

2nd review of “Turbulence measurements suggest high rates of new production over the shelf edge in the north-eastern North Sea during summer” by Bendtsen and Richardson.

The authors correctly addressed my main concerns and the revised manuscript was significantly improved. The revised manuscript includes, among others, a more thorough evaluation of the uncertainties associated with the TKE dissipation and nitrate fluxes (extended Figure 6) calculations; new panels in Figures 2 and 7 displaying the distribution of nitrate in transect Tr4, and the distribution of nitrate fluxes across the shelf edge; microstructure and CTD data from a 36-hour time-series, and a Table presenting the median of relevant parameters for the different regions. Those modifications strengthen the communication of the manuscript’s main conclusions. I have only a set of relatively minor points that I would like the authors to address before the manuscript is published.

GENERAL COMMENTS:

I contend that some weaknesses remain in the communication of the main conclusions. See for example the following sentences:

“Estimated nitrate fluxes due to turbulent vertical mixing into the euphotic zone were up to 0.5 - 1 mmol N m⁻² d⁻¹ over the shelf-edge (f-ratios > 0.1) while values of < 0.1 mmol N m⁻² d⁻¹ were found in the deeper open area north of the shelf-edge.” (Abstract, P.1 L. 13-14)

“Nitrate fluxes were generally very low (< 0.1 mmol N m⁻² d⁻¹) in the deeper area north of the shelf edge due to low vertical mixing in the upper 50 m. However, elevated nutrient fluxes of ~1 mmol N m⁻² d⁻¹ were seen in the shelf edge zone and near the Norwegian coast. This resulted in f-ratios above 0.10 in these regions compared to < 0.02 for the remainder of the study area (Fig. 7, S28d, e).” (P. 14, L. 10-14)

“Significant NP was found above the shelf-edge where vertical nitrate fluxes of 0.5 - 1.5 mmol N m⁻² d⁻¹ implied f-ratios above 0.10, whereas very low nutrient fluxes characterised the open area above the Norwegian Trench (f-ratios < 0.02).” (Conclusions, P. 21, L. 15-17)

Although the nitrate diffusive flux was as high as ~1 mmol m⁻² d⁻¹ and f>0.10 in some stations over the shelf edge area, those values seem not to be representative of the “mean state”, according to the median values presented in Table 2. The median flux in the shelf edge area and the corresponding f-ratio (0.11 mmol m⁻² d⁻¹, f-ratio = 0.021) are well below the values reported in these sentences. I would suggest to rephrase the sentences to acknowledge that, although values of the f-ratio/nitrate fluxes at individual stations could be as high as 0.1 and 1 mmol m⁻² d⁻¹, those values do not correspond to the regional means. You could also include the value of the median f-ratio in table 2.

SPECIFIC COMMENTS:

- This sentence “Every cast provided two shear-measurements and, in general, there was relatively small deviation between the two shear probes. Therefore, all measurements were included in the analyses and values from the two shear-probes were averaged.” (P.4, L 20) seems contradictory with the following paragraph (“This led only to the removal of a few pairs of epsilon from the dataset”, P.4, Line 32)

- Although I think that I understand what the authors meant with these two sentences: “ Thus, PB_{max} was significantly lower at the SCM, in general accordance with previous studies (see review in Richardson et al., 2016) whereas **αB showed a weak decrease with depth** (with overlapping uncertainty intervals between the two depth levels). In general, **αB has been found to increase with**

depth (resulting in a more efficient photosynthetic response at low light levels) and inspection of the vertical distribution showed a tendency to higher values between 15 -25 m depth (i.e. 2 - 3 e-folding depth of PAR) and lower values below 30 m resulting in a lower median value from SCM level.” (P. 12, L. 15-19); they might also sound a bit contradictory and probably need some clarification.

- In P 14, Line 5: “cf. Fig. 2c,d” I think the authors wanted to refer to Supplementary Figure 2 here. Also, the description of the figure remains extensive in the text. Although it contains some repeated information, I would also agree if the authors decided to keep this figure (or a reduced version of it) in the main manuscript file. My main concern with this figure was that the cross-shelf variability of the nitrate fluxes was nuanced here, but this is now clearly illustrated in Figure 7c.

- I appreciate that the authors extended the discussion about the calculation of photosynthetic parameters and its uncertainties. However, I still would like to see how the fitted curves and the data actually look like, as they are a central point of the manuscript. Could you show some figure as example to me and, maybe, include them in the manuscript or as supplementary information?

-Figure 7 (caption): Could you add the integration depth in the Figure caption as well?

- Table 2 (caption). “...depth intervals of depth,” please remove one “depth”