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Experimental Investigation into the long-term spatial and temporal development of Triadic Resonance Instability in a finite-width internal wave beam

Katherine Grayson[1], Stuart Dalziel[2], and Andrew Lawrie[3]
[1]Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, United Kingdom (kmg43@cam.ac.uk)
[2]Department of Applied Mathematics and Theoretical Physics, University of Cambridge, Cambridge, United Kingdom (sd103@cam.ac.uk)
[3]Hele-Shaw Laboratory, University of Bristol, University Walk, Bristol, BS8 1TR, UK (andrew.lawrie@bristol.ac.uk)

With an aim of understanding the role of internal waves to oceanic mixing, various mechanisms have been cited as a possible explanation for how they transfer energy across the wavenumber and frequency spectra and eventually contribute to small-scale turbulence. Triadic Resonance Instability (TRI) has become increasingly recognised as potentially one of these mechanisms. This talk will summarise experimental work that examines the long-term temporal and spatial evolution of this instability in the more realistic scenario of a finite-width internal wave beam. Experiments have been conducted using a new generation of wave maker, featuring a flexible horizontal boundary driven by an array of independently controlled actuators. We present experimental results exploring the role the finite-width of a wave beam has on the evolution of TRI. Experimentally, we find that the approach to a saturated equilibrium state for the three triadic waves is not monotonic, rather their amplitudes continue to oscillate without reaching a steady equilibrium. A detailed study into the structure of the secondary waves shows that this behaviour is also witnessed in Fourier space. We show how a spectrum of these resonant frequencies in the flow 'beat' to cause interference patterns which manifest throughout the instability as slow amplitude modulations.