CONCURRENT SESSION 4 – WATER RESEARCH AND OIL SPILL RESPONSE

Advances in Underwater Oil Plume Detection Capabilities

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Historically, visual observation is an emergency responder's first 'tool' in identifying spilled oil. Optical detection has since expanded to include a myriad of signals from space, aircraft, drone, vessel and submersible platforms that can provide critical information for decision-making during spill response efforts. Spill monitoring efforts below the air-water interface have been vastly improved by advances with in situ optical sensors and vehicle platform technology. Optical techniques using fluorescence, scattering, and holography offer a means to determine dissolved versus droplet fractions, provide oil concentration estimates and serve as proxies for dispersion efficiency. For subsurface spills over large space and time scales, Autonomous Underwater Vehicles (AUVs) can be used to provide subsurface plume footprints and estimate oil concentrations. For smaller, more frequent spills, tethered compact Remotely Operated Vehicles (ROVs) may be more appropriate as they are easy to deploy for rapid detection.

Two underwater oil detection technologies have been developed: (1) A Remote Environmental Monitoring UnitS (REMUS-600) AUV equipped with fluorescence and backscatter SeaOWL UV-A (Oil-in-Water Locator; Sea-Bird Scientific WET Labs Inc.), holographic imager (HoloCam; SeaScan, Inc), hydrographic information, video camera, CTD and a water/oil sampler. (2) A tethered ROV system (DTG2, Deep Trekker Inc.) equipped with video camera, UviLux (Chelsea Technologies Group, Inc) fluorometer, a CTD and water/oil sampler. Calibration and validation tests of the sensor suite were conducted at the Coastal Response Research Center flume tank (NH, USA). Oil concentration estimates were verified by chemical analysis of hydrocarbons and particle size analysis (LISST 200X, Sequoia, Inc). Operational performance of the ROV platform and sensors was evaluated at the Ohmsett wave tank (NJ, USA). Field performance of the REMUS and sensor suite was evaluated at natural seeps near Santa Barbara, CA. This research demonstrates the forensic value of in situ optical data for improved understanding of the behavior and transport of spilled oil below the air-sea interface.