Abstract Submitted
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Wave Impact on a Wall: Comparison of Experiments with Similarity Solutions[1] A. WANG, J.H. DUNCAN, D.P. LATHROP, University of Maryland — The impact of a steep water wave on a fixed partially submerged cube is studied with experiments and theory. The temporal evolution of the water surface profile upstream of the front face of the cube in its center plane is measured with a cinematic laser-induced fluorescence technique using frame rates up to 4,500 Hz. For a small range of cube positions, the surface profiles are found to form a nearly circular arc with upward curvature between the front face of the cube and a point just downstream of the wave crest. As the crest approaches the cube, the effective radius of this portion of the profile decreases rapidly. At the same time, the portion of the profile that is upstream of the crest approaches a straight line with a downward slope of about 15°. As the wave impact continues, the circular arc shrinks to zero radius with very high acceleration and a sudden transition to a high-speed vertical jet occurs. This flow singularity is modeled with a power-law scaling in time, which is used to create a time-independent system of equations of motion. The scaled governing equations are solved numerically and the similarly scaled measured free surface shapes, are favorably compared with the solutions.

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