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**Shear Instabilities, Internal Waves and Turbulence in an Equatorial Undercurrent Model** HIEU PHAM, SUTANU SARKAR, KRAIG WINTERS, University of California, San Diego — Direct Numerical Simulation is used to investigate the role of both shear instabilities and internal waves in turbulent mixing in an Equatorial Undercurrent model. The flow condition corresponds to a surface mixed layer moving in an opposite direction of an underlying linearly-stratified stream where the gradient Richardson number is larger than 0.25. Holmboe shear instability emerges at the base of the mixed layer, moves at the speed of the local velocity, and ejects wisps of fluid from the bottom stream upward. At the crests of the primary Holmboe instability, a secondary Kelvin-Helmholtz shear instability causes isopycnal overturns resulting in significant turbulent mixing. Vortices formed by the Kelvin-Helmholtz instability are occasionally ejected downward and stretched by the local shear into horseshoe vortices creating intermittent bursts of turbulence in the bottom stream. Horizontally propagating internal waves with wavelength and frequency equal to that of the Holmboe instability are trapped in the bottom stream where they persist longer than the turbulent mixing caused by either the two shear instabilities or the horseshoe vortices. Internal waves and turbulence in the bottom stream of our model have characteristics similar to the near-N oscillations and the deep-cycle turbulence observed in the Pacific Equatorial Undercurrent.

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