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On the Jet Impact in a Plunging Breaker[1] M. SHAKERI, M. TAVAKOLINEJAD, E.A. MAXEINER, J.H. DUNCAN, University of Maryland
— Plunging breaking ship bow waves were simulated experimentally using a 2D+T wave maker in a tank that is 14.8 m long, 1.15 m wide and 2.1 m deep (water depth of 1.83 m). In the 2D+T simulation, the sequence of shapes of the flexible surface (wave board) of the wave maker reproduces the time varying intersection of one side of the ship hull with a vertical plane oriented normal to the ship's track as the ship moves in calm water at constant speed. For equivalent full-scale ship speeds greater than about 20 knots, a large plunging breaker is formed. An LIF system that employs a high-speed digital movie camera taking pictures at 256 frames per second was used to measure the temporal history of the profile of the plunging jet. In each image, the top surface of the jet is easily extracted as the intersection of the light sheet with the water surface. The bottom surface of the jet is also seen in the images, but since it is seen by looking through the jet, its profile must be obtained by using an inverse refraction method. The characteristics of the jet including the velocity and acceleration of the jet tip and the distribution of jet thickness are presented. It is interesting to note that the jet tip trajectory is ballistic, but that the vertical acceleration ranges from about 0.6 to 0.8 times the acceleration of gravity.

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