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On the unsteady gravity-capillary wave pattern found behind a slow moving localized pressure distribution N. MASNADI, J.H. DUNCAN, University of Maryland — The non-linear response of a water surface to a slow-moving pressure distribution is studied experimentally using a vertically oriented carriage-mounted air-jet tube that is set to translate over the water surface in a long tank. The free surface deformation pattern is measured with a full-field refraction-based method that utilizes a vertically oriented digital movie camera (under the tank) and a random dot pattern (above the water surface). At towing speeds just below the minimum phase speed of gravity-capillary waves ($c_{min} \approx 23$ cm/s), an unsteady V-shaped pattern is formed behind the pressure source. Localized depressions are generated near the source and propagate in pairs along the two arms of the V-shaped pattern. These depressions are eventually shed from the tips of the pattern at a frequency of about 1 Hz. It is found that the shape and phase speeds of the first depressions shed in each run are quantitatively similar to the freely-propagating gravity-capillary lumps from potential flow calculations. In the experiments, the amplitudes of the depressions decrease by approximately 60 percent while travelling 12 wavelengths. The depressions shed later in each run behave in a less consistent manner, probably due to their interaction with neighboring depressions.

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