (panels in the upper row), thereby enhancing the capture of the total transport of the Algerian Current. Additionally, it is observed that the lower limit shifts from being adjacent to the main thermocline to being positioned below it (T/S diagrams in the second row).

As evident in the OMI plots presented in the third row, the outcome of this modification is practically indistinguishable. The time series exhibit a change in the obtained mean transport (0.32 Sv in the left case and 0.50 Sv in the right case). However, since the time series are presented in terms of anomalies, a modification in absolute variability is noted (anomaly values are higher in the right panel), but uncertainties, trends, and notable events remain unaltered.

SC3 → How was the outer (offshore) boundary of the different currents defined? The geographical limits seem rather arbitrary. Do they result solely from information based on the literature, or – which would seem more appropriate here – from an analysis of the variability of current intensity or transport for the different reanalyses? This is the case, in particular, for the Celtic-Armorican Slope section and the Armorican Slope Poleward current.

The very definition of monitoring windows entails an arbitrary component since the same current can be monitored using very different reference sections. For instance, the Armorican Slope Poleward current could be monitored on the continental slope at different latitudes ranging from 45ºN to 47ºN.

The selection of the region where we have chosen to monitor each current has been made based on the literature, attempting to locate the monitoring window in areas where the majority of studies describing it are concentrated and where the data we are working with seem to depict it more clearly.

However, once the region for monitoring each current has been selected, the definition of latitude and longitude values, as well as the density limits defining each current, has been established based on the mean values of the data.

SC4 → Figure 3: What do the different traces (lines) in the θ-S diagrams represent? Monthly climatological average? Results from one or more reanalyses? Please clarify.

The figure caption will be modified including this information.

SC5 → Discussion and Figure 4. Just out of curiosity, regarding the interpretation of interannual variability, is it by any chance the case that some of the significant signals you have highlighted have also been listed in the literature?

According to our investigations, we haven't found many works focused on the transports of specific currents. This is generally because the works we come across typically concentrate on calculating transports along complete sections without focusing on specific water masses.

Additionally, the comparison of transports with the literature becomes very complex since each transport must be calculated in a section with specific values of latitude, longitude, and depth. Therefore, the mean values are conditioned by the dimensions of the section.

We found the work of Houpert et al. (2020) particularly interesting, where they conduct a study of transports through a zonal section in Rockall Trough at 57.4ºN. We would have liked to define the RT section at this location, but unfortunately, the meridional limit of the IBI product is at 56ºN, making it unfeasible to calculate transports at latitudes so far north.

However, we have identified some bibliographic works (New and Smythe-Wright, 2001) that allow for comparisons of the mean current speed. We propose introducing these types of comparisons in a future version of the manuscript.

Houpert, L., Cunningham, S., Fraser, N., Johnson, C., Holliday, N. P., Jones, S., ... & Rayner, D. (2020). Observed variability of the North Atlantic Current in the Rockall Trough from 4 years of mooring measurements. Journal of Geophysical Research: Oceans, 125(10), e2020JC016403. https://doi.org/10.1029/2020JC016403.

New, A. L., and Smythe-Wright, D. Aspects of the circulation in the Rockall Trough. Continental Shelf Research, 21(8-10), 777-810, https://doi.org/10.1016/S0278-4343(00)00113-8, 2001.

Technical corrections

TC1 → Line 31 : change « Fricourt et al., 2007 » by « Friocourt et al., 2007 ».

Accepted

TC2 → Figure 2: The AC current on the Madeira section is barely legible. The contrast should be increased.

The figure will be modified to enhance the readability of the acronyms.

TC3 → The following reference in the bibliography is not cited in the text : Cavagnaro, R. J., Copping, A. E., Green, R., Greene, D., Jenne, S., Rose, D., Overhus, D.: Powering the blue economy: Progress exploring marine renewable energy integration with ocean observations. Marine Technology Society Journal, 54(6), 114-125, https://doi.org/10.4031/MTSJ.54.6.11, 2020.

This reference will be removed from bibliography.