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Evaluation of turbulence models in RANSS of wind-driven flow with full-depth Langmuir circulation NITYANAND SINHA, ANDRES E. TEJADA-MARTINEZ, University of South Florida, CHESTER E. GROSCH, GUILLAUME MARTINAT, Old Dominion University — Large-eddy simulations of full-depth Langmuir circulation (LC) in a wind-driven shear current in neutrally-stratified shallow water have revealed modified bottom log-layer dynamics. For example, mixing due to LC induces a large wake region eroding the classical log-law velocity profile within the range $90 < z+ < 200$. This has important implications on Reynolds-averaged Navier-Stokes simulations (RANSS) of the coastal ocean circulation. Turbulence models in RANSS are typically calibrated under the assumption of log-layer dynamics, which could potentially be invalid during occurrence of full-depth LC, often observed in shallow coastal shelf regions. Motivated by this, we perform RANSS of wind-driven flows with LC with a 1-D water column model in order to assess the performance of various turbulence parameterizations such as the k-epsilon model in capturing the disruption of log-layer dynamics induced by LC. Modifications to these models will be described in order to account for the presence of LC.

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