Biomarkers along a holocene sedimentary sequence from the Guadiana River Estuarine Area (Portugal/Spain Border)

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A wide range of recent sediments, such as algal mats and aquatic or sapropelic sediments, has been used as model systems for studying the formation of ancient sediments and the fate of organic materials after its deposition, in particular the early diagenesis of lipids, which is not until now a well-defined process in terms of time scale and end products (Killops and Killops, 1993 and references therein).

Estuarine zones, due to the fast accumulation of fine sediments, appear to be a suitable area for the study of the accumulation and post-depositional transformation of organic matter. In such a semi-enclosed environment the period of climatic warming and sea level rise (which occurred since the last glacial maximum) can be properly characterized in terms of organic carbon transfer and burial in coastal/marine sediments.

This communication is a part of a wider study of diagenetic processes in the area of Guadiana River Estuary (Spain/Portugal border) where its submerged delta is representative of natural changes occurred during the transition from Late Pleistocene Weichselian Pleniglacial to the present Holocene Interglacial period. In this communication the vertical distribution of terrestrial and phytoplankton biomarker compounds in a sediment core (65 m depth) going down to the Pleistocene surface is studied by gas chromatography-mass spectrometry (GC-MS).

Sediment samples were taken at different depth each 0,5 m from a drilling cored borehole (65 m deep) in the area of Ayamonte (Spain) down to the Pleistocene surface. Samples were immediately frozen to prevent microbial growth, and freeze-dried before analysis. Lipids were solvent extracted using a dichloromethane-methanol (2:1) mixture during 24 hours. Total extracts were concentrated at reduced pressure, derivatized with trimethylsilyldiazomethane and subjected to GC-MS analysis. Further details on the extraction and fractionation protocol, and the conditions for separation and identification of individual components were published elsewhere (Gonzalez-Vila et al., 2003).

The main conclusions drawn can be summarized as follows:

a) There is a close similarity between the biomarker distributions along the core. The most relevant parameters of source and maturity, such as the ratios pristane/phytane, pristane/C17 and phytane/C18 do not change significantly.

b) Terrestrial plants and plankton are the prevalent biogenic sources for the aliphatic hydrocarbons and fatty acids detected in the estuarine sediment. Their distributions also reflect the low maturity level of this sedimentary organic matter. The lack of typical unresolved mixtures of branched and cyclic aliphatic hydrocarbons indicates no contamination by petroleum residues or urban runoff.

c) It is noteworthy the detection of a series of resinic acids, typical biomarkers of conifer vegetation.

The observed changes in the hydrocarbon assemblage within the Holocene are discussed in terms of possible variations in the planktonic and terrigenous supply, which could be mainly attributed to the evolution of the circulation pattern in the estuary and to the alteration in vegetation cover within the Guadiana drainage basin.
