HOLOCENE SANDY BARRIER EVOLUTION AS INDICATED THROUGH LAGOONAL SEDIMENTARY INFILL. THE EXAMPLE OF THE THAU LAGOON-AND-BARRIER SYSTEM (WESTERN GULF OF LIONS, MEDITERRANEAN SEA, FRANCE)

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Abstract
As soon as a littoral barrier begins to construct, isolating progressively a lagoon, the sedimentary infill of the later can start and be potentially preserved. The different stages of a barrier construction and evolution can be thus analyzed by studying the sedimentary record preserved into the lagoon. Such a study has been performed, using very high resolution seismic data and sediment cores, into the Thau lagoon (SE France) that forms during the Holocene transgression. Two main sedimentary units above the rocky basement have been defined into the infilling. U1 corresponds probably to remnants of pre-Holocene continental facies, U2, which constitutes the main part of the infill, represents the Holocene infill. The detailed analysis of U2 allows to reconstruct the palaeogeographic evolution of the lagoon-barrier system during the last stages of the Holocene transgression.
Keywords : Lagoons, Seismics, Gulf Of Lions.

The Mediterranean coastline is characterized by numerous lagoons that are separated and protected from the sea by sandy barriers (also called lidos) resulting from a process of shore regularization by waves [1]. These lagoon/lido systems have been formed during the Holocene transgression and more precisely during the late Holocene period when sea-level rise slow down. Since they are protected from high energy open marine hydrodynamics, the lagoons are the most favorable areas to preserve into their sedimentary infilling, the different stages of construction of the beach barrier and adjacent shoreface that are usually subject to heavy wave reworking.

The Thau lagoon is one of these Mediterranean lagoons. It is located along the shore of the western Gulf of Lions (Languedoc-Roussillon, France) and belongs to a lagoon system that develops from the Rhone delta to the Spanish border. It is the largest and deepest lagoon. In order to study the sedimentary infill of the Thau lagoon, a very high resolution seismic survey has been performed. In addition, some cores have been collected for lithology analysis and ^{14}C dating.

Three main seismic units have been recognized, U0 representing the rocky substratum, U1 and U2 forming together the sedimentary infill of the lagoon [2] (Figure). U0 is represented by tilted, locally folded, reflectors interpreted as Pliocene to Miocene formations. The upper limit of U0 is an erosional surface corresponding to the bottom of the lagoon basin. The basal unit of the infill, U1, is acoustically transparent, locally chaotic, and rests discordantly on U0. Its thickness is variable, from 0 to about 6 m. It is mainly developed where the substratum is the deepest and tends to shape the erosional top surface of U0. U1 has not been reached by coring and its origin is uncertain. It probably corresponds to the very early stage of the lagoon infill, either of continental or marine origin. U2 constitutes the main unit of the sedimentary infill and reaches locally about 15 m in thickness. It rests discordantly on U0, and concordantly on U1. Its upper surface is the lagoon sediment bottom. U2 displays a general aggrading configuration and consists in an alternation of high amplitude and continuous parallel reflectors, and low amplitude, poorly continuous reflectors. U2 can be divided in two sub-units, SU2-1 and SU2-2. SU2-2 is generally concordant on SU2-1, especially where U2 is the thicker, toward the center of the lagoon. On topographic highs of the basement, SU2-2 rests discordantly on SU2-1. A marked unconformity between the 2 sub-units is also observed on the seaward edge of the lagoon, i.e. on the landward face of the present-day lido (Figure). This unconformity is assumed to indicate a probably important landward shift of the barrier.

Thus, as recorded by the lagoon infill through the seismic data, two main stages of construction of the littoral barrier seem to have occurred, a significant retrogradational event having arised between stage 1 (SU2-1) and stage 2 (SU2-2). During each of the stages, seismic facies evidences alternations of period of respectively low energy (high amplitude continuous reflectors) and high energy (low amplitude discontinuous reflectors) deposition that could be related to more or less protected configuration of the lagoon, and thus to the barrier state of stability. Cores collected in SU2-2 are composed of successive sequences consisting of thick shelly layer passing upward to organic rich clayey layer. The process that could explain this sediment alternation is not fully understood but is probably due to change in biological productivity and thus could be related to climate fluctuation. However the link between such changes in sedimentation, seismic facies, and barrier dynamic cannot be clearly established at the present state of the study.

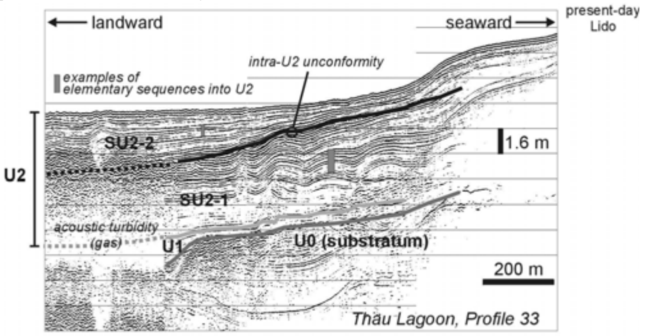

Fig. 1. Southern end of the seismic profile 33 shot into the Thau Lagoon. Theunconformity within U2, the main holocene infill unit, is well markedbelow the landward face of the present-day lido. In the center of thelagoon, the seismic image of the infill is masked by gas occurrence.

In terms of chronology, ^{14}C AMS analyses are in course. However, we assume that the beginning of the lagoonal infill, coeval with the initiation of barrier construction has occurred when sea-level lowed down, and reached almost its present-day level, i.e. around 6.000 B.P. We assume as well that the barrier retrogradational event recorded into the lagoon infill between SU2-1 and SU2-2 could be dated around 2000 B.P. Indeed, previous studies have demonstrated that the regional coastline has severely retreated since Classical times as a result of a drastic decrease in sediment supply [3]. In that hypothesis, the successive sequences preserved into the lagoon infill could represent the record of millennial to multicentennial time-scale climatic cycles that would have controlled sediment supply and the barrier morphodynamic.

References

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