

Second review of EGU sphere-2024-3436

Effect of double diffusion processes in the deep ocean on the distribution and dynamics of particulate and dissolved matter: a case study in Tyrrhenian Sea by Durrieu de Madron et al.

Overview

The manuscript by Durrieu de Madron et al. presents CTD, ADCP and optical profile data along a section crossing the Tyrrhenian Sea and investigates salt finger staircase effects on particulate and dissolved matter distribution.

The authors have significantly improved the readability and presentation of their results, but there are still a few corrections and clarifications to be made, and some points that could be improved. Therefore, I recommend a minor revision based on the comments below.

1 General comments

- a) Add Richardson number Ri to Fig. 3, and buoyancy frequency N^2 , vertical shear S^2 , Ri depth profiles in Figs. 6 and 7; expand the discussion on turbulent mixing in terms of shear instability to support your claims on lines 414-443.

2 Specific comments

Line 167: It is hereafter referred to in the

Line 269: visible below

Fig. 2: I would have expected distance to increase with increasing station number, so this is a bit confusing to me. Maybe at least mark east and west? Also, the panels are not aligned.

Fig. 2 caption: Upper x axes show ...

Line 286: Dynamic topography and observed horizontal velocity reveal

Line 295: Figure 3: (a) Absolute dynamic topography and surface geostrophic currents derived from daily Copernicus Marine Environment Monitoring Service Gridded L4 data (interpolated to 3.75 arcmin), averaged over the period of the cruise (14–16 March 2020). (b)

Line 301: between 21

Line 305: upper 300 m. Also, what do you mean by vertical shear, $\partial w / \partial z$? This is potentially interesting since it represents divergence. Is the sign inside the eddy consistent with what you

expect from isopycnal slope?

Fig. 5: mark (a), (b) etc

Line 327: tongues?

Line 359, 367: delete 'and'

Fig. 7 caption: 'Major density steps are delineated by horizontal grey lines. The horizontal dashed lines indicate the base of the main density interfaces.' - these two sentences are redundant

Line 373: position

Line 393: (a) Depth

Line 394: basin measured by

Fig. 8 is inconsistent between (a) and (b). Firstly, (a) is not marked. I presume the dots in (b) are steps identified using the procedure referenced in Methods; dots are lacking from (a). (a) shows isopycnals, (b) does not. What is 'average layer depth' in y axis label in (b), is it just depth (the float was profiling, not in isopycnal following mode, correct?)? Please present consistent information between the panels and clearly explain what is illustrated in the caption.

Line 404: wind forcing

Line 427: of concurrent direct

Line 429: delete ' This observation is consistent with the emerging understanding of the dynamic interplay between mesoscale features and fine-scale thermohaline structures in the ocean interior.' - redundant

Line 434: highlighted the persistence of

Line 467: in suspended

Line 468: coarse particle fraction

Line 468-469: 'microscale' in the ocean is O(mm)-few cm! And 'macroscale' is not established nomenclature for a specific vertical scale. Please replace 'macroscale' and 'microscale' by something like 'scales between / of the order of ...' to be specific.

Line 506: delete 'in the literature'

Line 515: interfaces

Line 542: sedimentation patterns, promoting

Line 546: organic matter?

Line 572: delete 'in'

Line 577: assessed at the depth of each step