

Abstract Submitted
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A new triad resonance in two-layer density stratified fluids

MOHAMMAD-REZA ALAM, Department of Mechanical Engineering, University of California, Berkeley — In a two-layer density stratified fluid it is known, due to Ball (1964), that two oppositely traveling surface waves may form a triad resonance with an interfacial wave. In the case of a real ocean with a relatively weak stratification, the two surface waves have close wavelengths and the resonant interfacial wave has the wavelength of about half of surface waves. Ball (1964) claims “there are no other interactions” between two surface waves and one interfacial wave. Contrary to this, here we present a new class of triad resonance that obtains between two co-propagating surface waves (with close wavelengths) and a much longer interfacial wave. We present, via theoretical analysis and direct simulation, that for weak stratifications this new class of resonance results in a cascade of (near) resonance interaction that spreads the energy of initial waves to a number of lower and higher frequency waves. The resonance discussed here is in fact more likely to affect the evolution of a spectrum because waves within a typical spectrum are usually co-propagating than oppositely traveling. The significance of the resonance studied here is, particularly, more highlighted in the littoral zones, where the spectrum refracts toward a uni-directional wave train.

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