Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
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# Comment on gmd-2020-437

Anonymous Referee #2

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Referee comment on "Integrating CVMix into GOTM (v6.0): a consistent framework for testing, comparing, and applying ocean mixing schemes" by Qing Li et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-437-RC2, 2021

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The authors implemented three different KPP-based vertical mixing schemes in the GOTM, among two of which include LT-enhanced vertical mixing or entrainment, and then systematically assessed their performances by comparing to observations of three oceanic scenarios, yielding consistency with previous studies and improvements in the LT-parameterized schemes, particularly in significant mixed layer deepening events during winter. This work provides both framework and example of implementing LT-effects into ocean models, which benefits the ocean modeling community. In general, the paper is well written and supports its conclusions as well as findings except for some minor places, which may need to be further clarified.

- In section 3, table 1, the flags for Ekman depth limit and MO length limit are both false while there exist strong heating events (re-stratification in FLEX) and significant mixed layer deepening (Gotland Basin). Can you clarify why these two depth limits are not considered here?

- In your Fig.5, panel IV, why the temperature bias in the well-mixed upper layer is much greater than the salinity bias in the same layer? It seems the salinity prediction is

generally better than temperature. Can you briefly explain why?

- Section 3.2, Page 12, do you have any discussion on wind-wave misalignment effects on LT intensity and thus their effects on turbulent mixing?

- Page 16, L335-336, Can you be more specific about why a second-order turbulence closure scheme will be more helpful?

- Page 19, L371-375, small Langmuir number is also occasionally observed in the spring or summer, can you explain why LT effects are most pronounced in the winter? Is it easier for LT to erode halocline than thermocline?