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Wave damping of a sloshing wave by an interacting turbulent vortex flow[1] FRANCISCO REYES, Universidad de Santiago de Chile, VICENTE TORREJN, CLAUDIO FALCN[2], Universidad de Chile — We report on the enhancement of the hydrodynamic damping of gravity waves at the surface of a fluid layer as they interact with a turbulent vortex flow in a sloshing experiment. Gravity surface waves are excited by oscillating horizontally a square container holding our working fluid (water). At the bottom of the container, 4 impellers in a quadrupole configuration generate a vortex array at moderate to high Reynolds number, which interact with the wave. We measure the surface fluctuations using different optical non-intrusive methods and the local velocity of the flow. In our experimental range, we show that as we increase the angular velocity of the impellers, the gravity wave amplitude decreases without changing the oscillation frequency nor generating transverse modes. This wave dissipation enhancement is contrasted with the increase of the turbulent velocity fluctuations from PIV measurements. To rationalize the damping enhancement a periodically forced shallow water model including viscous terms is presented, which is used to calculate the sloshing wave resonance curve. The calculated curve is then used to relate the turbulent velocity fluctuations with the enhanced shallow water viscous friction coefficient, which are shown to be proportional between themselves.

[1]Millenium Nucleus of Soft Smart Mechanical Metamaterials
[2]Millenium Nucleus of Soft Smart Mechanical Metamaterials

Francisco Reyes
Universidad de Santiago de Chile

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