Abstract Submitted
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Experimental investigation of two oil dispersion pathways by breaking waves[1] CHENG LI, JOSEPH KATZ, Johns Hopkins University — This experimental study focuses on generation and size distribution of airborne and subsurface oil droplets as breaking surface waves interact with a crude oil slick (MC252 surrogate). Experiments in a specialized wave tank investigate the effects of wave height and wave properties (e.g. spilling vs. plunging), as well as drastically reducing the oil-water interfacial tension by orders of magnitude by introducing dispersant (Coexist 9500-A). This dispersant is applied at varying dispersant-to-oil ratios either by premixing or surface spraying, the latter consistent with typical application. The data include high-speed visualizations of processes affecting the entrainment of subsurface oil and bubbles as well as airborne aerosols. High-speed digital holographic cinematography is employed to track the droplet trajectories, and quantify the droplet size distributions above and below the surface. Introduction of dispersants drastically reduces the size of subsurface droplets to micron and even submicron levels. Ahead of the wave, the 25 μm (our present resolution limit) to 2 mm airborne droplet trajectories are aligned with the wave direction. Behind the wave, these droplets reverse their direction, presumably due to the airflow above the wave.

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