PRELIMINARY STUDY OF ORIGIN AND DISTRIBUTION OF ORGANIC MATTER IN SURFACE SEDIMENTS OF THE "LAC SUD" OF TUNIS

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Abstract

Superficial bottom sediment samples inside the "Lac Sud" of Tunis were analysed for the TOC, free and potential hydrocarbon compounds, and total hydrocarbons in order to establish the origin and the spatial distribution of organic matter. Attempt was made to the compositional patterns of the aliphatic hydrocarbon to identify the petrogenic and biogenic sources of hydrocarbons.

Key words: recent sediments, Rock-Eval pyrolysis, TOC, gas chromatography, n-alkanes

The study of distribution and composition of organic matter in surface sediments of "Lac sud" of Tunis (situated at the North-East of Tunisia) allowed the individualization of 2 zones. The first one, situated in the western part of the lake, presents high contents of TOC (>6%, Fig. 1), high values of free hydrocarbons (S1= 12,51 mg of hydrocarbons/g of sediment) and high values of total hydrocarbons (from 5040 to 16380 ppm). Liquid chromatography shows that saturated and aromatic hydrocarbons represent more than 50% of the total hydrocarbon content. Chromatograms of the saturated fraction (Fig. 2) show the presence of a regular distribution of n-alkanes centred on n-C_{25} with a large UCM indicating that the hydrocarbons present have suffered a higher degree of biodegradation. All these results confirm the presence of contamination by petroleum products in these sediments (1, 2, 3, 4).

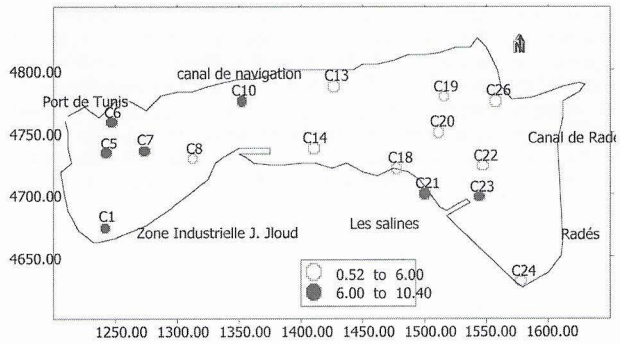

Fig. 1. Space distribution map of TOC values.

The second zone presents an organic matter inherited from the original biomass with a mixed origin: continental and marine. These sediments are characterised by: low contents of TOC (3%, Fig. 1), low values of S1 (< 1 mg of hydrocarbons/g of sediment), low values of total hydrocarbons (340 to 1000 ppm). The lipid compounds vary between 2 and 6% of TOC, these values characterize an organic matter inherited from the original biomass. In fact, in the sediments where the organic matter is still immature, lipid fraction does not exceed, in general, 1 to 3 % of the TOC (2). The saturated fraction (Fig. 2) represents less than 10% of the total lipid content. N-alkanes have a bimodal distribution with light n-alkanes ranging from n-C_{15}, to n-C_{19} characteristic of benthic algae (5, 6, 7), and long chains (n-C_{25} to n-C_{31}) having an odd/even predominance corresponding to n-alkanes from high vascular plants (8, 7, 2).

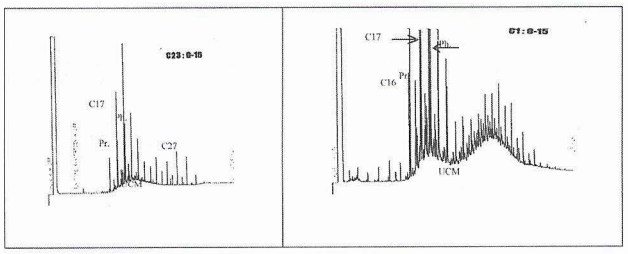

Fig. 2. Gas chromatograms of the aliphatic fraction. Pr=pristane, Ph=phytane, numbers refer to n-alkane chain length.

With these results, we can estimate the consequences of biogeochemical processes on the hydrocarbon composition of the lake and evaluate the impact of human and in particular harbour activity on the organic contents of the sediments.

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