

## Sedimentary architecture of the Roussillon shelf (SW Gulf of Lions, France): sequence stratigraphy considerations

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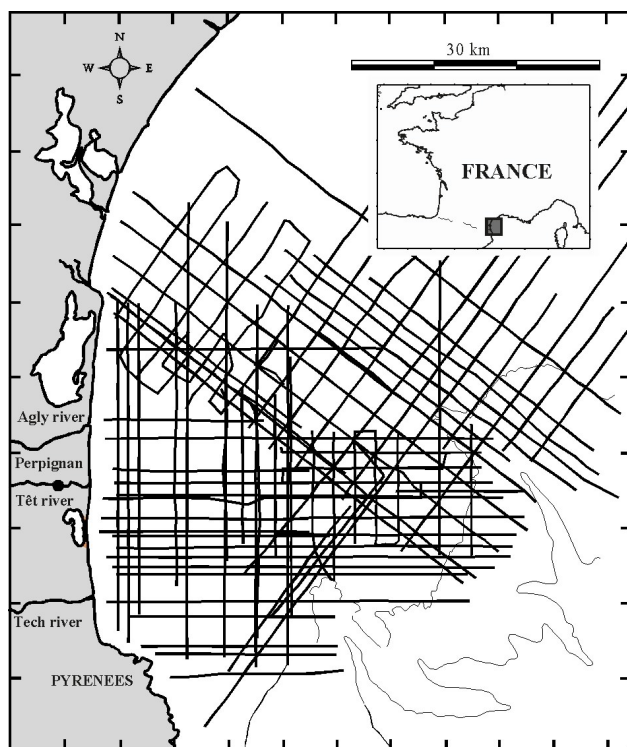
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### INTRODUCTION

Shelf stratigraphic architecture is well documented for the Rhone [1, 2] and the Languedoc [3] sectors of the Gulf of Lions. Quaternary deposits in these shelves are represented by a middle-outer shelf sedimentary wedge, which is constituted by two types of deposits [3, 4]: a) Regional prograding units (RPU) are laterally extensive wedges, characterised with low-angle prograding configurations; b) Intercalated units (IU), which are located between RPU and are constituted of several, patchy deposits over the shelf with currently high-angle prograding clinoforms. The Roussillon shelf (SW part of the Gulf of Lions) is less studied, and shows several stratigraphic features that differ from other sectors. This paper provides the first description of its sedimentary structure, taking special consideration of controlling factors and peculiar sequence stratigraphy characteristics. This work has been based on the analysis of a dense grid of high-resolution seismic profiles (Minisparker) collected on the Roussillon shelf during seven oceanographic surveys (Fig. 1).



**Fig. 1.** Location of seismic profiles on the Roussillon shelf (SW Gulf of Lions, SE France).

### SEDIMENTARY ARCHITECTURE

Twelve seismic units have been identified in the Roussillon shelf. Those units have been classified according to their distribution and internal structure in several types [5], considering the already proposed terminology for the other Gulf of Lions sectors:

A) Regional prograding units (RPU), characterised by a widespread shelf distribution (Fig. 2). They are subdivided in: i) Shelfal RPU: they are distributed over the middle-outer shelf. Main depocenters are on the middle shelf, showing an elongated, coastline parallel pattern. Dominant seismic facies are low angle ( $<1^\circ$ ) prograding, and intercalated wavy facies are also frequent. They are interpreted as distal portions of coastal bodies, deposited in a moderate to low energy marine environment. ii) Shelf-break RPU: they are distributed over the outer shelf-upper slope, with thickness increasing steadily seawards. Low angle facies evolve seaward to high-angle facies ( $>2^\circ$ ). They are locally affected by erosive channels. They are interpreted as distal facies of coastal deposits prograding over the upper slope

B) Intercalated units (IU), mainly characterised by discontinuous, patchy distribution over the shelf, and dominated by high-angle progradational configurations (Fig. 2). They are subdivided in: i) Discontinuous IU, constituted by several unconnected deposits, which are generally disposed over the outer shelf/shelf-break, middle shelf and inner shelf. These units are attributed to a large variety of littoral deposits. ii) Middle shelf continuous IU: they have lateral continuity and progradational configurations, normally high-angle, but they may evolve seaward to low-angle configurations. Occasionally, erosive channels are determined at their upper boundary. These deposits are attributed to high-energy environments, such as shorefaces that may evolve seaward to shelf muds.

C) Regional aggrading unit (RAU); it is the most recent unit, characterised by sub-horizontal internal configuration and wedge external shape, distributed over the inner-middle shelf (Fig. 2). It is interpreted as fluvially-derived sediments.

### DISCUSSION

These seismic units compose several depositional sequences (at least four) mainly constituted by regressive

Lowstand Wedges and secondarily by Transgressive Deposits [5]. Two main types of cycles can be proposed to explain their development: a fourth order (about 100,000 years) and a fifth order cyclicity (about 20,000 years). However, the different preservation of RPU and existence of continuous IU indicates that other factors have also controlled the development of this shelf sector. We propose that reactivation of pre-existing structures could have influenced shelf subsidence and therefore permitted the good preservation of mid-shelf deposits through much of the shelf history. Besides, the influence of submarine canyons on shelf deposition should be taken into account in this case.

Several aspects in terms of sequence stratigraphy interpretation can be put into question. Between them, we would like to discuss the following:

1) No distinction of a regressive/lowstand boundary. Regressive deposits on the Roussillon shelf do not show significant internal boundaries, and they are only differentiated by the degree of preservation. Thus, shelfal RPU are best preserved in middle shelf settings, whereas shelf-break RPU are better preserved in marginal settings.

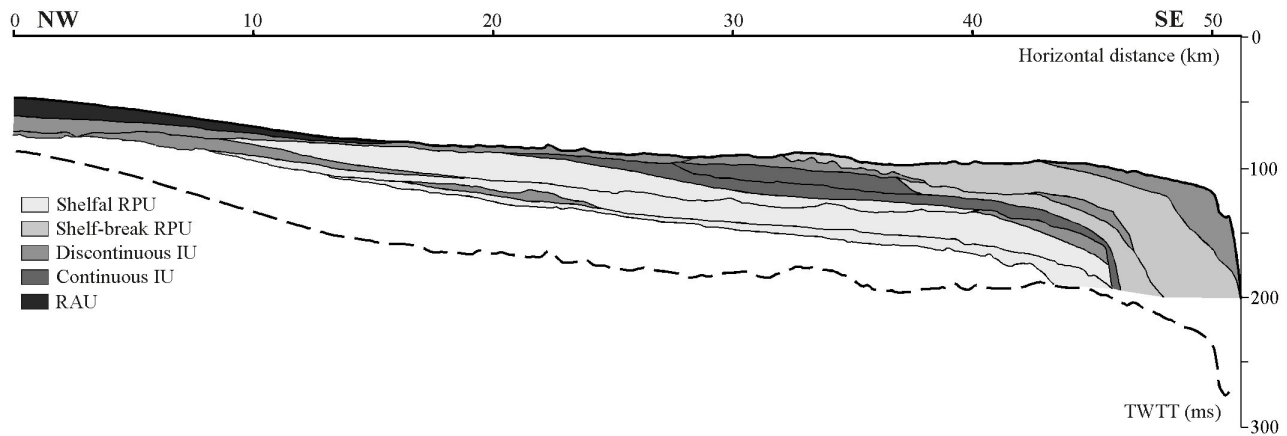
2) Sequence interpretation of IU is still open. Stratigraphic characteristics of discontinuous IU drive us to interpret them as transgressive deposits, but it is not clear if outer shelf deposits would be related to maximum sea-level lowstands or to initial stages of sea-level rises. This interpretation would be based on their attribution to a particular depositional system, which is questioned. Besides, the occurrence of continuous IU laterally related to low-angle deposits is a particular stratigraphic feature

of this shelf, as it would provide evidence of forced regressions or of superimposed sea-level variations.

3) The most distinct, significant surfaces which are identified in seismic sections establish the boundaries between RPU and IU, and they are considered as transgressive surfaces. By contrast, sequence boundaries are identified by downlaps of RPU over ancient deposits. These considerations have genetic implications, in the sense that these surfaces are related to sea-level changes of similar magnitudes but very different duration.

## REFERENCES

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**Fig. 2.** Sedimentary architecture of the Roussillon shelf, showing the main types of seismic units: RPU (Regional prograding units), IU (Intercalated units) and RAU (Regional aggrading unit).