Abstract Submitted
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Large-eddy simulation of the upper ocean mixed layer[1] ANDRES TEJADA-MARTINEZ, University of South Florida — Large-eddy simulations (LES) of the wind-driven upper ocean mixed layer with and without wave-current interaction are presented. Wave-current interaction is parameterized through the well-known Craik-Leibovich (C-L) vortex force appearing in the momentum equation and generating Langmuir circulation (LC). LC consists of pairs of parallel counter-rotating vortices aligned in the direction of the wind characterizing the turbulence (i.e. the Langmuir turbulence) advected by the mean flow. LES subgrid-scale (SGS) closure is given by a traditional Smagorinsky eddy viscosity model for which the model coefficient is derived following similarity theory in the near-surface region. Alternatively, LES closure is given by the dynamic Smagorinsky model (DSM) for which the model coefficient is computed dynamically as a function of the flow. The validity of the DSM for parameterizing the viscous sublayer is assessed and a modification to the surface stress boundary condition based on log-layer behavior is introduced improving the performance of the DSM. Furthermore, in the simulation with wave-current interaction, the implicit LES grid filter leads to LC subgrid-scales requiring explicit spatial filtering of the C-L vortex force in place of a suitable SGS parameterization.

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