The fate of oil spilled in mangrove sediments – Rio de Janeiro, Brazil

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Mangrove areas in Guanabara Bay, Rio de Janeiro were severely contaminated in January 2000 by a spill of 1800 m^3 of MF 380 oil. The goal of the present work was to investigate the fate of the oil in the mangrove sediments. For this, sediments cores were samples once a year in the period from 2000 to 2004. Sampling occurred in two contaminated mangroves (Surui and Nova Orleans) and in one reference area (Piedade). Determinations comprised 37 PAHs, aliphatics and hopanes, besides other ancillary variables.

PAH concentration in Surui in 2000 were higher than 300 mg kg^{-1} in the first sediment layer (0-3cm). USEPA 16 PAH were completely obliterated by alkylated homologues in Surui and N. Orleans, but in 2000 levels (> 8 mg kg^{-1}) where above the threshold for toxicity to benthic organisms. In the course of 5 years concentration decreased in the first layer (see Figure 1), while a substantive increase was observed in lower layers demonstrating vertical migration. This can be ascribed to the action of crabs and to the tidal cycles. The decrease in surface concentration is also seen in Nova Orleans and derives from weathering, from migration, and from washing away by tidal movements. The ratio PAH/C30 hopane decreased 4 folds over the time demonstrating an on going degradation process. The relative degradation constant, calculated using a first order degradation model, is equal to -0.17 $year^{-1}$ in Surui. Such processes are also indicated by the alteration from 1.7 to 0.4 in the C2dibenthiophene/C2chrysene ratio. All diagnostic ratios pointed out the presence of the MF 380 in the sediments of Surui . The UCM/RP ratio was maximum in 2001 in Surui (24) in surface sediments and was usually in the range of 2-5 in the other regions. This and CPI > 3 reveal the chronic state of contamination by oils of the studied area.

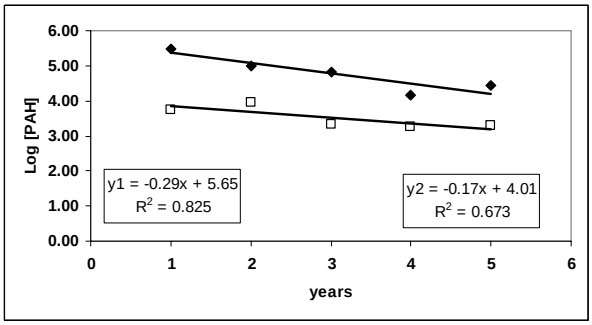

Figure 1 .PAH decreasing rates; Surui (1) and N.Orleans (2)