Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Effect of chemical herders on wave breaking[1] LAKSHMANA CHANDRALA, FRANZ O'MEALLY, JOSEPH KATZ, Department of Mechanical engineering, Johns Hopkins University — Chemical surface-active agents (oil herders) could be used to concentrate oil slicks to facilitate *in-situ* burning after an oil spill. The water-insoluble but oil-soluble surfactants in commercial oil herders accumulate on the air-water interface and might alter the wave breaking process. In this study, the characteristics of mechanically generated breaking waves of varying energies are visualized in clean seawater and water treated with a herder containing 65% Span-20 and 35% 2-ethyl butanol at a concentration of 5.5 ml/m^2. The experiments are performed in a 6x0.3x0.6 m transparent tank and the waves are generated by translating a paddle. Multiple high-speed cameras follow the evolution of both waves. For a plunging breaker in clean water, prior to impact, the wave front contains multiple ripples and small fingers. In contrast, in treated water the wave-front is smooth, resulting in entrainment of a larger volume of air, and deeper subsequent penetration of the bubble cloud. Conversely, for relatively weak spilling breakers, adding the surfactant delays the wave breaking, and dampens the formation of capillary waves on the wave crest. Once breaking occurs, visually, there is no significant difference in the appearance and penetration of the waves.

[1]GOMRI

Lakshmana Chandrala
Department of Mechanical engineering, Johns Hopkins University

Date submitted: 30 Jul 2019 Electronic form version 1.4