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Turbulence generated by parametrically excited capillary waves

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We present the first experimental evidence of a modulational instability of capillary waves on the water surface. Waves are excited parametrically in a vertically shaken container. At lower excitation amplitudes a wide spectrum of discrete harmonics of the parametrically driven wave develops. The modulational instability leads to the development of a spectrally broadened sideband mode. When the spectral width of the unstable mode becomes comparable to the spacing of the discrete harmonics, broadband turbulence forms.

The analysis of the bispectra suggests that a transition from a discrete to turbulent broadband spectrum occurs via the phase-transition from the coherent to random-phase 3-wave interactions. The scaling of the broadband turbulence spectrum agrees with the one expected for weak turbulence of capillary waves.