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Crude Oil Detection with Seapoint Sensors, Inc. Optical Sensors

Optical sensors have recently been deployed in the Gulf of Mexico for detection and monitoring of crude oil in response to the BP Deepwater Horizon oil spill. The broadband fluorescence of crude oil and the turbid nature of oil in water emulsions allows for detection of oil using fluorometers and light scattering sensors. The Seapoint Ultraviolet Fluorometer (SUVF), Seapoint Turbidity Meter (STM), and Seapoint Chlorophyll Fluorometer (SCF) were tested to determine their response to oil emulsions prepared in the laboratory. The following is a report of the results of these tests.

An oil and water emulsion was prepared combining South Louisiana Light Crude and a water-based dispersant (blend of surfactants, detergent, and emulsifiers) in a 1:1 ratio, then applying agitation to mix the oil into distilled water. The result of this was a very homogeneous and stable emulsion that was used to determine the response of the Seapoint optical sensors.

Response curves for each sensor are shown in the following Figures 1 and 2. The SUVF proved to be extremely sensitive to this emulsion, having a detection threshold on the order of 0.01 ppb crude oil. At very high oil concentrations (above 100 ppm) the SUVF response becomes non-linear. The STM and SCF have a somewhat weaker response, but respond in a relatively linear fashion to more than 500 ppm oil, with a detection threshold on the order of 0.1 ppm crude oil.

Detection of oil in the field is expected to be much more difficult than in the laboratory. Fluorescence of crude oil will depend on compounds present in the oil and would be expected to diminish as oil degrades. Turbidity of oil plumes will depend on droplet size and composition. It may be difficult to distinguish oil from other fluorescent and turbid components in water.



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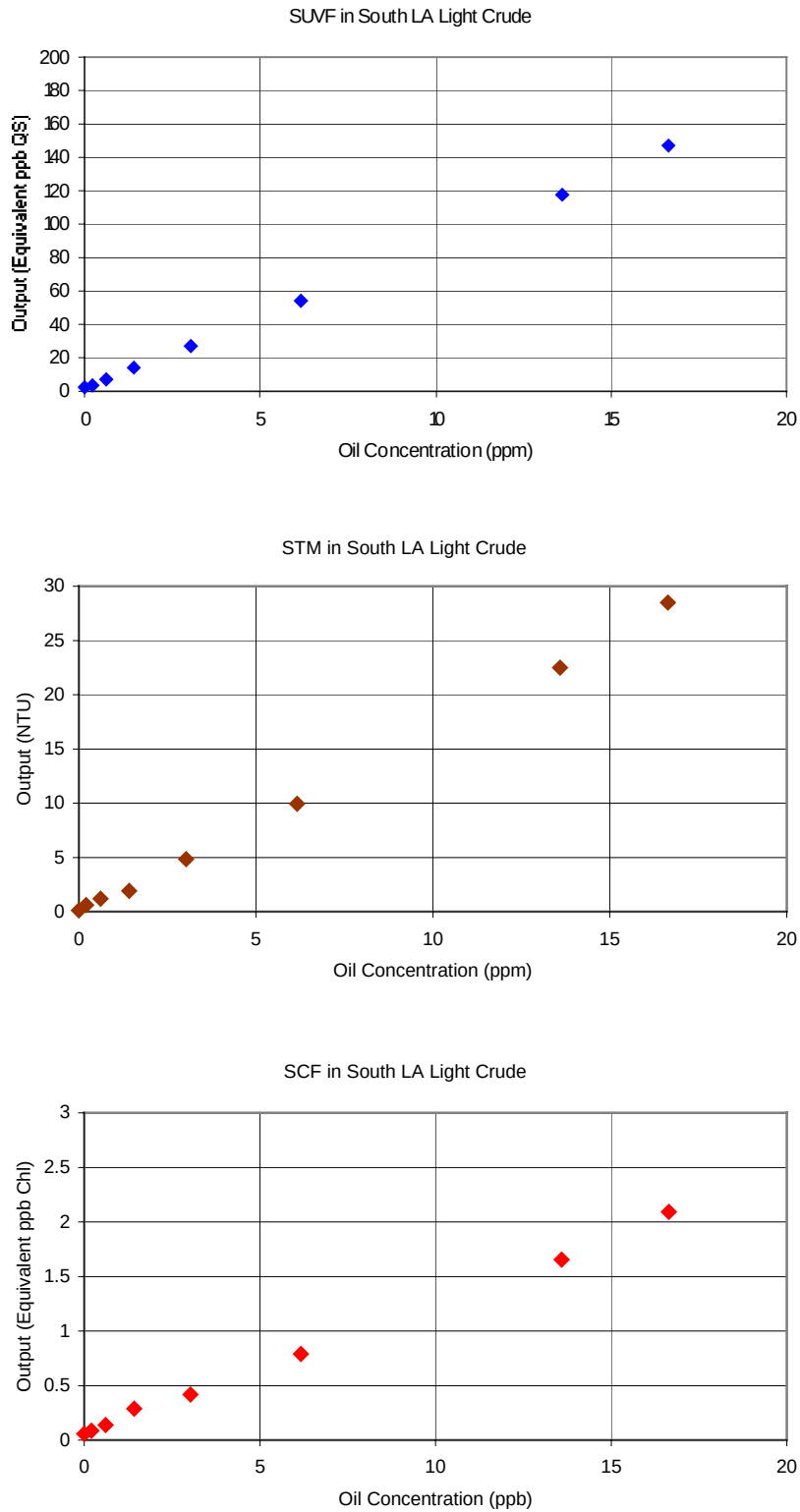


Figure 1. Response of Seapoint optical sensors in South Louisiana Light Crude Oil and water emulsion, 0-20 ppm oil concentration



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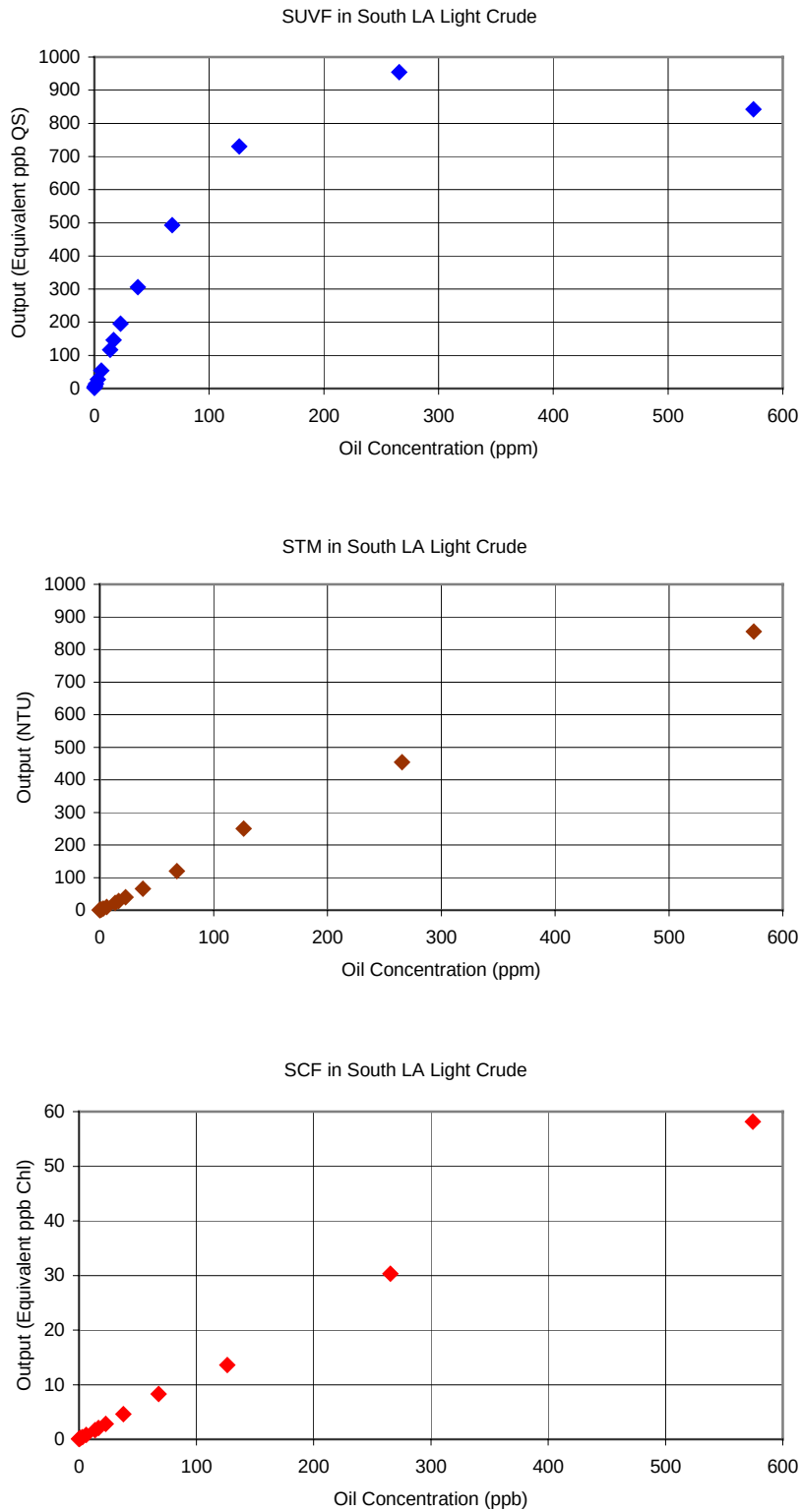


Figure 2. Response of Seapoint optical sensors in South Louisiana Light Crude Oil and water emulsion, 0-600 ppm oil concentration