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Wave turbulence in a two-layer fluid: Coupling between free surface and interface waves[1] ERIC FALCON, Université Paris Diderot, Univ. Sorbonne Paris Cité, MSC, CNRS, Paris, France, BRUNO ISSENMANN, Université Claude Bernard Lyon 1, Univ. Lyon, ILM, CNRS, Villeurbanne, France, CLAUDE LAROCHE, Université Paris Diderot, Univ. Sorbonne Paris Cité, MSC, CNRS, Paris, France — We experimentally study gravity-capillary wave turbulence on the interface between two immiscible fluids of close density with free upper surface. We locally measure the wave height at the interface between both fluids by means of a highly sensitive laser Doppler vibrometer. We show that the inertial range of the capillary wave turbulence regime is significantly extended when the upper fluid depth is increased: The crossover frequency between the gravity and capillary wave turbulence regimes is found to decrease whereas the dissipative cut-off frequency of the spectrum is found to increase. We explain these observations by the progressive decoupling between waves propagating at the interface and the ones at the free surface, using the full dispersion relation of gravity-capillary waves in a two-layer fluid of finite depths. The cut-off evolution is due to the disappearance of parasitic capillaries responsible for the main wave dissipation for a single fluid.

[1]B. Issenmann, C. Laroche E. Falcon, EPL 116, 64005 (2016) published online 16 feb. 2017. This work has been partially supported by CNRS (1-year postdoctoral funding), ANR Turbulon 12-BS04-0005, and ANR Dysturb 2017.

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