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LES of full-depth Langmuir circulation with surface cooling RACHEL WALKER, ANDRES E. TEJADA-MARTINEZ, University of South Florida, CHESTER E. GROSCH, Old Dominion University — Results are presented from large-eddy simulations (LES) of full-depth Langmuir circulation (LC) in the presence of surface cooling in a domain representative of the shallow coastal ocean. LC consists of counter-rotating vortices aligned roughly in the direction of the wind and generated by the interaction of the wind-driven shear with the Stokes drift velocity induced by surface gravity waves. In LES of open channel flow (without LC), surface cooling has been found to lead to the development of full-depth convection cells similar in structure to LC. As such, in the current simulations unstable stratification is imposed by a constant surface cooling flux and an adiabatic bottom wall to assess the impact of cooling-induced buoyancy on the strength of the wind and wave-driven LC. The surface cooling flux will be quantified by the value of the Rayleigh number, representative of surface buoyancy forcing relative to wind shear forcing. The impact of the convection on LC will be assessed by analysis of mean velocity, root mean square of velocity, and budgets of Reynolds stress components. It is intended that results may assist in determining the dominant mechanism in large-scale cell structure development when both LC and surface cooling are present.

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