

We thank the editor, Prof. Ilker Fer, for carefully reviewing the revised version of the manuscript and for providing helpful feedback to enhance the paper's quality. We addressed all issues raised in the comments below and incorporated the revised changes into the manuscript. The comments are included below in black, and our responses to the comments are in blue. The line numbers in the responses refer to the marked-up manuscript; modified text is presented in red in the marked-up version and presented below in the responses as *italic text*.

Response to the editor, Prof. Ilker Fer

Thank you for revising your methods section and describing your quality control thoroughly. Before we proceed with publication, I would like a couple of clarifications (see below). I also have a few comments regarding colormap / colorbar and log-scale presentations. These are optional, but would make the presentation better in my opinion.

Kind regards,

Ilker

Thank you, Prof. Fer, for handling the manuscript and for your time and effort in reviewing it; we really appreciate it. We have addressed your comments and resolved your concerns, as shown in the responses below.

Thorpe scale method, revised text: It is not clear whether you are using the N_2 value averaged over the overturn. (I assume you are; if not, please repeat your calculations). For example, in line 187 (author's tracked version), after reference to Osborn, you can clarify by inserting "In the calculations, the average value of N_2 over an overturn is used."

Thank you for this comment. We confirm using the average value of N^2 over an overturn. We have added a sentence about it; please check lines 187-188.

Fig S1: It is clear that you remove the depths where the rosette was kept at constant depth, and some other spikes, but I do not understand what criteria led you to exclude chunks of data around 20 m and 175 m depth (the entire halocline). Is there an error in plotting the pressure of the excluded points? If not, please explain in the figure caption (or wherever suitable) the reasons for excluding these data.

Thank you for this comment. We have added an explanation for this part in the figure caption as follows:

“The data points marked by hollow circles represent the points rejected by different filters, including pressure reversals, low-speed, and salinity-only spikes. Note that points removed at depths of around 165-185 m in the profiling speed plot (b) are related to salinity-only spikes (check the temperature and salinity plot, d, at the same depth interval). The first 20 m below the sea surface were excluded from the subsequent Thopre scale analysis because near-surface measurements are often highly contaminated, likely by turbulence generated by the hull.”

However, since we used the original vertical CTD resolution, these excluded points didn't affect the halocline. We have also added a supplementary figure showing the QC output for the same QC example station. This figure is used to visually compare the input data and the output data after QC. Please check the new Figure S2.

The 20 m exclusion justification was added to the main text in the previous revision. Please check lines 152-154, quoted below:

“Following Park et al. (2014), the first 20 m below the sea surface were excluded from the analysis because near-surface measurements are often highly contaminated, likely by turbulence generated by the hull.”

Optional, for your consideration:

Fig 2d, N2 panel: please mirror the colorbar such that negative values are on the left (as usual). You could consider limiting the negative end to a smaller number (judged from the colors, minimum values are about -2×10^{-5}).

Thank you for this comment. We updated the N^2 panel in Figure 2 as suggested. Please check the revised Figure 2.

Fig 3, panels a-b: blue-white-red colormap is an odd choice, because significant intermediate values are represented by white. Please consider another colormap, for example starting with pale colors to bright colors with increasing values (e.g. white to red). Also, a discrete colormap (instead of continuous) would be helpful (12-15 ticks, e.g. one color every 0.5 m for LT, and similarly for Krho)

We changed the colormaps of Figure 3, panels a and b, as suggested. However, we found the new colormap to be clearer and showed distinct colors, so we maintained the continuous coloring style. Please check the updated Figure 3.

Fig 3b- consider plotting $\log_{10}(\text{Krho})$

Thank you for this comment. We plotted the $\log_{10}(\text{Krho})$ as suggested. Please check the updated Figure 3, panel b.