

Abstract Submitted
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Disruption of bottom log-layer in LES of Langmuir circulation in shallow seas NITYANAND SINHA, ANDRES E. TEJADA-MARTINEZ, University of South Florida, CHESTER E. GROSCH, GUILLAUME MARTINAT, Old Dominion University — We report on disruption of the log-layer in the resolved bottom boundary layer in large-eddy simulations (LES) of full-depth Langmuir circulation (LC) in a wind-driven shear current in neutrally-stratified shallow water. LC consists of parallel counter rotating vortices that are aligned roughly in the direction of the wind and are generated by the interaction of the wind-driven shear with the Stokes drift velocity induced by surface gravity waves. The disruption is analyzed in terms of mean velocity, budgets of turbulent kinetic energy (TKE) and budgets of TKE components. For example, in terms of mean velocity, the mixing due to LC induces a large wake region eroding the classical log-law profile within the range $90 < z+ < 200$. The dependence of this disruption on wind and wave forcing conditions is investigated. Results indicate that the amount of disruption is primarily determined by the wavelength of the surface waves generating LC. These results have important implications on turbulence parameterizations for Reynolds-averaged Navier-Stokes simulations (RANSS) of the coastal ocean. Preliminary simulations highlight the need for turbulence models taking into account log-layer disruption by LC, as RANSS with the k-epsilon model is unable to capture this disruption.

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