

Caractérisation chimique des composés humiques et de leurs diverses classes de poids moléculaires dans les dépôts du delta du Rhône



The analysis of humic compounds by elemental analysis, PY-GC-MS and HPLC techniques permitted determination of the origin of organic inputs, essentially terrestrial, and the effects of environmental conditions in the deposits along a north-south transect through the Rhone delta, from the river mouth to the open sea. In the prodelta the sedimentation of fine particles enriches the sediments in organic matter. The humic compound contents were relatively low in sediments, perhaps due to a rapid burying of organic matter which leads to anoxic conditions. In sediments fulvic acids are more abundant than humic acids. Elemental analysis indicated that fulvic acids were enriched in hydrogen and nitrogen as compared to humic acids. Furthermore, H/C and N/C ratios increased in the fulvic and humic acids towards the open sea, related to a more marine character. Pyrolysis analysis showed some differences between the chemical composition of fulvic acids which correspond to low molecular weights enriched in carbohydrates, and that of humic acids, high molecular weight compounds which are enriched in phenols and aromatic hydrocarbons. The pyrolysis-derived phenols were abundant near the river mouth, decreasing towards the open sea as nitrogen-containing-compounds increased. Near the river mouth, the abundance of phenolic aldehydes demonstrated by HPLC emphasized the existence of fresh organic matter. On the other hand, off the mouth, an increase in phenolic acids could indicate a more degraded organic material. The fractionation of humic acids in various classes of molecular weight species using ultrafiltration (Amicon membranes) and their analysis showed that, close to the river mouth, the large proportion of the high molecular weight humic compounds observed was enriched in phenols and carbohydrates, probably inherited from the terrestrial ligno-cellulosic complex. This process seemed to be superimposed on the increase of molecular weights which is usually observed as the environment becomes purely marine. These humic compounds would derived either from organic matter from terrestrial soils swept along by the river flow, after deposition on its bed or, more probably, from high molecular weight compounds which, associated with the mineral phase, flocculated when reaching the fluvio-marine front. Generally, the low molecular weight fractions were enriched in hydrogen and nitrogen. Near the river mouth, nitrogen-containing compounds were concentrated in the low molecular weight classes which correspond to organic molecules regarded as humic precursors. Off the mouth, they were incorporated into the high molecular weight complexes, certainly of marine origin.

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Obtenir le document : Gauthier-Villars

Mots clés : HUMIC COMPOUNDS, MOLECULAR WEIGHT CLASSES, PY-GC-MS, HPLC, RHONE DELTA

Thème (issu du Text Mining) : MILIEU NATUREL, POLLUANTS

Date : 1992

Format : text/xml

Source : Oceanologica Acta (0399-1784) (Gauthier-Villars), 1992 , Vol. 15 , N. 1 , P. 61-74

Langue : Inconnu

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