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Numerical Investigation of Surface Wave Effect on Turbulence Underneath ANQING XUAN, BINGQING DENG, LIAN SHEN, Univ of Minnesota - Twin Cities — We perform numerical simulations to study the fundamental mechanism of the distortion of turbulence by surface waves. In our model setup, statistically steady, isotropic turbulence is generated by random forcing in the bulk flow under a monochromatic progressive wave. The simulations are performed on a wave-surface-fitted grid with fully nonlinear free-surface kinematic and dynamic boundary conditions, so that we are able to resolve wave motions directly to include both the instantaneous distortion effects and the phase-averaged accumulative effects of the wave. The simulations capture the distortion of turbulence and reveal detailed information of the instantaneous turbulence field. We analyze the turbulence statistics and observe Reynolds shear stress generated under the wave. Reynolds stress is found to be dependent on wave phase. Further analysis shows that both the wave strain rate and free surface kinematics contribute to the distortion of turbulence underneath.

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