Reddy et al. 10.1073/pnas.1101242108

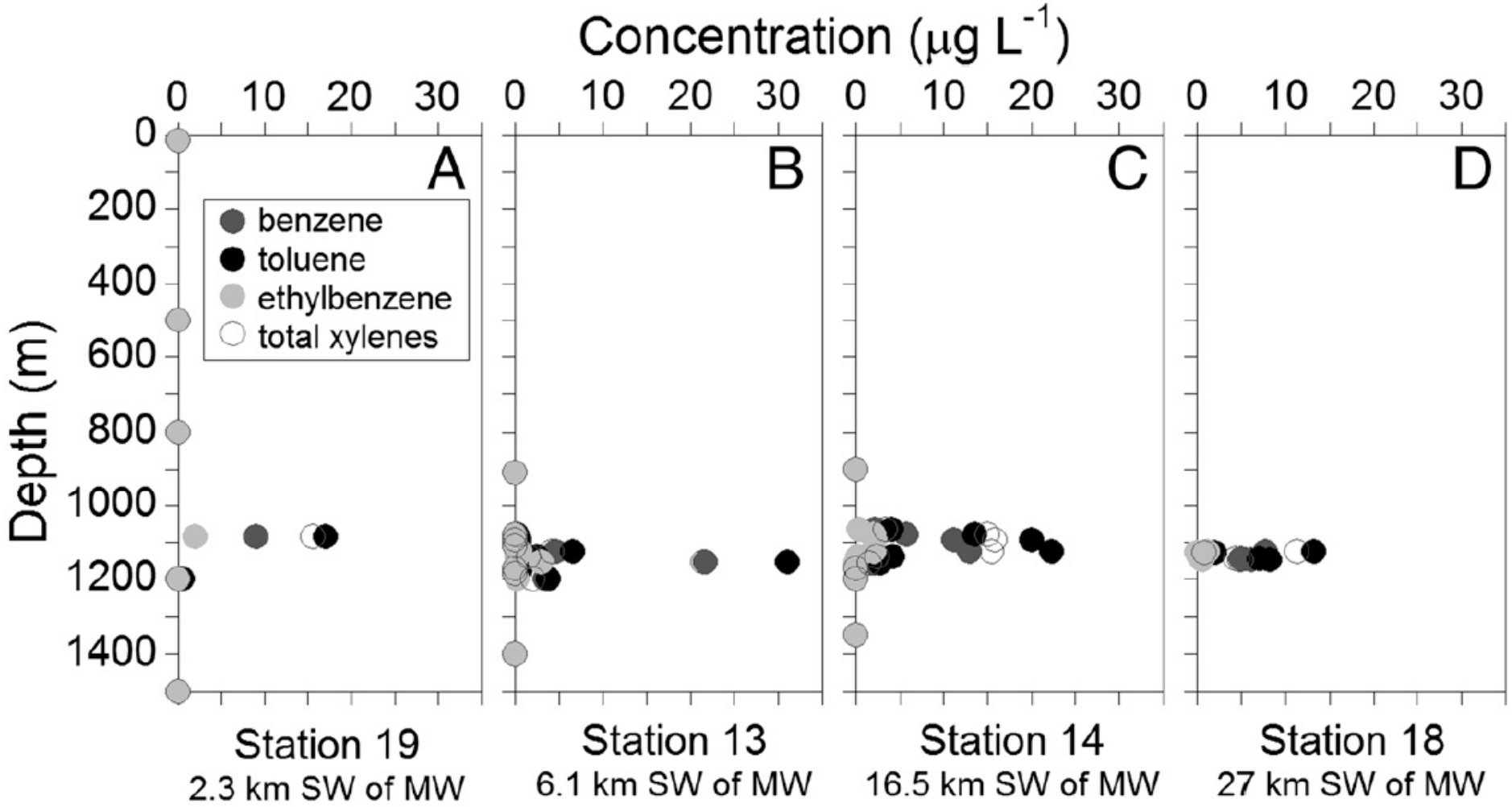

Table 1. Composition of hydrocarbon gases (C_1 to C_5) and oil of MW-1 from the Macondo well on June 21, 2010, and a comparison of gas end-members estimated from field data from June 2010 by Valentine et al. (3)

Analyte	MW-1 content	Valentine et al. (3)*
Gas[†]		
Methane	82.5% ($\delta^{13}C = -57.5‰$; $\delta D = -187‰$)	87.5% ($\delta^{13}C = -61.3‰$)
Ethane	8.3% ($\delta^{13}C = -31.5‰$; $\delta D = -147‰$)	8.1%($\delta^{13}C = -30.5‰$)
Propane	5.3% ($\delta^{13}C = -29.2‰$; $\delta D = -123‰$)	4.4% ($\delta^{13}C = -29.0‰$)
Isobutane	0.97% ($\delta^{13}C = -29.9‰$)	NA [‡]
n-butane	1.9% ($\delta^{13}C = -27.9‰$; $\delta D = -119‰$)	NA
Isopentane	0.52%	NA
n-pentane	0.52%	NA
Methane/ethane	9.9	10.85
Methane/propane	15.5	19.8
GOR (measured)	1,600 standard cubic feet per barrel	NA
GOR (estimated)	1,730 standard cubic feet per barrel [§]	NA
GOR		3,000 standard cubic feet per barrel [¶]
Oil (select properties) [‖]		
Density	820 g L^{-1}	NA
Gravity	40° API	NA
Carbon	86.6%	NA
Hydrogen	12.6%	NA
Nitrogen	0.38%	NA
Sulfur	0.39%	NA
Saturated hydrocarbons	74% ($\delta^{13}C = -27.9‰$)	NA
Aromatic hydrocarbons	16% ($\delta^{13}C = -26.5‰$)	NA
Polar hydrocarbons	10%	NA

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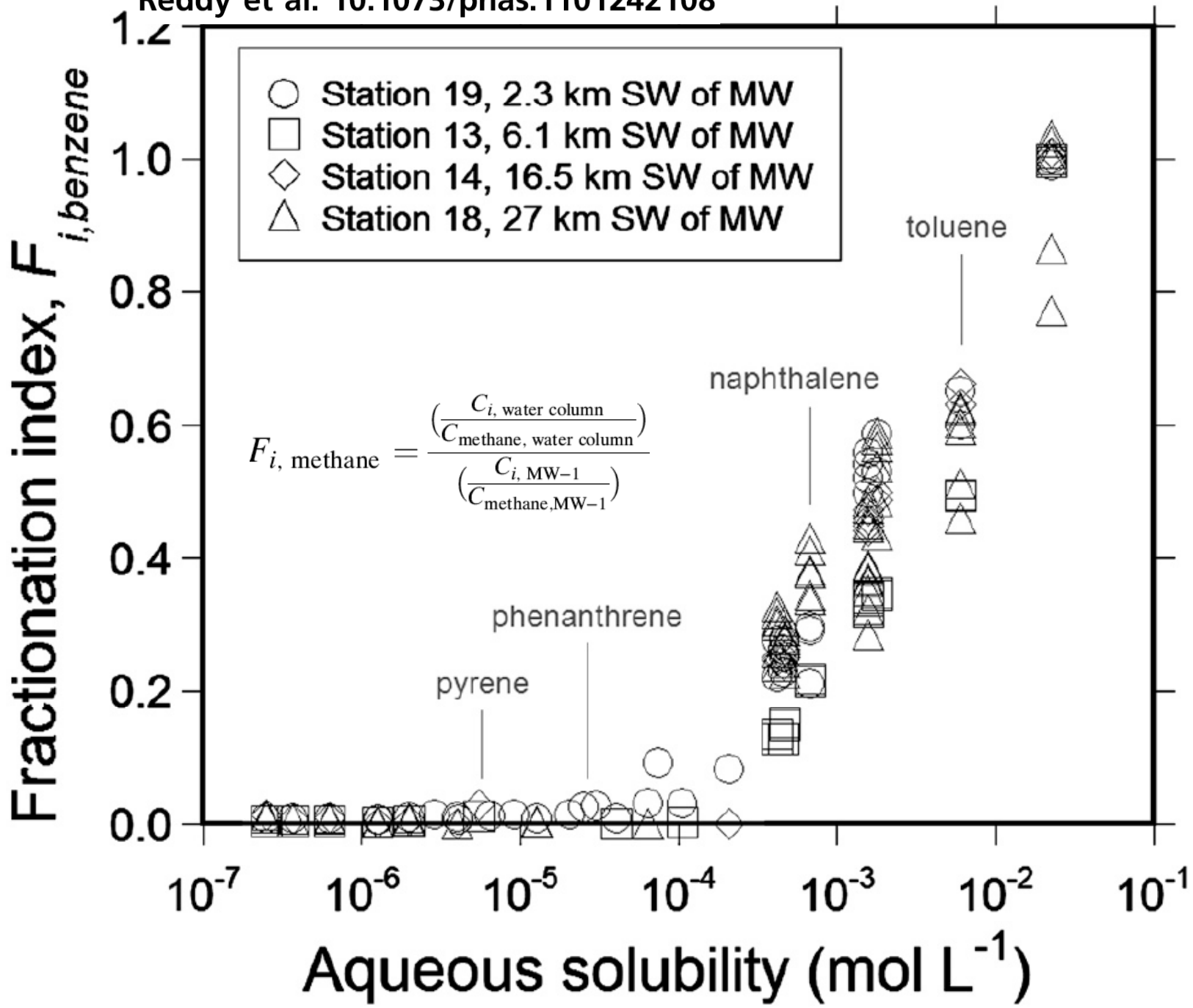

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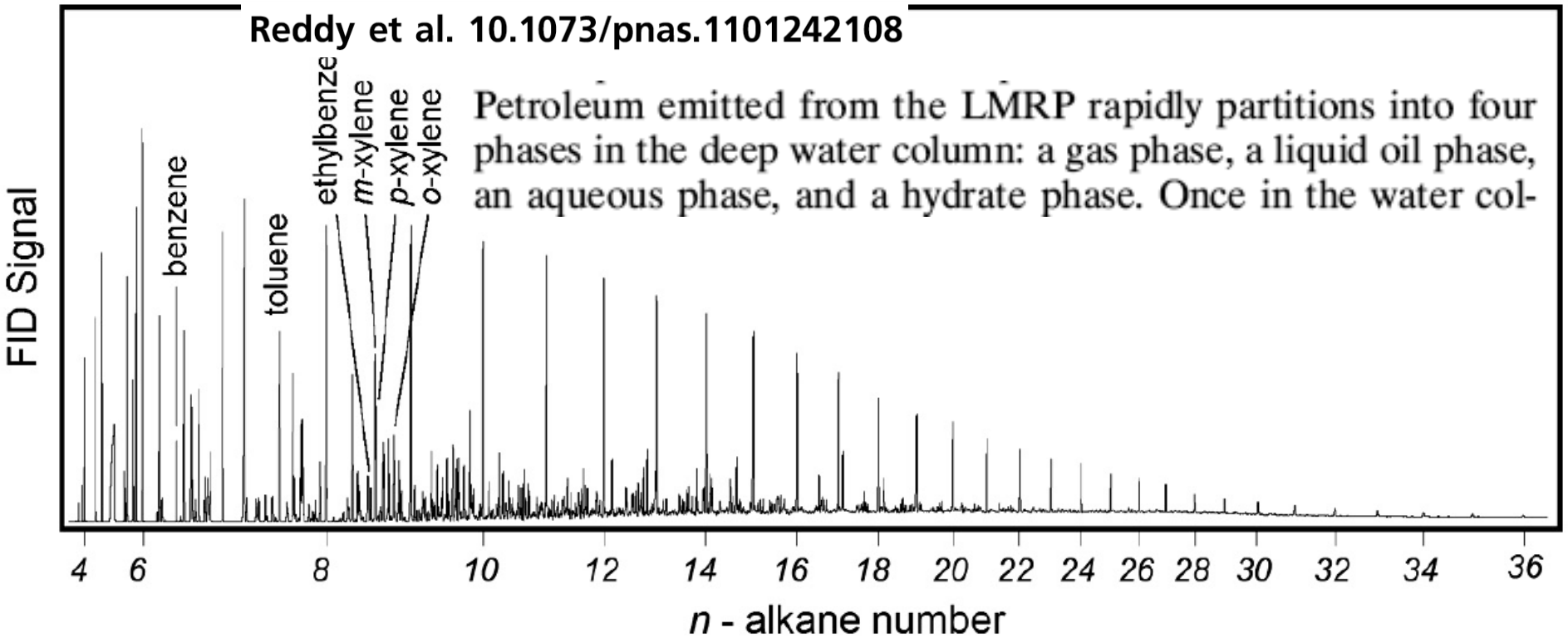
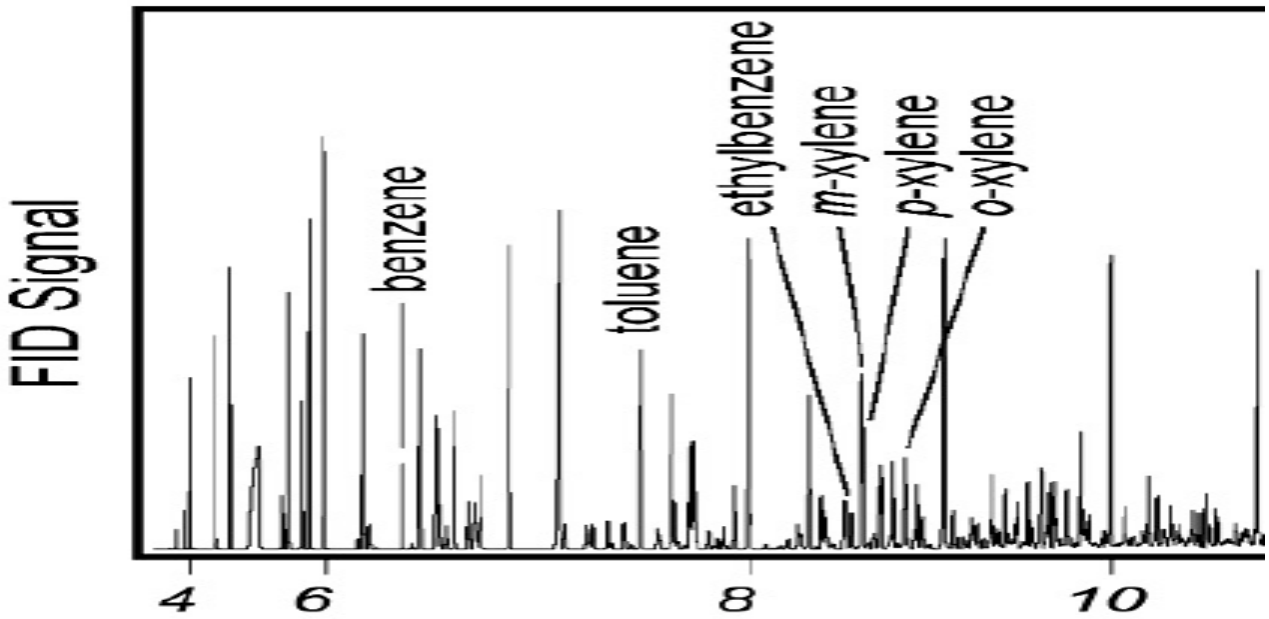
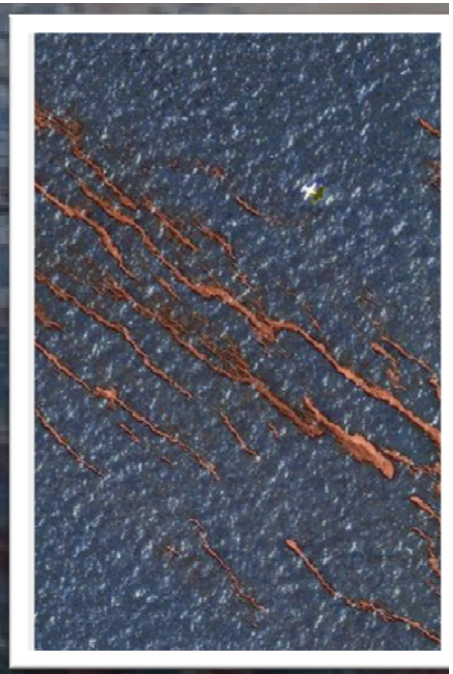
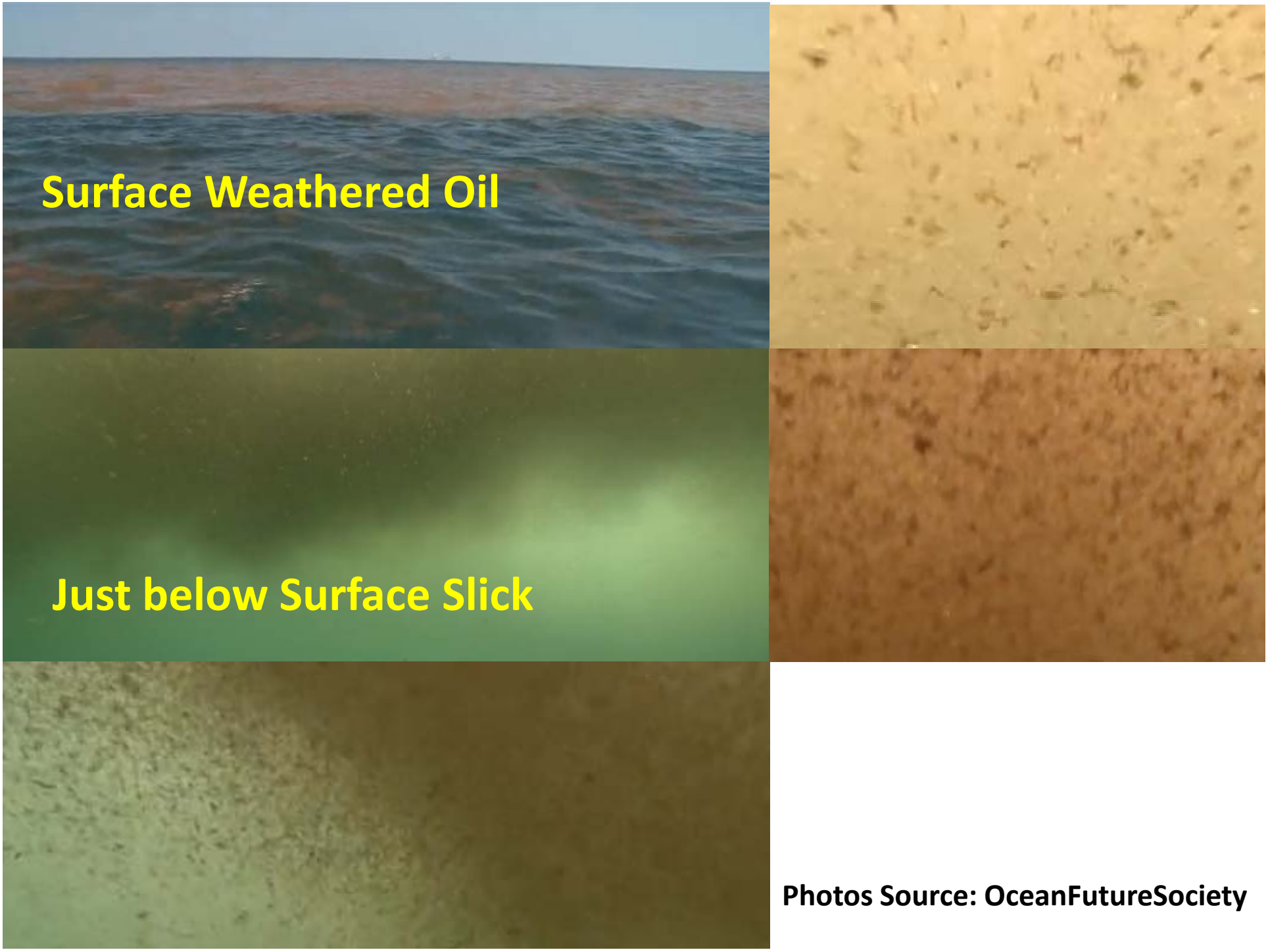


Petroleum emitted from the LMRP rapidly partitions into four phases in the deep water column: a gas phase, a liquid oil phase, an aqueous phase, and a hydrate phase. Once in the water col-



The Many Looks of Surface Oil, Complications for Remediation





Photos Source: OceanFutureSociety

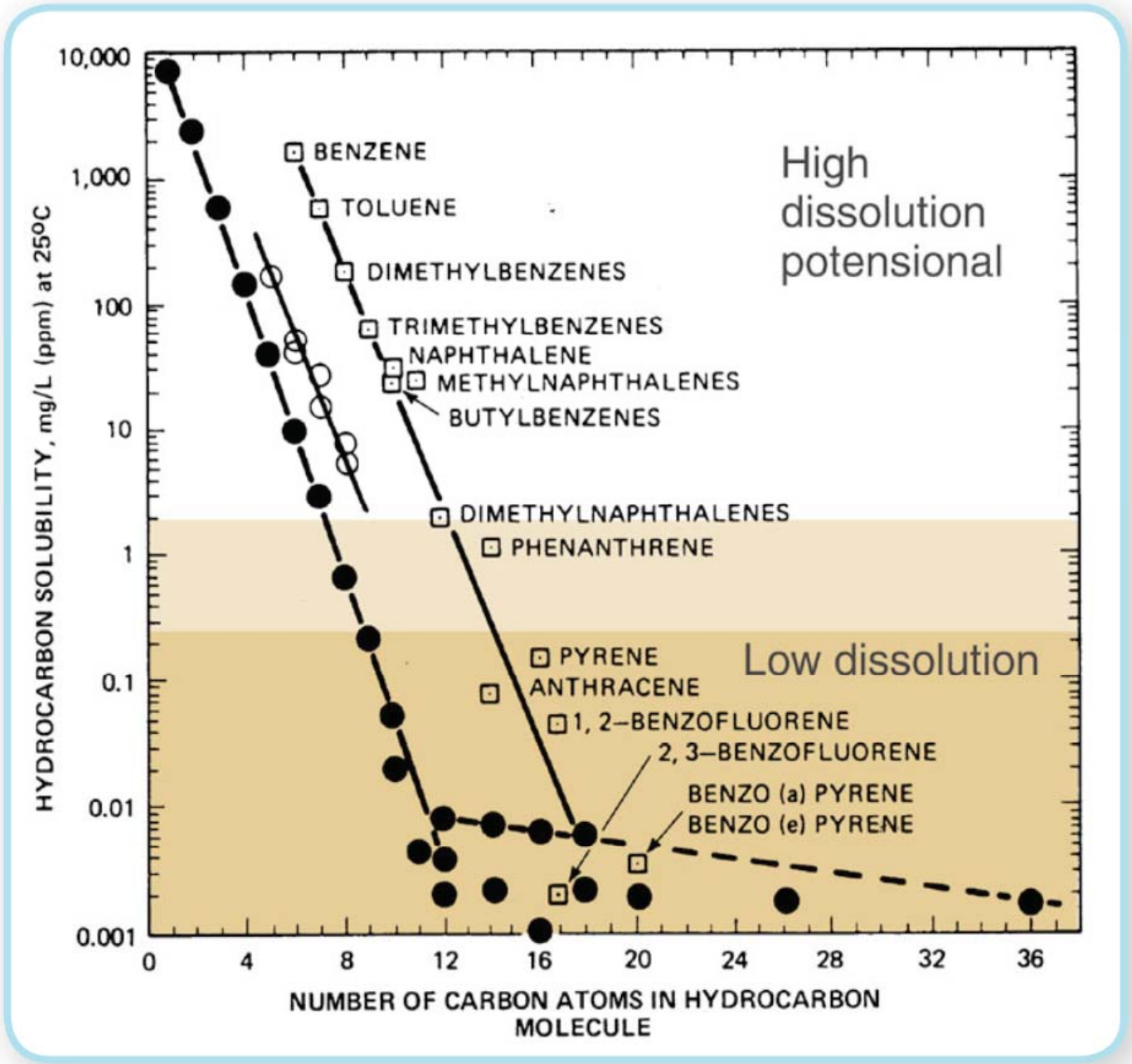


Figure 6: Solubility per carbon number for hydrocarbon molecules, (Modified from McAuliffe, 1987 IOSC - proc. Pp 275-288)

of aqueous dissolution as a possible driver for the previously reported formation of deep water hydrocarbon-enriched plumes of neutrally buoyant water at 1,100-m depth. The abundance of low molecular weight *n*-alkanes and aromatic compounds observed in the hydrocarbon-rich plume at 1,100 m are far below their aqueous saturation values at ambient conditions, suggesting that gas and oil droplets did not reach complete equilibrium with the aqueous phase, and partitioning into the deep water column is a kinetically controlled process. However, the rates at which hydrocarbon compounds dissolve from gas bubbles and oil droplets are likely influenced by their aqueous solubilities (11). To