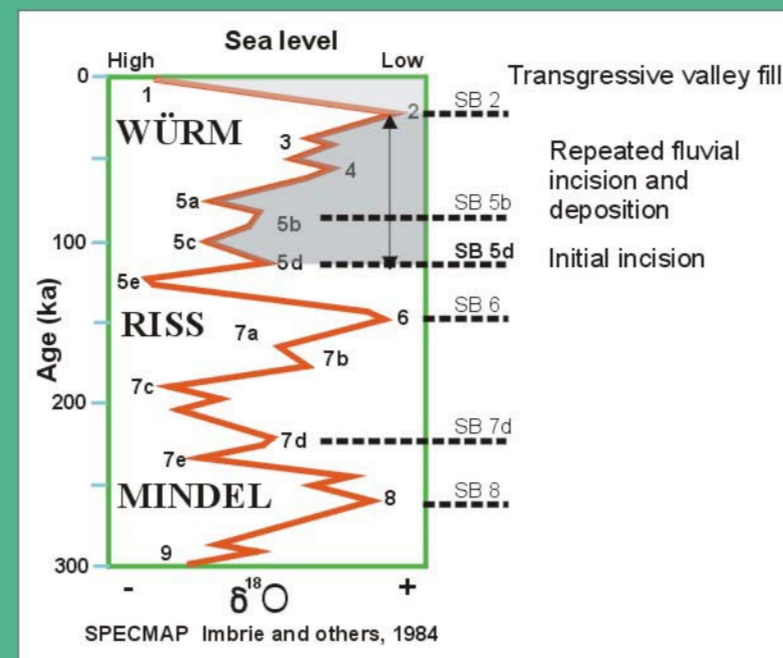
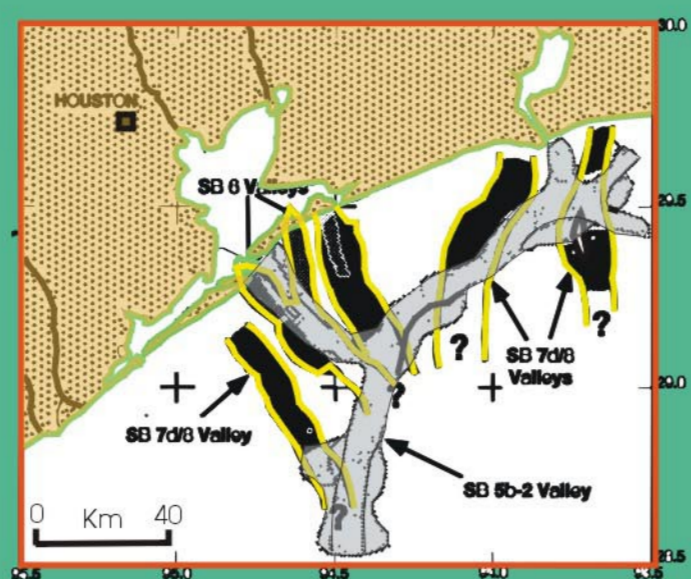
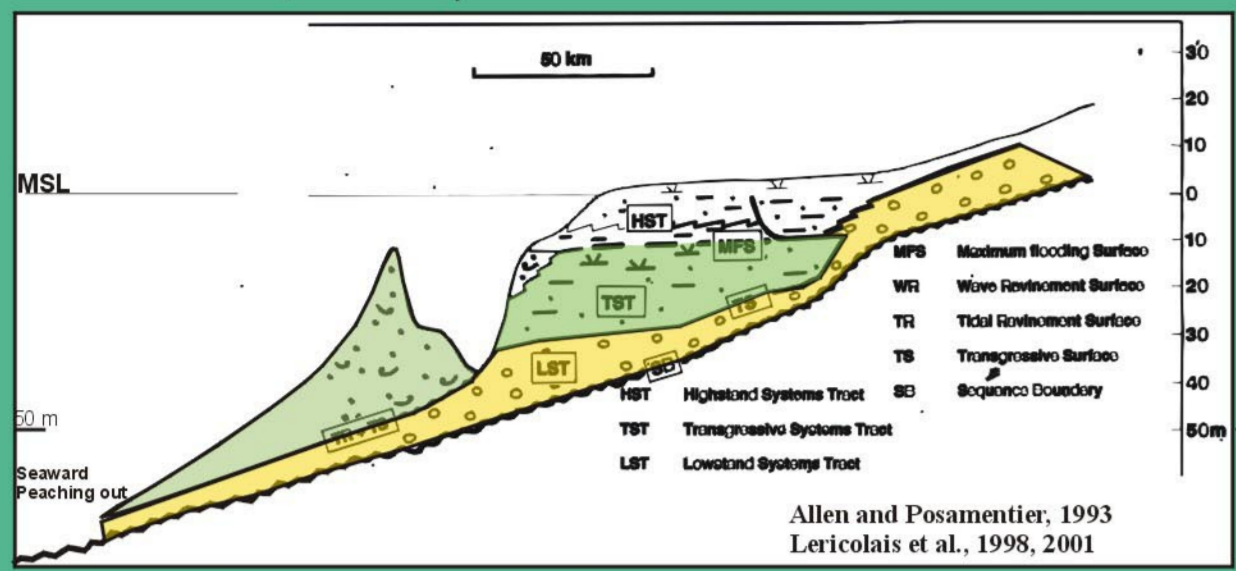


Stratigraphic models of modern estuary infilling and seaward extension, on shelf are based on an initial base level lowering during the last glacial period, ending at 18-16 ky. B.P.

The basal surface described is the sequence boundary and the sedimentary infilling is subdivided by well known discontinuities (transgressive surface, tidal and wave reactivation surfaces, maximum flooding surface). The lowstand systems tract is mostly fluvial and is overlain by transgressive and highstand systems tracts made of estuarine to marine and finally fluvial deposits.

These models seem common but too simple because seaward relationship with shelf deposits are few documented and high order environmental events such as Dryas are apparently not recorded or recognized.

STATE OF THE ART



Onland in fluvial catchment areas, vertical changes of the base level during the late-Quaternary period have led to the development of imbricated fluvial terraces.

Seaward on the shelves, more or less well preserved depositional sequences have built up in response to climatic and eustatic changes.

There is no clear relationship between fluvial and shelf deposits, probably because the coastal and inner shelf areas are often located at the hinge line which marks the boundary between uplifting and subsiding domains of the continental margin.

Regional settings where relations between fluvial and shelf are recorded have been scarce : on the Gulf of Mexico shelf, incised valley systems related to the Mindel glaciation have been reported and represents an exception.

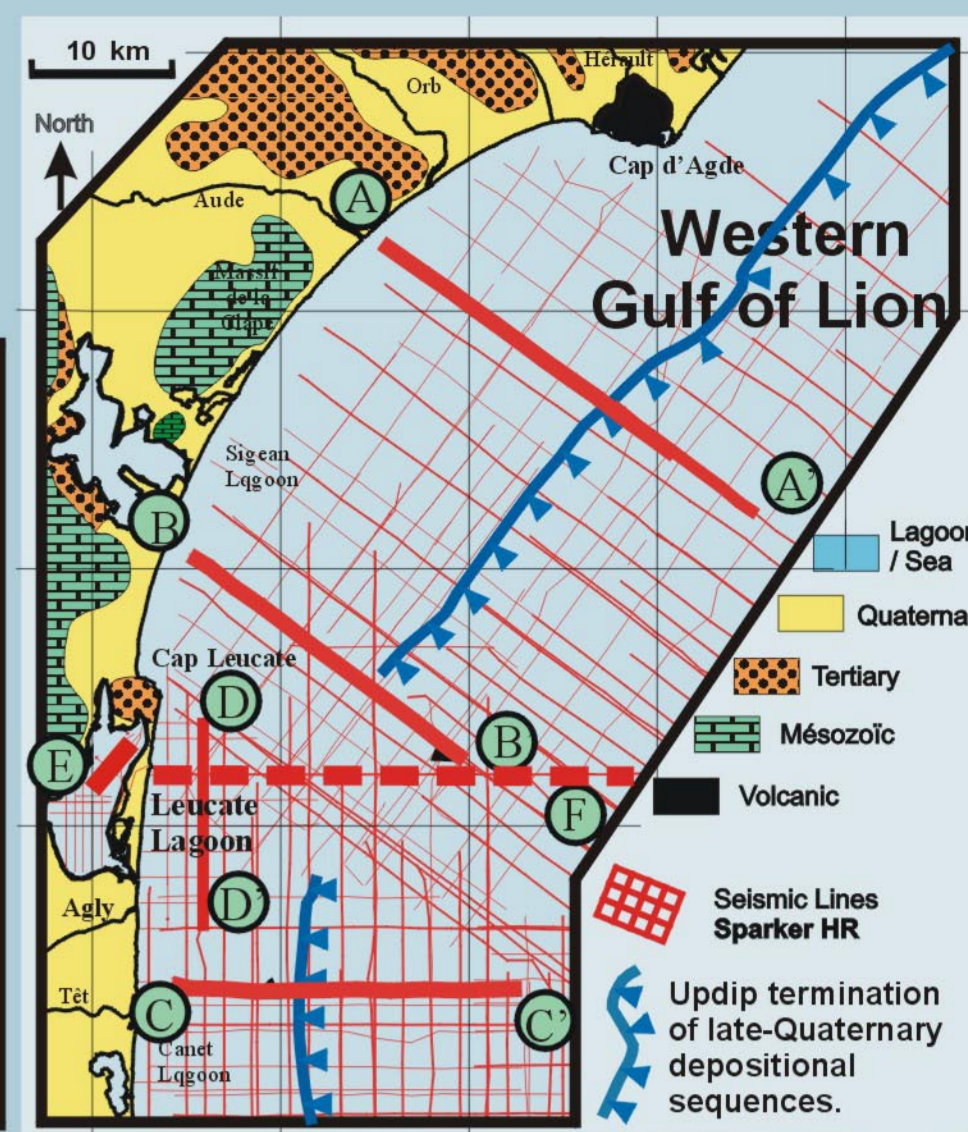
WESTERN GULF OF LION

Seismic data base "ARGO"
1989 - 2003
STRARHO Program
Support : TOTAL, IFP and INSU

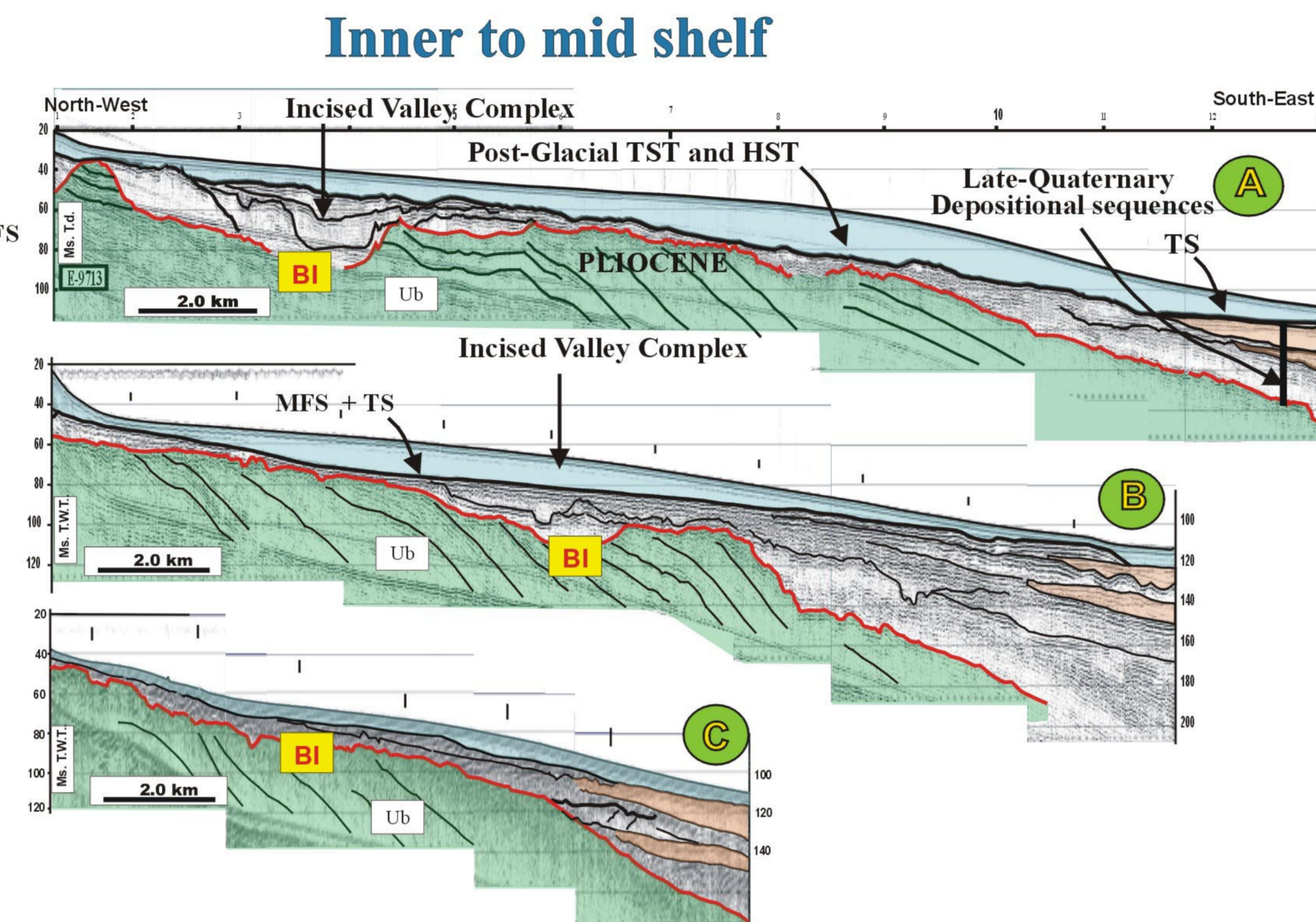
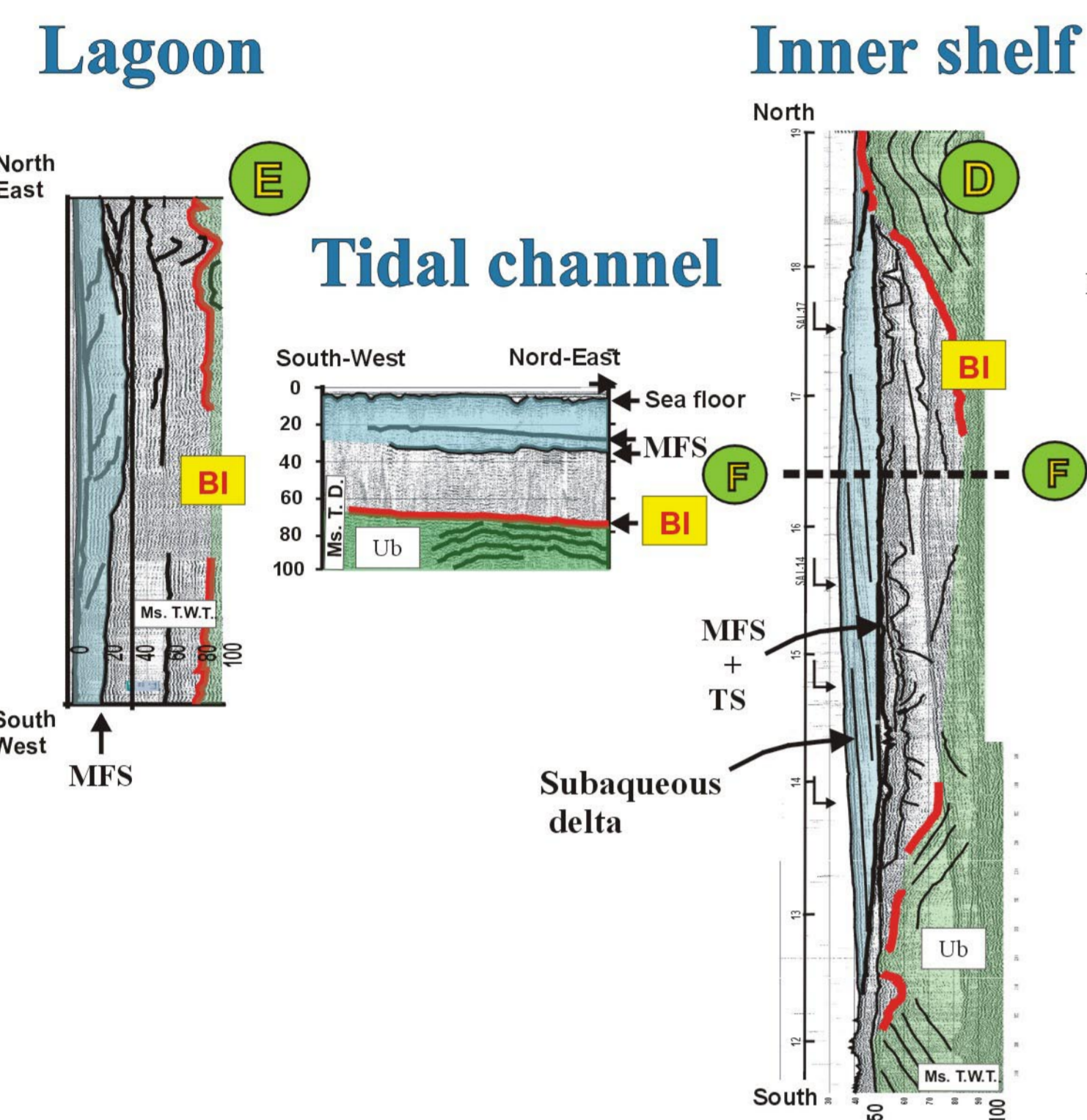
In progress program:
Land to Sea Stratigraphic Relationship during Quaternary in Languedoc-Roussillon setting.

support :
CNR MARGES 2003
Chantier 7 Golfe du Lion
Thème 2 : Processus et enregistrement sédimentaire.
M. TESSON, B. GENSOUS

VALINCIS cruise (N/O Téthys II)
INSU planning : June 2004



HIGH RESOLUTION SEISMIC SKETCH



Incised valleys complex location. It extends parallel to the nearshore from south Cap d'Agde until south Cap Leucate. It underlies the Orb, Aude and Agly coastal plains and the Leucate lagoon. The complex turns eastward and seaward at the level of the Leucate lagoon.

Width is some km
Length reaches up to 50 km
Complex axis dips from North to South (from 60-70 to 90 ms t.w.t.)

Substratum. The underlying sedimentary unit (Ub) is globally seaward tilted and affected by small scale folds and faults from Cap d'Agde to Pyrenean belt in the south. The upper boundary is erosional and progressively uplifts southward. Kilometer scale folds oriented East/West are observed. Off Leucate lagoon, the incised valleys complex is incised into an east-west syncline.

Basal surface of incision. At top of Ub, the incised surface (Ib) at the base of the complex, extends seaward until mid-shelf and under the late Quaternary depositional sequences already studied and mapped.

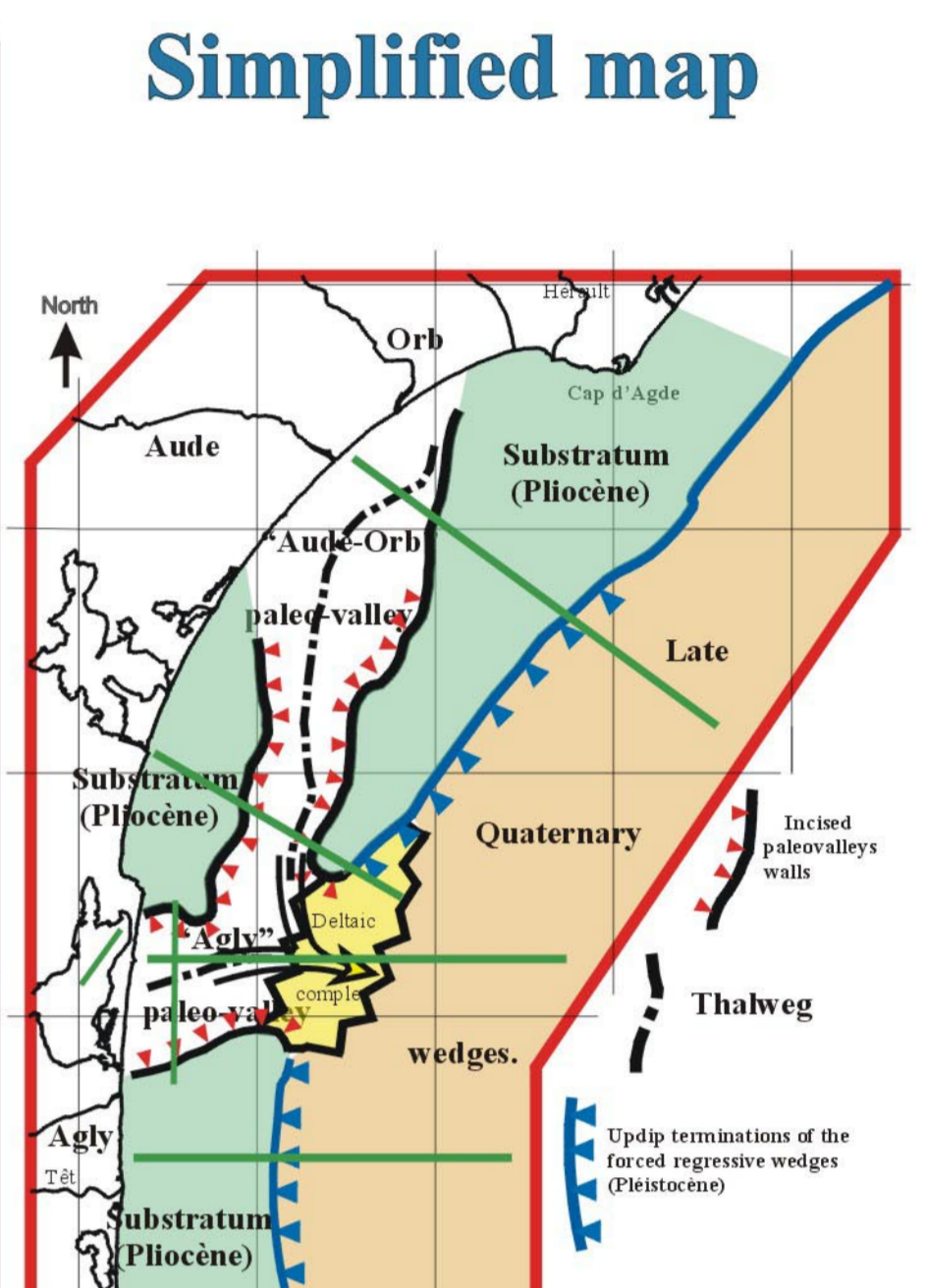
Sedimentary infilling. Along the incised valleys complex, several internal discontinuities and sedimentary units constitute a set of imbricated terraces and channels.

Most of the units are aggrading, with lateral overlaps. The uppermost unit is seaward prograding under the Leucate lagoon, beach barrier and inner shelf. Sedimentary bodies such as elongated sandy (?) banks and spits similar to those of modern estuaries are observed.

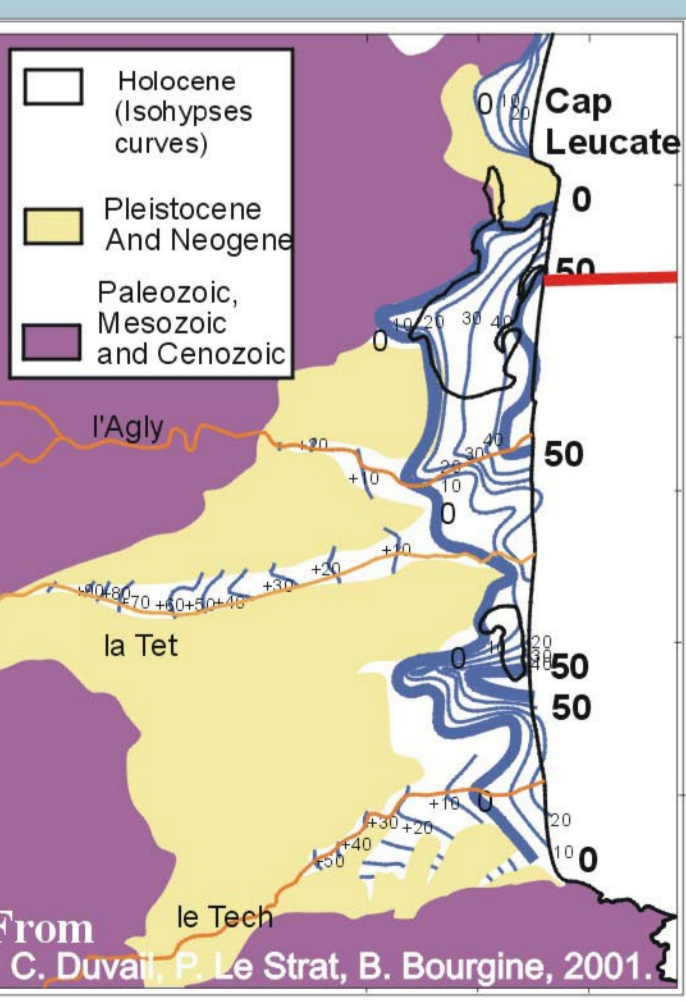
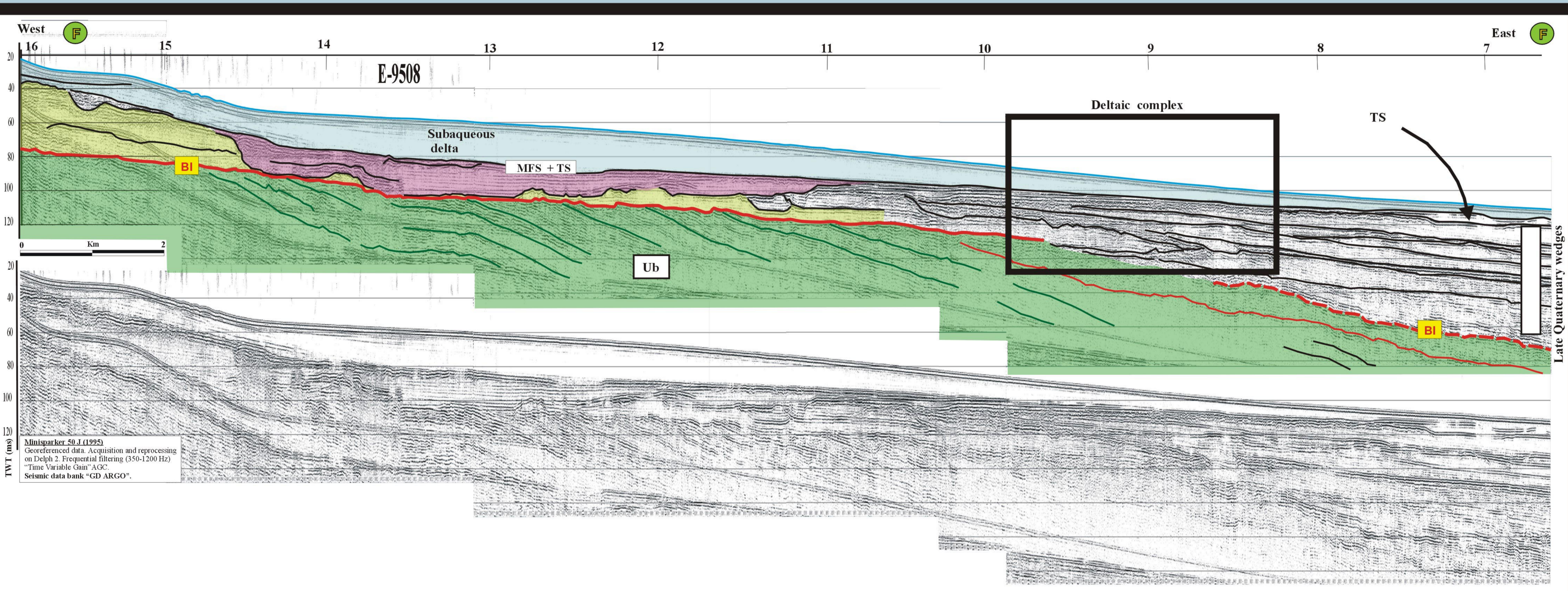
Seaward connection with the regressive shelf wedge deposits shows analogs with high energy tidal-wave bodies (deltaic complex?).

Truncation surface. Infilling is truncated by a surface that merges laterally with the Ub erosional upper boundary (Ib). It constitutes a polygenic surface landward uplifted. Depth is less than 20 ms t.w.t. but under the modern beach and coastal plain or lagoon. In the landward part, it may be separated into two surfaces : truncation surface (TS) at the base (toplap terminations below and overlap above), downlap surface (MFS) at the top.

Post-Glacial or deglacial deposits. Above the transgressive surface (TS), several sedimentary units constitute the transgressive and highstand systems tracts. Near the shore, TST is represented by the retrograding body enclosed between the TS and MFS surfaces. The HST is represented by the sigmoidal and seaward prograding bodies that constitute the upper part of the coastal deposits and the sub-aqueous delta.



MAGNIFIED SHORE TRANSVERSE SEISMIC SECTION



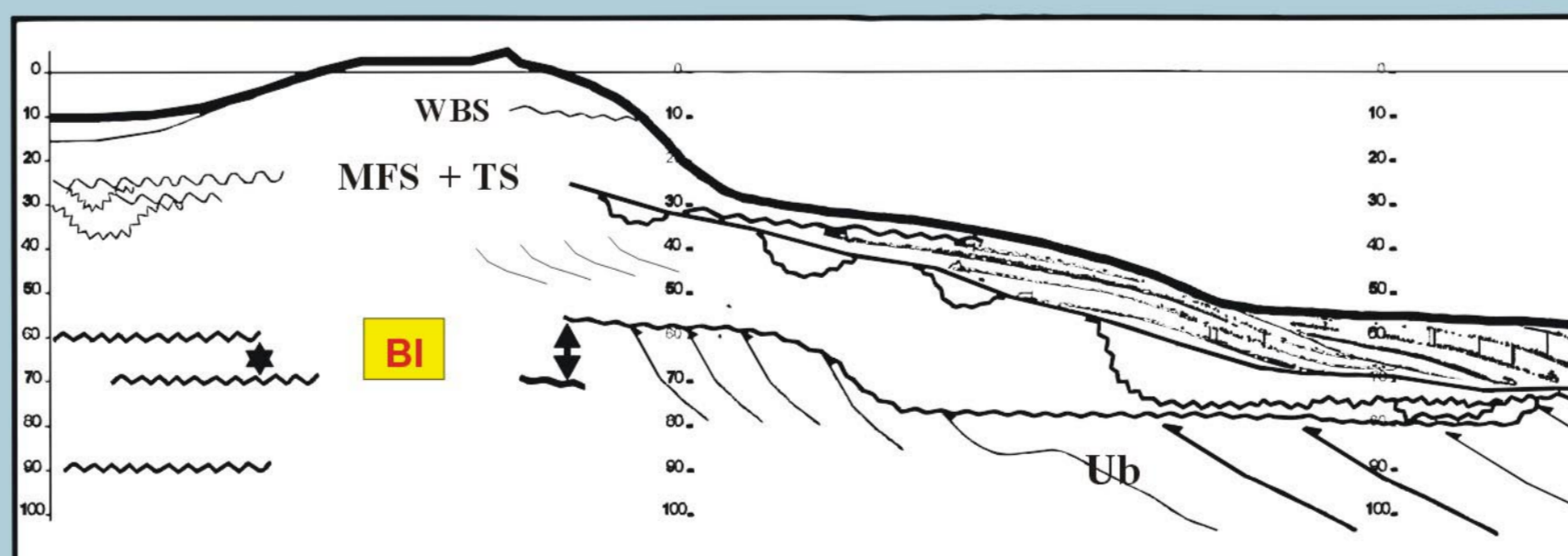
The stratigraphic model for Languedoc-Roussillon (Duvail et al., 2001) is based on an erosional surface developed during the last sea level lowstand (~120 m b.s.l.) at the top of the continental Pliocene. The overlying sedimentary units from the coastal plain to offshore have prograded during the Holocene (6 ky. B.P. To Present). This surface presents valley incisions at about 50 m b.s.l. the seismic discontinuity BI, at about 60 ms t.w.t. at the Leucate lagoon level, correlates with onshore borehole data. It represents the top of the Pliocene.

The complex of incised valleys may have developed during all the Quaternary between the basal surface of incision in Pliocene formations and the MFS surface at the base of the regressive HST.

Romarin chronostratigraphic section (Aloisi et al., 1975) based on core drilling across coastal plain deposits, shows an uppermost seaward prograding system with a lower boundary at about 20 m b.s.l. The system is radiocarbon dated from 6 ky. B.P. To Present.

- the seismic downlap surface MFS, at about 25-30 ms t.w.t., corresponds well and represents the base of the modern Highstand Systems Tract.

WBS represents the base of the modern coastal wedge



CONCLUSIONS

The stratigraphic model for Quaternary in coastal areas around the Gulf of Lion is probably more complex than previously exposed and evidences of the effects of eustasy/tectonic control on sedimentation have to be confirm in selected places.

The main fluvial system of the Gulf of Lion is the Rhône river system but, for several reasons (coarse pebble layers, gas, retrogressive slumps), its incised valleys fill system is not a good study example. Thus, the best place to study land to sea relationship during late-Quaternary are probably the Languedoc-Roussillon fluvial systems.

Other examples in France from the Atlantic coast are similar to the Gironde situation, with no clear evidence of the seaward extension of the incised valleys on the shelf. Comparison between those systems would be meaningful because generally those estuaries have trapped more fine deposits in and the record analysis of proxies would be easier and more detailed.

WHAT IS THE FUTURE

An effort will be made to achieve a detailed 3D model of the architecture of the complex from the coastal plain to the shelf wedges. A special attention will be devoted to the deltaic complex that represents the key point for relation between the fluvial and the marine systems. A cruise is programmed in 2004 to best attain this goal.

Chronologic calibration is essential and lateral correlations should be rapidly expected as soon as the PROMESS program advance (long coring on the shelf front of Languedoc).

Thanks to : G.P. Allen (TOTAL), Ch. Ravenne (IFP), crew and captain of N/O C. Laurence, G. Petit and Téthys II.

References : Allen et Posamentier, 1993 et 1994 ; Lericois et al., 2001 ; Thomas et Anderson, 1994 ; Duvail et Le Strat, 2002 ; Tesson et al., 2000.