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Interaction between Langmuir circulation and the bottom boundary layer in shallow water ANDRES TEJADA-MARTINEZ, JIE ZHANG, University of South Florida — Results are reported from large eddy simulations (LES) of a shear flow in an unstratified finite-depth water column driven by a surface wind stress and a constant crosswind pressure gradient. The Craik-Leibovich vortex force in the LES equations serves to generate Langmuir circulation (LC) consisting of parallel counter rotating vortices aligned downwind. The vortex force parameterizes the interaction between surface gravity waves and the wind-driven shear current resulting in LC at the surface of the ocean. In the LES without crosswind pressure gradient, LC is generated at the surface and over time penetrates deeper into the water column while also growing in the crosswind direction. The growth of the LC is restricted by the bottom of the water column. In LES with constant pressure gradient such that the induced crosswind current is 1.5 times the wind-driven current at mid-depth, the growth of LC is interrupted by the crosswind current's bottom boundary layer. Turbulent ejections from this boundary layer interact with the LC leading to a full-depth coherent structure characterized by a blend between Langmuir turbulence (associated with the LC) and bottom-generated shear turbulence. Diagnostics of this hybrid turbulence and budgets of the Reynolds shear stress will be analyzed.

Andres Tejada-Martinez
University of South Florida

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