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THE PRESTIGE INCIDENT: A CASE STUDY OF A DEEP SEA OIL SPILL

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There are tens of thousands of sunken vessels in the oceans sea floor (Michel et al., 2005). Many of them date from the World Wars, but some hundreds of them are from sunken commercial ships including oil tankers. The amount of oil that is estimated to remain still inside the wrecks is between 512.000 and 4.000.000 tonnes. The recent case of the World War II tanker USS Mississinewa has warned the international scientific community about the potential environmental and socio-economical impact oil laden sunken wreck. After six decades an oil slick suddenly appeared in a tropical lagoon, and it was determined that the source was the, corroded, sunken Mississinewa (Michel et al., 2005).

The biological, physical and chemical processes governing the final fate of the oil and its residual compounds in the marine environment are still unclear. The Prestige incident represents a unique opportunity to study a deep sea oil spill, since its exact location is known and 44.000 tonnes of the cargo were released from the ship, after it broke in two and sank at more than 3.500m depth. It is also relatively close to land. Furthermore several tens of thousands of tonnes of the cargo remain in the wreck, and we have shown in two separate cruises in 2006 that the wreckage is still leaking and spilling daily from the deep sea tens of tonnes of oil (Figure 1).

To understand the fate of the oil from a deep sea spill we have carried out a laboratory and field study to find out which are the dominant processes that contribute to the dispersion and dissolution of oil in the pelagic marine environment.

Laboratory experiments were designed to appraise the extent of dissolution in different water masses with a range of temperatures and salinities. The seawater soluble fraction (SWSF) of the Prestige fuel oil was determined simulating the oceanographic conditions of the water masses overlying the wreck. All the samples were organic extracted and were analysed by GC-MS (gas chromatography-mass spectrometry) and GC-IRMS (gas chromatography-isotope ratio mass spectrometry). Differences in hydrocarbon concentrations of the SWSF were observed as consequence of density changes due to salinity, temperature

and depth. These results show a potential fractionation pf the oil in the different water masses of the NE Atlantic by means of dissolution and diffusion processes.

With regard to field study, we undertook two oceanographic cruises in the Prestige sinking area and surrounding zones during spring and autumn of 2006. Suspended particulate matter and dissolved phase of the seawater were sampled at different depths using small (Niskin and Go Flo bottles) and large volume sampling (in situ filtration pumps) devices. Individual biomarkers concentrations were determined in all the samples by microwave assisted extraction followed by GC-MS and GC-IRMS analysis. Traces of the prestige fuel oil were found in several samples and differences in concentrations of hydrocarbons were observed related to depth and latitude. The final results of the field study, together with those obtained in the laboratory experiments, provide valuable information on the vertical and horizontal distribution of the fuel oil leaving the wreck of Prestige. It is also valuable data to assess the consequence on the marine environment of deep sea spills.

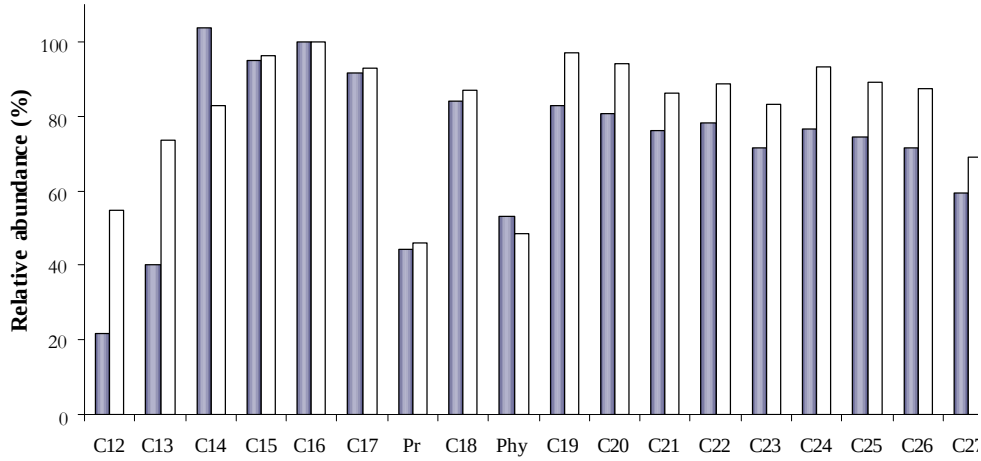

Figure 1. Relative distributions of the abundances of n-alkanes in Prestige fuel oil (grey), and from an oil lump in a slick on the sea surface in October 2006 (white).

REFERENCES

Michel, J., Gilbert, T., Waldron, J., Blocksidge, C., Schmidt, D. and Urban, R., (2005).Potentially Pollutioning Wrecks in Marine Waters. An Issue Paper Prepared for the 2005 International Oil Conference. In: www.iosc.org.