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Oil Droplet and Sediment Suspension in Laboratory-Scale Stommel Retention Zones CARLOWEN SMITH, ZONGZE LI, University of South Florida Department of Mechanical Engineering, ANDRES TEJADA-MARTINEZ, University of South Florida Department of Civil and Environmental Engineering, DAVID MURPHY, University of South Florida Department of Mechanical Engineering — Langmuir supercells are helical wind- and wave-driven circulations in the ocean with alternating regions of upwelling and downwelling that extend to the full depth of the water column. These flows can trap suspended materials in subsurface regions of turbulent vertical motion known as Stommel Retention Zones (SRZs), an effect that can specifically impact oil-particle aggregation following an oil spill. We present a laboratory facility recreating some aspects of SRZs and its characterization using PIV. The experimental facility consists of a 10.20.5 m tank in which a shear stress is applied on the side walls using conveyor belts, resulting in a counterrotating vortex pair with either a central downwelling or upwelling region of variable strength and turbulent kinetic energy. Mean up/downwelling flow speeds range from 0.05-0.2 m/s, where turbulent kinetic energy ranges over two orders of magnitude. The facility is used to study oil and particle dynamics within these zones of turbulent retention. Positively buoyant oil droplet and negatively buoyant sediment particle trajectories and spatial concentration fields are quantified, and droplet retention is then compared with sediment suspension, yielding information about the expected efficiency of oil-particle aggregation.

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