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LES of full-depth Langmuir circulation in a crosswind tidal current ANDRES TEJADA-MARTINEZ, NITYANAND SINHA, University of South Florida, CHESTER GROSCH, GUILLAUME MARTINAT, Old Dominion University — We report on the impact of a crosswind tidal current on full-depth Langmuir circulation (LC) in shallow water computed via large-eddy simulations (LES). 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 current with the Stokes drift velocity induced by surface gravity waves. During times of weak tidal current, full-depth LC disrupts the classical log-layer dynamics occurring at the bottom of the water column. 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 $90 < z+ < 200$. However, during times of strong tidal current, bottom-generated turbulence induced by the tide is able to break-up the full-depth LC giving rise to smaller scale LC characterized by different turbulent structure. The LC turbulent structure during strong and weak tidal currents is consistent with field measurements during episodes of full-depth LC. Statistics of the turbulence associated with LC during strong and weak tides will be contrasted.

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