In this paper, the authors investigate the horizontal distribution and temporal variation of the thickness of the bottom mixed layer (BML), $H_{BML}$, in the South China Sea. Regarding the horizontal distribution, the authors show that $H_{BML}$ calculated from the CTD data are thicker over the continental slope of the northern South China Sea than $H_{BML}$ over the continental shelf and deep basin. Concerning the temporal variation, the authors demonstrate that temperature fluctuation in the BML is dominated by diurnal, semidiurnal, and inertial variations at the mooring the continental shelf (Station M1), whereas low-frequency variation dominates at the mooring in the deep basin (Station M2). Considering that $H_{BML}$ at Station M1 is thicker than that at Station M2 as well, the authors attribute the horizontal distribution of $H_{BML}$ to vertical mixing due to the dissipation of the internal tide, and construct the map of $H_{BML}$ in the entire South China Sea using the statistical relationship between $H_{BML}$ calculated from the CTD data and internal tide dissipation estimated by de Lavergne et al. (2019).

Although I think that the topic of this paper is within the appropriate scope of EGUsphere, I cannot recommend publication in the current form due to the reasons described below. I hope my comments will be of some help.

Major comments

- Although the relative variance method is applied to potential temperature, salinity, and potential density measured with the CTD, the EOF analysis is applied only to potential
temperature measured at the mooring sites. I understand that there are no salinity measurements at Station M1, but at least the salinity and potential density data at Station M2 should be analyzed to make sure that there exists no significant difference among the \( H_{BML} \) estimated from potential temperature, salinity, and potential density.

- The depths of sensors listed in Table 1 are much coarser than those of the circles in Figure 7. The authors should describe how to calculate the EOF modes more in detail.

- Figure 7a shows that stratification around 115 m is reduced (positive) when stratification in the BML (below 100 m) is enhanced (negative), and vice versa. By contrast, Figure 7b shows that stratification around 50 m is reduced (positive) when stratification in the BML is reduced (positive) as well. I feel the latter is physically reasonable, but the former is not. The authors should explain that the former result is not inconsistent with the quasi-homogeneous structure shown in Figure 6.

- The total energy dissipation is not suitable for examining the influence of internal tide dissipation on \( H_{BML} \) (Figures 9c and 10) because the low-mode dissipation attributed to wave-wave interaction occurs in the stratified water column "over" the BML. Instead, the sum of the "low_modes_shoaling", "low_modes_critical_slopes", "low_modes_scattering", and "high_modes_local" dissipation, all of which are included in the dataset provided by de Lavergne et al. (2019), should be used.

- The influence of external (barotropic) tide dissipation, which is not considered in the present study at all, should also be examined. In fact, Zu et al. (2008, Deep-Sea Res. Part I) demonstrated that the barotropic tidal energy is dissipated around the Luzon and Taiwan straits.

- Eq. (3) is valid only when the vertical eddy diffusivity, \( A_z \), is constant. In the present case that \( A_z \) varies in the vertical direction, the right-hand side of Eq. (3) must be \( d(A_v(dT/dz))/dz \). The relevant parts of the manuscript should be revised as well.

Minor comments

- Line 85: “less than 50 m” should read “more than 50 m”.
- Lines 191-192, Figure 6: This is not a fair comparison because the contour interval of Figure 6a(6b) is ten times larger than that of Figure 6c(6d).
- Lines 106-108, Figure 8: The power spectra shown in Figure 8 cannot be calculated from the filtered data where the inertial, diurnal, and semidiurnal signals are removed. To avoid misunderstanding, the authors should mention that the power spectra are calculated from the raw data.
- Lines 212-214, Figure 8: For the benefit of a reader, the heights of the data used for spectral analysis should be denoted.
- Figure 2: The title of the y-axis is missing.
- Figure 6: For the benefit of a reader, the depths of sensors should be superposed.