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Predicting orientation of coastal-zone Langmuir cells influenced by misaligned current, wind and wave forcing KALYAN SHRESTHA, WILLIAM ANDERSON, UT Dallas — Multi-scale physical processes that involve the interaction between winds, waves, and mean currents regulate turbulence in the upper ocean boundary layer (OBL). Among them, Langmuir turbulence is one such process. In coastal settings, Langmuir turbulence is subjected to additional shear from mean currents. Thus, such wind-wave-mean current parameter space and the system response to their disequilibrium becomes an important study for improved parameterizations of OBLs with wave effects. As such, this investigation considers idealized cases of wind-wave-mean current misalignment and attempts to predict the resultant orientation of coastal Langmuir cells. An *a priori* predictive model based on mean Lagrangian shear direction is formulated and direct comparisons have been performed successfully with a thorough list of large-eddy simulation results of the Craik-Leibovich equations. The prognostic model as well as the numerical results depict that the resultant cells maintain coherency (although, diminishes with increasing obliquity between the underlying forces) and aligns at an intermediate angle to the range of imposed forces. This was further justified with theoretical developments, which involved analysis of the vorticity transport equation to assess the terms responsible for the sustenance of streamwise vorticity.

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