MIOCENE OF THE GULF OF LIONS (FRANCE): A PASSIVE MARGIN?

BACHE, F (1); GORINI, C (1); OLIVET, JL (2); RABINEAU, M (3); RUBINO, JL (4), MAUFFRET, A (5); LOFI, J (6)

(1) - Université de Lille 1, UMR 8110 PBDS, 59655 Villeneuve d'Ascq Cedex (France) (2) - DRO/GM, Ifremer, Centre de Brest . 29280 Plouzané (France) (3) - CNRS- UMR 6538, Domaines océaniques, 1 place Nicolas Copernic, 29280 Brest (France)
(4) - DGEP/GSR/TG/ISS, TotalFinaElf, CST-JF, Avenue Larribau, Pau. 64018 (France) (5) - Université Pierre et Marie Curie. Département de Géotectonique, case 129, 4 Place Jussieu, 75252 Paris cedex (France) (6) - Instituto di Scienze Marine - Consiglio Nazionale delle Ricerche- Via Gobetti, 101. 40 129 Bologna (Italia)

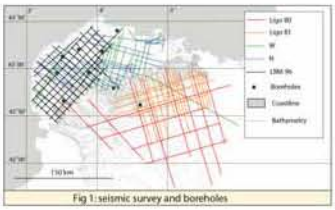

Fig 1: seismic survey and boreholes

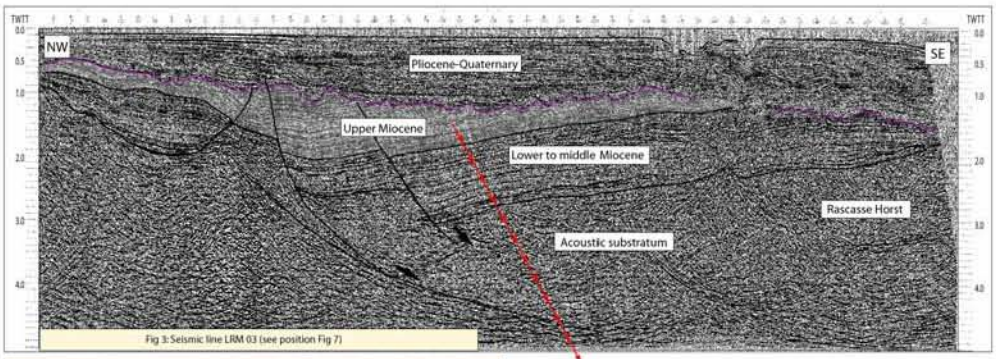

Fig 3: Seismic line LRM 03 (see position Fig 7)

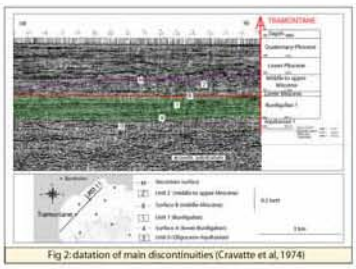

Fig 2: datation of main discontinuities (Cravatte et al, 1974)

Two processes have played a major part in preserving or eroding the Upper Miocene series on the continental shelf:
* The Messinian event is responsible of intense erosion (Fig 7), which has locally removed the Upper Miocene and a part of middle Miocene deposits (Fig 3).
* A tectonic event is at the origin of the preservation of middle and upper Miocene series (Rascasse Horst; Fig 3 and 8).
It's possible to follow Miocene unit beyond the continental shelf (LIGO profiles, Fig 1). An upper Miocene unit (yellow) show a chaotic facies at the transition between the continental shelf and the basin (Fig 5 and 6). The Burdigalian unit (green) show a progradate configuration toward the basin (Fig 4 and 6).

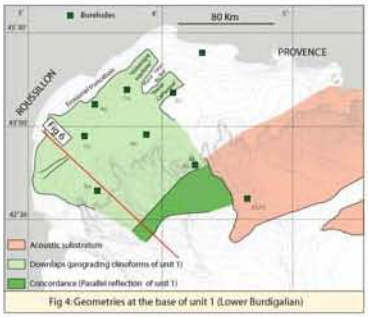

Fig 4: Geometries at the base of unit 1 (Lower Burdigalian)

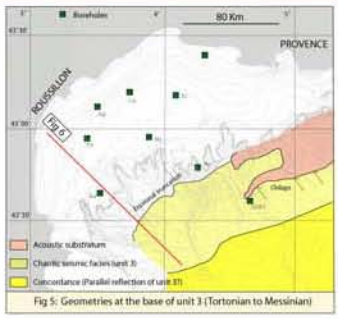

Fig 5: Geometries at the base of unit 3 (Tortonian to Messinian)

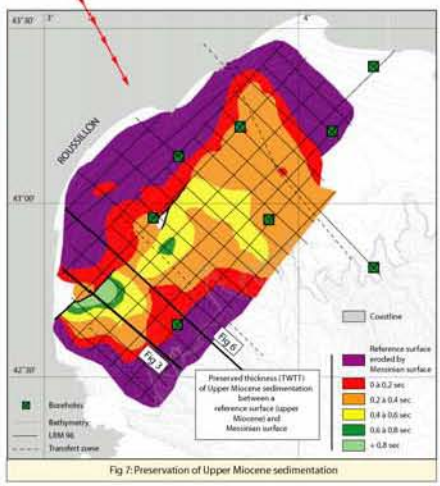

Fig 7: Preservation of Upper Miocene sedimentation

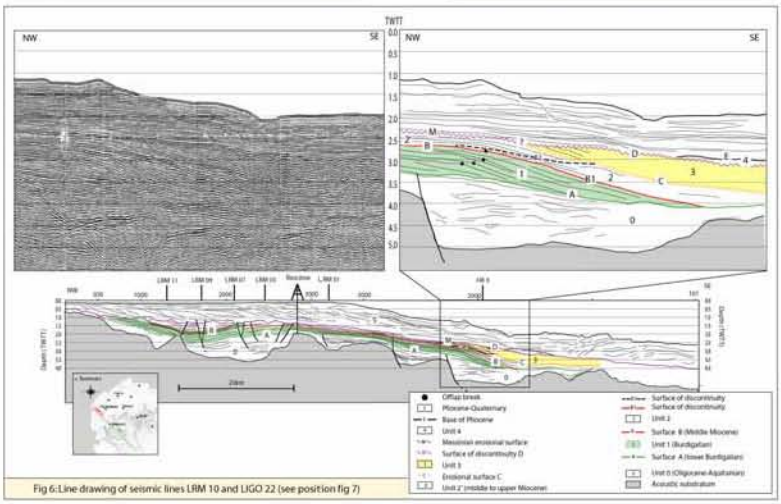

Fig 6: Line drawing of seismic lines LRM 10 and LIGO 22 (see position fig 7)

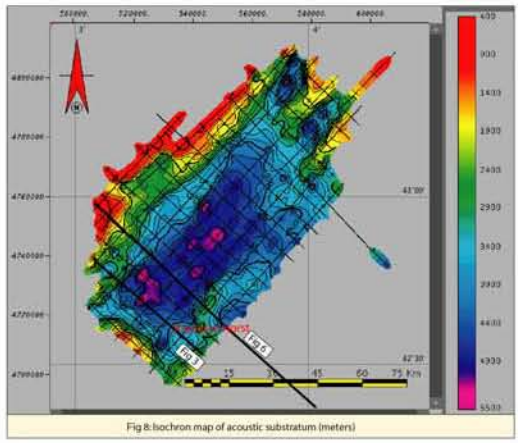

Fig 8: Isochron map of acoustic substratum (meters)

Thermal contraction of an initially hot lithosphere is widely accepted as the main cause of tectonic subsidence in sedimentary basins. The thermal contraction mechanism predicts the rapid beginning of subsidence (tectonic subsidence) which will then slow down with time (thermic postrift subsidence).
The study of Miocene sedimentation helps us to understand the tectonic processes which affects the Gulf of Lions margin and its evolution. This approach gives us new elements to study post-rift subsidence and basin formation.
Successive migration of offlap break of margin during Burdigalian (green unit) reveals that margin morphology and subsidence pattern changed after the rifting (Fig 9).
This interpretation is important because the model usually adopted to explain the formation of passive margins does not apparently fit the subsidence history of the Gulf of Lions. For this margin, the major part of subsidence occurs after the rifting.
The postrift subsidence is clearly anomalous in the Gulf of Lions and doesn't fit with models of thermal contraction. It is now necessary to understand the reasons why subsidence remained high after the rifting and which mechanisms other than thermal contraction can intervene in the formation of passive margins?

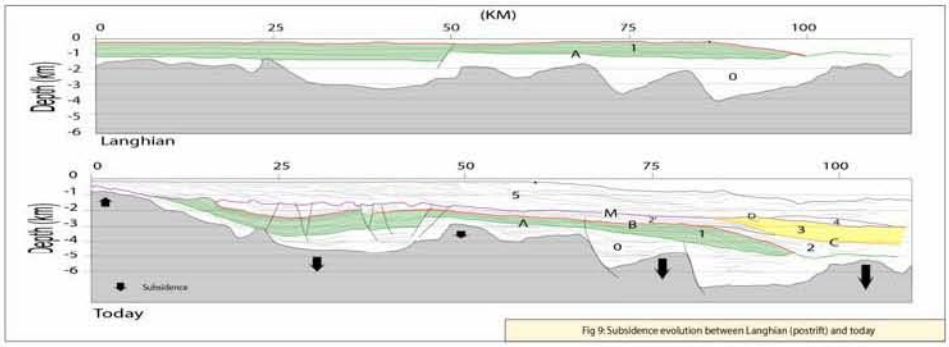

Fig 9: Subsidence evolution between Langhian (postrift) and today