

Fate of MC252 crude oil from the Deepwater Horizon accident in northern Gulf of Mexico permeable sandy beaches

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An estimated 150,000 barrels of crude oil impacted the Gulf of Mexico shores from East Texas to the Western Florida Panhandle after the Deepwater Horizon accident in spring 2010. Nearly half of this coastline is comprised of sandy beaches. The goal of this dissertation was to investigate the fate of MC252 crude oil in the permeable beach sediments. Oiled beach sediment layers had significantly higher carbon dioxide production and oxygen consumption rates compared to layers with no visible contamination revealing aerobic microbial decomposition of the buried oil. Warmer summer beach temperatures caused a 4-fold increase in degradation rates over rates at winter temperatures. Sediment-oil-agglomerates in the swash zone were rapidly disintegrated within 24 hours by the mechanical stress of wave action, thereby enhancing the specific surface area of oiled material and biodegradation. Oxygen consumption rates of sediment containing weathered crude oil scaled with pore water flows through the permeable beach sand. This research revealed the roles of microbial activity, temperature and mechanical stress on the degradation of Deepwater Horizon oil in Gulf of Mexico sandy beaches. The high-energy warm beach environment and its highly permeable sands facilitated a relatively rapid degradation of the oil.