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On the Structure of Turbulence and Reynolds Stress Distribution in the Bottom Boundary Layer of the Coastal Ocean

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Turbulent flow measurements were performed in the bottom boundary layer on the U.S. Southeastern continental shelf using particle image velocimetry (PIV). The experiments were performed within 2 m above the bottom, during half of a tidal cycle. At each elevation and mean flow, 3600 vector maps were collected. The data demonstrate the existence of a log layer within a mixed oscillatory motion and a mean current flow. A major challenge is to separate between waves induced motion and turbulence. To estimate the Reynolds stresses, free of wave contamination, we calculates the 2nd order structure function of the velocity vectors. In addition, turbulence in the bottom boundary layer consists of powerful vortical structures (gusts), separated by periods of quiescent flow. The shear stresses are high during periods of gusts, and essentially zero during the quiescent periods.

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