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Laboratory experimental study on wave-turbulence interactions

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Surface gravity waves play an important role in the mixing process of upper ocean. How wave energy is transferred to ocean turbulence through the wave-turbulence interactions remains an open question. Here, laboratory experiments were designed and performed in a wave tank to investigate wave-turbulence interactions in detail. The turbulence intensities before and after the wave-turbulence interactions were compared quantitatively based on their power spectra, and the experimental results indicate that the background turbulence increased approximately by 23.3% through wave-turbulence interaction between 7 and 20 Hz of the power spectrum. Using the Holo-Hilbert spectral analysis method, the results clearly show that the turbulence was modulated by surface waves and then enhanced through the wave-turbulence interaction process. When the wave height was 3 cm and 5 cm, the modulation mainly occurred in the wave trough phase which is consistent with previous literatures. However, the modulation occurred in both the wave trough and crest phases when the surface wave was strong with a wave height of 7 cm. In addition, the intensity of the wave-turbulence interaction increases with the wave height and is proportional to .