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Review of the manuscript "Revised submission":
"Improving the thermocline calculation over the global ocean"

Submitted for publication in "Ocean Science"
2nd Review, 19th April 2023

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After revision of the paper it appears to me that this work is more solid and precise when presenting its new methodology and approaches. It also encompasses nice discussions about the role of salinity on MLD estimations, which are necessary in a context of diagnosing MLD from temperature profiles. Main issues that were raised in the first review were correctly adressed and the reviewer thanks the authors for their detailed answers. This work is then quite ready to be published in Ocean Science according to me.
I have still a few comments below and also suggestions for minor/technical corrections, especially about figure 1 and S1 that, for me, could be better described and be coherent with each others :

l.6 : instead of "the maximum depth of the thermocline" what you compute more exactly is "the maximum thermocline depth" or identically "the depth of the maximum thermocline"

l. 102-103: I find the formulation here a bit unclear. I would suggest instead something like : "To locate the MTD, we computed the vertical maximum of the contribution of temperature to the squared brunt-Vaisala frequency (i.e. maximum of N_T^2) to locate the most stratified point from the temperature profile."
Also, it is quite obvious what is N_T^2 but still there is no explicit routine to compute it in TEOS10 as far as I have checked, so it could be nice to recall the formulation of $N_T^2 = - g^2 * rho * alpha * d(Cons.Temp.)/d(press)$.

l.214-215 : this sentence is not clear grammatically I think, and should be rephrased

l.338 : "Tin" → "In"
l.340 : "thermocline"

Figure 1 : when comparing figure 1 with figure S1 (which is a plus to have it), I do not find the two corresponding upper/lower thermocline limits sometimes and also the colour code is not the same it seems (upper/lower is resp. black/red in fig1 and in figS1, it looks to be the opposite, so you should arrange this to be same). For exemple, on fig S1b, there is only one black dotted line which seems to be the one around 40m but the 400m one is not there, why ? better to have it in both figures , same for figS1c (missing red line) ; same for fig1g which has only the black line while figS1g has also one red one close to surface ; same for figS1f which has very different lines that on fig1f ….
Also the legend of fig1 and figS1 should describe further what are those lines. You write about thermocline and mld or barrier limits on fig S1 but you never say to what they correspond on the figure. This should be corrected as for now it is unclear and misleading to me.

Figure 8 : missing unit of the variable above the colorbar, can be e.g. "Thermocline Strength Index (TSI) [degC/m]"

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