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**On the response of a water surface to a surface pressure source moving at trans-critical gravity-capillary wave speeds**[1] NAEEM MASNADI, University of Maryland, YEUNWOO CHO, Korea Advanced Institute of Science and Technology (KAIST), JAMES H. DUNCAN, University of Maryland, TRIANTAPHYLLOS AKYLAS, Massachusetts Institute of Technology — The nonlinear response of a water free surface to a pressure source moving at speeds near the minimum speed of linear gravity-capillary waves ($C_{min} \approx 23$ cm/s) is investigated with experiments and theory. In the experiments, waves are generated by a vertically oriented air-jet that moves at a constant speed over the water surface in a long tank. The 3-D surface shape behind the air-jet is measured using a cinematic refraction-based technique combined with an LIF technique. At towing speeds just below $C_{min}$, an unsteady pattern is formed where localized depressions periodically appear in pairs and move away from the source along the arms of a downstream V-shaped pattern. This behavior is analogous to the periodic shedding of solitary waves upstream of a source moving at the maximum wave speed in shallow water. The gravity-capillary depressions are rapidly damped by viscosity and their speed-amplitude characteristics closely match those from inviscid calculations of gravity-capillary lumps. The shedding frequency of the lumps in the present experiments increases with both increasing towing speed and air-flow rate. Predictions of this behavior using a model equation that incorporates damping and a quadratic nonlinearity are in good agreement with the experiments.

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