

## **What Happened to All of the Oil?**

### *Chasing Oxygen Anomalies in the Gulf of Mexico*

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The *Deepwater Horizon* accident in the Gulf of Mexico released an estimated 4.4 million barrels of oil and 500,000 t of gaseous hydrocarbons into the Gulf over 87 days. However, the behaviour of these hydrocarbons in the water column—their physical dispersion, eventual fate, and ultimate consequences for the Gulf ecosystem—remains poorly constrained. It is known, though, that one of the degradation processes for the wellhead's oil and gas has been its consumption by bacteria. Since this aerobic respiration resulted in “anomalous” decreases in dissolved oxygen (DO) concentrations in Gulf waters, these DO “anomalies” are treated as proxies for the hydrocarbon plume's location before the oil and gas was metabolized. To search for DO anomalies, two autonomous Lagrangian profilers, Autonomous Profiler Explorers (APEX) manufactured by Teledyne Webb Research, were deployed in the Gulf of Mexico between August 23 and December 21, 2010, where they measured 318 oxygen profiles. The magnitude of DO anomalies was calculated by comparing each anomalous oxygen profile to a mean profile calculated from averaging the five nearest neighbour profiles without anomalies. The anomalous profile was then selected for at those depths between 600m and 1200m for which the mean profile's oxygen value was at least  $0.075(\text{mL}\cdot\text{L}^{-1})$  higher than that of the anomalous profile. In this manner, DO anomalies of up to  $0.58518(\text{mL}\cdot\text{L}^{-1})$  were discovered at distances of up to 300km from the wellhead. A three-dimensional map of the locations and magnitudes of

the detected anomalies is presented.