Geophysical Research Abstracts
Vol. 13, EGU2011-9084, 2011
EGU General Assembly 2011

Fluorescence detection and characteristics of oil during the Deepwater Horizon oil spill

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The Deepwater Horizon spill was unprecedented in terms of magnitude, depth of the spill and subsurface dispersant application. Of the various sensors used by emergency responders and researchers, UV fluorometers proved to be among the most useful for detection of oil in the water column. However, it is clear that the various instruments deployed responded differently, and that response was greatly affected not only by fluorometer design, but also by environmental factors such as concentration, weathering, and physical and chemical dispersion. In nearly all cases, the field instruments were not optimized for maximum sensitivity and it may never be possible to reanalyze the raw fluorescence data to determine PAH concentration during the first months of the disaster.

We have used Excitation Emission Matrix Spectroscopy to examine suspensions of Deepwater Horizon source oil (with and without added dispersant) as well as samples collected in the field (including information collected via ROV at the well head). Our results have revealed changing nature of the optical properties of the oil from wellhead to surface waters and also provide clues as to the effects of various ratios of oil to dispersant on the optical signals. The work presented here will improve current protocols by highlighting the critical fluorescence wavelengths needed to accurately track oil through marine systems. As of December 2010, oil was still detectable in the water column in coastal waters north of the original spill site, although at levels too low for in situ detection. This highlights the importance of rapid technology development to assist in ongoing monitoring efforts for protection of ecological and human health.