

The 1979 Ixtoc-I oil spill revisited

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The 1979 Ixtoc-I blowout in the Bay of Campeche (southern Gulf of Mexico, sGoM) was the second largest submarine oil spill in history, releasing more than 3 million barrels of oil during nine months, which was transported northward up the Gulf west coast as far as Galveston, Texas. Except some initial post-spill estimates of the amount of oil that reached the seafloor [1], little is known about the extent of sedimentary oil deposition, and its weathering, transformation and preservation.

We present the results of studies investigating the seafloor sediments collected across the sGoM in 2015, 36 years after the Ixtoc-I spill. The aim of these studies is to determine whether an identifiable fingerprint of Ixtoc oil is still present in the samples, and to elucidate the transformation processes, degradation products, and the preservation potential of oil in sediments, over multidecadal timescale. To this end, we combined traditional GC-MS methods for oil fingerprinting, with ²¹⁰Pb dating, and ultrahigh resolution mass spectrometry (FTICR-MS).

The analyses revealed spatially and temporally ubiquitous signals of hydrocarbon input, suggesting a constant activity and contribution of natural oil seeps, a common geological feature of sGoM. On the other hand, some biomarker ratios of norhopanes/hopanes, emerged as a potential tool for the discrimination of Ixtoc-I oil, a member of a distinct Tithonian oil family of the Sureste basin [2]. In addition, FTICR-MS analyses showed a correspondence of characteristic petroleum compound classes, such as hydrocarbon and sulphur containing heteroatom groups, between a visibly oiled sediment extract and the Ixtoc-I oil. The sediment extract also showed a presence of oxygen containing compound classes, possibly products of oxidative transformation of the parent oil.

This study serves as a useful analog to help assess the potential long-term fate of the oil released after the Deepwater Horizon blowout in 2010.

[1] Farrington, J.W. (1980) Report prepared for the Office of Marine Pollution Assessment, NOAA, NA80RAC0017; [2] Guzman-Mello et al. (1999) AAPG Bulletin 83, 1068-1095.