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Experimental investigation of gravity wave turbulence and of non-linear four wave interactions..

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Using the large basins of the Ecole Centrale de Nantes (France), non-linear interactions of gravity surface waves are experimentally investigated. In a first part we study statistical properties of a random wave field regarding the insights from the Wave Turbulence Theory. In particular freely decaying gravity wave turbulence is generated in a closed basin. No self-similar decay of the spectrum is observed, whereas its Fourier modes decay first as a time power law due to nonl-inear mechanisms, and then exponentially due to linear viscous damping. We estimate the linear, non-linear and dissipative time scales to test the time scale separation. By estimation of the mean energy flux from the initial decay of wave energy, the Kolmogorov-Zakharov constant of the weak turbulence theory is evaluated. In a second part, resonant interactions of oblique surface gravity waves in a large basin are studied. We generate two oblique waves crossing at an acute angle. These mother waves mutually interact and give birth to a resonant wave whose properties (growth rate, resonant response curve and phase locking) are fully characterized. All our experimental results are found in good quantitative agreement with four-wave interaction theory.

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