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Budgets of Reynolds stress and turbulent kinetic energy in LES of Langmuir circulation in shallow water ANDRES TEJADA-MARTINEZ, University of South Florida, CHESTER GROSCH, Old Dominion University — We analyze budgets of Reynolds stress and turbulent kinetic energy (TKE) in large-eddy simulation (LES) of full-depth Langmuir circulation (LC) in a wind-driven shear current in shallow water. LES with near-wall resolution is performed, thereby resolving surface and bottom viscous boundary layers. The LES is driven by wind and wave forcing representative of conditions during field measurements of shallow water, full-depth LC and is able to capture the turbulent structure measured in the field. Analysis of the budgets reveals that LC impacts the energy transfer near the bottom. In traditional boundary layers, mean shear acts as the main source of downwind TKE (u'u') while pressure-strain correlation serves to re-distribute this energy to crosswind (v'v') and vertical (w'w') components. In the flow with LC, the Craik-Leibovich vortex force generating LC acts as a source of vertical TKE, while pressure-strain correlation re-distributes this energy to the crosswind component. LC also disrupts the usual log-layer balance between production and dissipation. Furthermore, LC disrupts the log-law, inducing a "law of the wake-like" behavior. These results have important implications on turbulence parameterizations for RANSS (Reynolds-averaged Navier-Stokes simulation) of the coastal ocean.

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