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The Rhône Deltaic Margin : a Preferential Natural Laboratory for Testing Sequential Stratigraphy Concepts in High Resolution Analysis

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Detailed stratigraphic models of modern deltaic systems have not been proposed yet in terms of the sequential analysis developed since 1977 by EXXON scientists and others, except for a few studies of the Louisiana shelf (SUTER and BERYHILL, 1985). Deltaic environments which are characterized by high sedimentation rates have recorded and preserved worldwide fluctuations of the natural environment (climatic) and effects of regional stresses (tectonic, hydrodynamical). These events can be identified from the distribution of sedimentation patterns, variations of sedimentological parameters and facies and changes in biological communities. Chronostratigraphic models would certainly be helpful for the exploration and management of natural resources and the assessment of the impact of changes introduced by human activities .

A programme was developed since 1987 in the Rhône continental margin with national and international participants. It is included in "DBT" ("Dynamique et Bilan de la Terre) national programme supported by INSU-CNRS and oil companies (TOTAL and IFP) and based on the previous studies carried out by various laboratories which are now involved in the new program .

The time scale sequence is of order 5 (VAIL et al., 1977) and studies are focussed on the latest cycles of the Quaternary. A coherent data base should contain a continuous and homogeneous grid of high resolution seismic profiles coupled with outcrop and well sampling performed with the same level of precision. Boring would be one of the task for the future European Research Vessel but seismic data acquisition started in 1987. Outcrop core sampling which began one year later has been based on efficient location systems and preliminary mud penetrator profiling. These studies should rely on precise time scales (secular) which require paleomagnetic measurements to be adapted to shallow marine environments, besides data provided by more classic methods .

A first homogeneous grid of seismic lines has been achieved which provides a high resolution continuous recording of acoustic reflectors from the shoreface to the upper slope which will be complemented. The late Quaternary deltaic shelf deposits mainly consist of stacked prograding wedges built up during relative sea-level variations which are classical features of the shelf. The construction of such wedges was attributed to a period of sea-level highstand according to the initial model by VAIL et al. (1977). But our recent studies (TESSON et al., 1990a et b, WILLIAMSON et al., 1990) have shown that they should be considered as "Shelf-Perched Lowstand Wedges", at least the uppermost ones. This interpretation is based on the rates of shifts and the regional bathymetry of their coastal onlap. This implies new developments which are supported by recent studies already taken into account in the new global high frequency models (POSAMENTIER and VAIL, 1988) .

Subsurface data which were obtained by a coring network adapted to the sismostratigraphic scheme are consistent with the new interpretation. Only the uppermost Shelf Perched Lowstand Wedge is well documented from a stratigraphic point of view. Lateral correlations lead to assume an age 25-30 000 yrs BP. At 120m water depth, the sedimentary facies varies from prodeltaic silty muds rich in organic matter to coarsening up interbedded sand/mud of basal shoreface and near intertidal environments. These facies are described for the first time. They contain microfaunal associations which are consistent with the proximity of sediment distributaries moving seaward during small-scale eustatic falls in sea-level. This time and paleaobathymetric record well agrees with the "Shelf-Perched Lowstand Wedge" model.

The detailed two-dimensional chronostratigraphy is well documented for the Transgressive and Highstand System Tracts and the condensed section of the postglacial time. Fine sequential analysis agrees well the typical patterns of such system tracts, the carbonate/terrigenous ratio excepted. They can be assumed to be related to sea-level oscillations of higher frequency (parasequences). The last set of cores should lead to identify allocyclic to autocyclic events .

The very high resolution programme carried out in the Rhône continental margin participates in the development of new concepts in high frequency sequential stratigraphy, such as Shelf-Perched Lowstand Wedges. This area which had been amply studied represents a preferential environment due to its limited extension and broad diversity of interactions, biological activity included, which can be quantified. The programme has been extended to the slope and the deep sea fan and should be developed furthermore .

REFERENCES

POSAMENTIER, H.W. and VAIL, P.R., 1988. Eustatic controls on clastic deposition . II Sequences and system tract models. In Sea-level changes - an integrated Approach. Soc. Econ. Paleontol. Mineral. Spec. Publ. 42: 125-154.
SUTER, J.R. and BERYHILL Jr., H.L., 1985. Late Quaternary shelf-margin deltas, Northwest Gulf of Mexico. Am. Pet. Geol. Bull., 69: 77-91.
TESSON, M., RAVENNE, Ch. et ALLEN, G.P., 1990a. Application des concepts de stratigraphie séquentielle à un profil sismique haute résolution transverse à la plate-forme rhodanienne. C.R. Acad. Sc. Paris, 310, ser. II: 565-570.
TESSON, M., GENSOUS, B., ALLEN, G.P. and RAVENNE, Ch., 1990b. Late Quaternary deltaic lowstand wedges on the Rhône continental shelf, France. Marine Geology, in press .
VAIL, P.R., MITCHUM Jr., R.M., TODD, R.G., WIDMIER, J.M., THOMPSON III, S., SANGREE, J.B., BUBB, J.N. and HATLELID, W.G., 1977. Seismic stratigraphy and global changes of sea-level. In Seismic Stratigraphy - Applications to hydrocarbon exploration, C.E. Payton ed., Am. Ass. Petrol. Geol., Mem. 26: 49-205.
WILLIAMSON, D., GENSOUS, B., EL HMAIDI, A., TAIEB, M. and THOUVENY, N., 1990. Deltaic platform deposits as recorders of geomagnetic oscillations. Marine Geology, in press .