Abstract Submitted
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Numerical Simulations of a Multiscale Model of Stratified Langmuir Circulation[1] ZIEMOWIT MALECHA, IAM, Univeristy of New Hampshire, GREGORY CHINI, Department of Mechanical Engineering, University of New Hampshire , KEITH JULIEN, Applied Mathematics, University of Colorado Boulder — Langmuir circulation (LC), a prominent form of wind and surface-wave driven shear turbulence in the ocean surface boundary layer (BL), is commonly modeled using the Craik–Leibovich (CL) equations, a phase-averaged variant of the Navier–Stokes (NS) equations. Although surface-wave filtering renders the CL equations more amenable to simulation than are the instantaneous NS equations, simulations in wide domains, hundreds of times the BL depth, currently earn the "grand challenge" designation. To facilitate simulations of LC in such spatially-extended domains, we have derived multiscale CL equations by exploiting the scale separation between submesoscale and BL flows in the upper ocean. The numerical algorithm for simulating this multiscale model resembles super-parameterization schemes used in meteorology, but retains a firm mathematical basis. We have validated our algorithm and here use it to perform multiscale simulations of the interaction between LC and upper ocean density stratification.

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