# Investigation of bottom boundary layer dynamics in the shallow waters

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The current investigations were focused on the dynamics of bottom boundary layer in East China Sea where water depths are comparatively shallow. The bottom boundary layer (BBL) is a well-mixed homogeneous layer that extends from outer free flow to the seafloor. It is usually separated from the overlying stratified waters by a distinct density interface. However, stratification in the quasi-homogeneous near-bottom layer may gradually increase towards the water interior, and hence the thickness of such layers is not easy to determine. In many cases BBL dynamics are influenced by tides but a certain number of cases show the non-tidal formations. The Acoustic Doppler Current Profiler (ADCP) data which was collected in East China Sea was used during the investigation. The results indicated friction velocity varies between $1.8 \times 10^{-2}$ and $8.8 \times 10^{-2}$ ms$^{-1}$, with a mean value $\langle u_{*l1} \rangle$ = 5.6 x $10^{-2}$ ms$^{-1}$. The friction velocity estimated from log wake method is closer to the classical logarithmic layer method which is represented by $\langle u_{*lw} \rangle$ = 0.94 $\langle u_{*l1} \rangle$. The modified logarithmic layer gives approximation of $\langle u_{*ml} \rangle$= 2.9 x $10^{-2}$ ms$^{-1}$while $\langle u_{*l1} \rangle$ = 5.3 x $10^{-2}$ ms$^{-1}$. These results indicated the upper log-layer $u_{*l2}$ appears to be overestimated by 2.6 times compared to $u_{*ml}$. The estimates of friction velocity associated with the latter, assuming that it can be approximated by the classic log-layer formula, appeared to be larger than in the lower layer by a factor of 1.65. However, even the lower log-layer $u_{*l1}$ appeared to be unreasonably high, which suggests that $u_{*l1}$ could be substantially overestimated due to the fact, pointing to the fact that seemingly logarithmic sections of the observed velocity profiles are not solely governed by the classic log-layer formula. Some other dynamics appears to be at play, wherein variable such as the drag, stratification, and rotation of the tidal vector may be important. The classical log-wake model at times gave a perfect agreement with observed velocity profiles in and above the log-layer but it did not change the estimates of friction velocity much. This also corroborates the claim that other form of dynamics may be in action in the BBL.

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