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Quantifying oil degradation processes by flow, microbes and dispersant using digital holographic interferometry and micro-bioassay JIAN SHENG, Tesas A & M Univ, Johns Hopkins Univ, MARYAM JALALI, Tesas A & M Univ, LARRY BROCK , Johns Hopkins Univ — The unceasing demand of hydrocarbons has led and will lead to the future events of releasing crude into marine environment like Deep Horizon oil spill. The burning question to scientific community after the spill was the fate of oil spill especially with high concentration of dispersant. It is found that various physical processes such as wind, wave, turbulence, compounded with dispersants, break oil into suspension of micro-droplets. It is widely accepted that dispersant reduces interfacial tension and results in increased surface to volume ratio and subsequently improve biodegradation. Due to complexity of oil composition, key mechanisms differ substantially from well-studied laboratory system, especially in the presence of other environmental factors such as flow shear and microbes. To investigate these mechanisms at oil water interface qualitatively, we have developed a micro-bioassay consisting of microfluidics with a substrate printed with oil droplet array and a digital holographic interferometer (DHI). The degradation of micro-droplets is evaluated with the change of shape and volume measured in real time by DHI at a 2-minute interval over 100 hours. Time resolved experiments are performed to study effects of droplet size, dispersant concentrations, flow shear, and different bacteria species on the rate of degradation. The details on the rate and mechanisms will be provided in the talk.

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