Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

The Impact of a Deepwater Wave on a Wall with Finite Vertical Extent[1] AN WANG, JAMES H. DUNCAN, University of Maryland — The impact of a dispersively focused 2D plunging breaker (average wave frequency 1.15 Hz) on a 2D wall that is 45 cm high and 30 cm thick is studied experimentally. The temporal evolution of the water surface profile upstream of the wall is measured with a cinematic LIF technique using frame rates up to 4,500 Hz. Impact pressures on the wall are measured simultaneously at sample rates up to 900 kHz. The wall is located horizontally 6.41 m from the wave maker in all cases and the submergence of the bottom surface of the wall is varied. It is found that the impact behavior varies dramatically with the wall submergence. When the bottom is submerged by 13.3 cm, a flip-through impact occurs. In this case, the impact evolves without wave breaking and a vertical jet is formed. When the wall is submerged by less than 4.5 cm, small-amplitude components in the wave packet interact with the bottom of the wall before the main crest arrives. Ripples reflected during this interaction modify the behavior of the incoming breaker significantly. When the bottom of the wall is located sufficiently high above the mean water level, the first interaction occurs when the undisturbed wave crest collides with the wall. The highest pressures are observed in this case.

[1]The support of the Office of Naval Research is gratefully acknowledged.

James Duncan
Univ of Maryland-College Park

Date submitted: 30 Jul 2016 Electronic form version 1.4