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Scalar transport in large-eddy simulation of Langmuir turbulence in shallow water ANDRES E. TEJADA-MARTINEZ, University of South Florida, CIGDEM AKAN, Oregon State University, CHESTER GROSCH, GUILLAUME MARTINAT, Old Dominion University — Large-eddy simulations (LES) of wind-driven shallow water flows with Langmuir turbulence have been conducted and associated passive scalar transport analyzed. In these flows, the largest scales of the Langmuir turbulence consist of full-depth Langmuir circulation (LC), parallel downwind-elongated, counter-rotating vortices acting as a secondary structure to the mean flow. Langmuir turbulence is generated by the interaction of the wind-driven shear current with the Stokes drift velocity induced by surface gravity waves. LES shows that Langmuir turbulence plays a major role in determining scalar transport throughout the entire water column and scalar transfer at the surface. Langmuir turbulence affects scalar transport and its surface transfer through 1. the full-depth homogenizing action of the large-scale LC and 2. the near-surface vertical turbulence intensity induced by the Stokes drift velocity shear. Results from simulations are analyzed in order to understand the effect of wind and wave forcing parameters on these two mechanisms.

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