

Further Clues about Subsurface Oil Movements

The National Oceanic and Atmospheric Administration (NOAA), the US Environmental Protection Agency (EPA) and the White House Office of Science and Technology Policy (OSTP) have released its second peer-reviewed, analytical summary report about subsurface oil monitoring in the Gulf of Mexico. The report contains preliminary data collected at 227 sampling stations extending from one to 52 kilometres from the Deepwater Horizon/BP wellhead. Data shows movement of subsurface oil is consistent with ocean currents and that concentrations continue to be more diffuse as you move away from the source of the leak. This confirms the findings of the previous report.

The report comes from the Joint Analysis Group (JAG), which is comprised of the afore mentioned agencies and was established to facilitate cooperation and coordination among the best scientific minds across the government and provide a coordinated analysis of information related to subsea monitoring in the Gulf of Mexico.

The JAG report contains data analysis of fluorometric measurements and comments on the methods used to monitor dissolved oxygen levels. Data were collected on the R/V Brooks McCall, R/V Ocean Veritas, R/V Walton Smith, NOAA Ship Thomas Jefferson and NOAA Ship Gordon Gunter between May 19 and June 19, 2010. The fluorometric data provide additional information on the likely presence of sub-surface oil and its location in the water column. The report indicates that subsurface oil concentrations are highest near the wellhead and become more diffuse farther away from the source.

Over the course of multiple research missions conducted in the last three months, scientists have employed and tested many techniques to better understand the extent of this unprecedented oil spill and have found fluorometric sampling to be useful to help identify the location and concentration of subsurface oil. Fluorometers use light waves to detect anomalies in the water column. Researchers deployed water sampling devices in areas where the anomalies were detected to collect samples which are undergoing chemical analysis in the labs to determine the actual levels of hydrocarbons present.

Conclusions based on the fluorometric data in this report include:

- Fluorometry measurements show repeated signals between approximately 3,300 feet (1,000 meters) and 4,300 feet (1,300 meters) deep that are consistent with diffused oil in the water.
- The fluorometric signal is strongest near the wellhead and decreases with distance, which is consistent with previous sampling.
- Average fluorescence in the depths of interest - 3,300 feet and 4,300 feet - at sampled locations range from 4 to 7 parts per million (ppm). This estimated value is slightly higher than the laboratory-confirmed values previously reported by the JAG, which at their highest, near the wellhead, were approximately 1 to 2 ppm.

It is important to note that fluorescence techniques also detect other natural organic substances in the water, leading to the existence of a background level of fluorescence throughout the water column. This means that the measured fluorometer signal is not solely attributable to Deepwater Horizon/BP oil.

For the areas sampled, the fluorescence data indicate movement primarily west-southwest until June 2. In mid-June, fluorescence indicates movement toward the northeast within the Gulf. These movements are generally consistent with observed ocean currents in the area.

"The Joint Analysis Group is working to ensure the vast amounts of data being collected in the Gulf are compiled, synthesized and analyzed in a comprehensive manner. This is the best way to ensure the Unified Command is benefitting from a full understanding of the available information, and that relevant findings and lessons are being shared with the responders as well as the broader research community," said Steve Murawski, NOAA's Chief Scientist for Fisheries and the head of the Joint Analysis Group.

Dissolved oxygen levels are being continuously monitored as part of the EPA monitoring protocols required for the use of subsea dispersants. Dissolved oxygen measurements sometimes show a drop in dissolved oxygen at or below a depth of 1,000 metres, although these drops were not severe enough to indicate impending hypoxic conditions.

Scientists continue to study these data and have noted that these lower dissolved oxygen readings are the same depths where elevated levels of fluorescence have been detected and where prior work, presented in the first JAG report, has identified elevated concentrations of oil in water samples.

Decreases in dissolved oxygen concentrations may be related to a breakdown of oil by oxygen-consuming microbes. There are also concerns that the instruments used to monitor oil may be affected by that oil in the water. As a way to confirm the dissolved oxygen measurements, the JAG has recommended the use of a second, complementary, dissolved oxygen testing system, called Winkler titrations, be added to all monitoring ships.

The recommended Winkler titration system is more difficult to perform, but it is a more precise measurement method that involves taking discrete water samples and conducting a chemical analysis on board the ship. While the dissolved oxygen sensors most often used provide a continuous stream of data, the Winkler titration provides definitive readings at specific locations. A comparison of results from the conventional sensors and Winkler titration will help verify the sensor data and uncover any interference by the oil or other confounding factors.

<https://www.hydro-international.com/content/news/further-clues-about-subsurface-oil-movements>
