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The Non-Linear Response of a Water Free Surface to a Pressure Distribution Moving at Constant Speed N. MASNADI, J.H. DUNCAN, University of Maryland, T.R. AKYLAS, Massachusetts Institute of Technology — The non-linear response of a water free surface to a localized pressure distribution moving at constant speed just below the minimum phase speed (C_{min}) of gravity-capillary waves is studied experimentally. The experiments are performed in a tank that is 6 m long and 0.25 m wide with water depths ranging from 15 to 40 mm. The pressure distribution is generated by blowing air on the water surface via a vertically oriented 2-mm-ID tube that is mounted on an instrument carriage. The bottom of the tank is made of clear plastic and covered with translucent paper. A checkerboard pattern is printed on the paper and this pattern is viewed from above the water surface with a high-speed digital movie camera. The images of the checkerboard pattern are distorted by refraction at the water free surface and yield qualitative observations and quantitative measurements of the temporal evolution of the wave pattern. At towing speeds close to but below C_{min}, a gravity-capillary lump appears behind the pressure source. For higher speeds, but still below C_{min} an unsteady wave pattern consisting of a wide V is generated. At the boundary between the two response states, the pattern is asymmetric in the cross-stream direction. Above this boundary, lumps are shed from the tips of the V and the frequency of shedding increases with towing speed.

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