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On the interaction of gravity-capillary lumps in deep water

NAEEM MASNADI, JAMES DUNCAN, University of Maryland — The nonlinear response of a water surface to a pressure source moving at a speed just below the minimum phase speed of linear gravity-capillary waves in deep water ($c_{min} = 23.1$ cm/s) consists of periodic generation of pairs of three-dimensional solitary waves (lumps) in a V-shaped pattern downstream of the source. In the reference frame of the laboratory, these unsteady lumps propagate in a direction oblique to the motion of the source and are damped by viscosity. In the current study, the interaction of lumps generated by two equal strength pressure sources moving side by side in parallel straight lines is investigated experimentally via photography-based techniques. The first lump generated by each source, collides with the lump from the other source in the center-plane of the two sources. It is observed that a steep depression is formed during the collision. Soon after the collision, this depression radiates energy in the form of small-amplitude radial waves. After the radiation, a quasi-stable pattern is formed with several rows of localized depressions that are qualitatively similar to lumps but exhibit periodic oscillations in depth, similar to a "breather". The shape of the wave pattern and the period of oscillations depend strongly on the distance between the soures.

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