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Understanding the dimensional and mechanical properties of coastal Langmuir Circulations. KALYAN SHRESTHA, UT Dallas, JOSEPH KUEHL, Baylor University, WILLIAM ANDERSON, UT Dallas — Non-linear interaction of surface waves and wind-driven shear instability in the upper ocean mixed layer form counter-rotating vortical structures called Langmuir Circulations. This oceanic microscale turbulence is one of the key contributors of mixing and vertical transport in the upper ocean mixed layer. Langmuir turbulence in the open (deep) ocean has already been the topic of a large research effort. However, coastal Langmuir cells are distinctly different from Langmuir cells in open-ocean regions, where additional bottom-boundary layer shear alters the kinematic properties of Langmuir cells. For this study, we have conducted a wide-ranging numerical study (solving the grid-filtered Craik-Leibovich equations) of coastal Langmuir turbulence, assessing which parameters affect Langmuir cells and defining the parametric hierarchy. The Stokes profile (aggregate velocity due to orbital wave motion) is functionally dependent on Stokes drift velocity and wavenumber of the surface waves. We explain that these parameters, which correspond to the environmental forcing variables, control the horizontal and vertical length scales of Langmuir cell respectively. This result is important in understanding the transport and dispersion of materials in the upper mixed layer of coastal ocean. We argue that wind stress is a parameter governing the strength of Langmuir cells.

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