Defining bottom boundary layer structure in the East China sea

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Bottom boundary layer (BBL) is generally a well-mixed homogeneous layer that extends from outer free flow to the seafloor, usually separated from the overlying stratified water mass by a distinct density interface. However, stratification in the quasi-homogeneous near the bottom layer may gradually increase towards the water interior. Therefore, the thickness of such layer is not easy to determine firmly.

During this study classical log layer, modified log layer and law of the wake approximation were used. A total number of 8616 current velocity profiles were analyzed in the depth range of 3.7 to 36.7 m above bottom (mab). The results indicated that the minimum and the maximum height of BBL vary from 5.7 m to 21.7 m with an average height of 9.97 mab. Friction velocity (u_*) was estimated to be in the range 0.018 to 0.088 m/s with a mean of 5.6×10^{-2} m/s. Second layer (l_2) structure varies from 3 to 13 m and upper boundary extended to 11 - 21 mab. The estimated value of u_{*l2} varied between 5.8×10^{-2} m/s and 14.3×10^{-2} m/s with the mean $\langle u_{*l2} \rangle = 9.8 \times 10^{-2}$ m/s. The obtained ratio $\langle u_{*l2} \rangle / \langle u_{*l1} \rangle = 1.7$ which exactly same to previous studies. Law of the wake study shows that the relationship of u_* as $\langle u_{*lw} \rangle = 0.94 \langle u_{*l1} \rangle$. Modified log layer structure is relevant to the average $\langle u_{mll} = 2.9 \times 10^{-2} \rangle$ m/s while $\langle u_{*l1} \rangle = 5.3 \times 10^{-2}$ m/s. The upper log-layer u_{*l2} appears to be overestimated 2.6 times, compared to the u_{*mll}. In the modified log layer method the estimate of drag coefficient $C_d = 3 \times 10^{-3}$ with 95% confidence bounds is $(2.85 - 3.13) \times 10^{-3}$, which is close to a traditional. The study revealed that over estimation of u_* which mostly appears as form drag produced by the upstream seabed, sand ripples and other small homogeneities on bathymetry.

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