



Multiscale Analysis of the Cretaceous-Early Paleogene Carbonate Systems In a Foreland Basin (Aquitaine Basin, France)

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The multiscale analysis of Upper Cretaceous to Early Paleogene carbonate systems from basin scale to pore scale of Bas-Adour sub-basin (Aquitaine Basin, France) is based on the integration of different specific tools : seismic and numerical modeling, well logging, petrophysics, thin and polished sections supported by isotopic and Cathodoluminescence analysis.

First, the aims of this study intends to understand the cinematic evolution of a basin under halotectonic control, supported by a seismic stratigraphy analysis and numerical modeling.

Next, this study intends to unlock the sedimentary and diagenetic record, especially the dolomitized bodies distribution, so as to predict reservoir properties.

The model is composed of six layers, Albian to Priabonian aged, well constrained and depth migrated with the integration of major discontinuities. The Picking of the six layers has been produced with a Charisma software and the modelisation with a Petrel software. The surveyed area is limited by Magesq and Sebastopol/Dax structures to the west and by Siougos and Audignon structures to the est.

The Principal geological structures are N100-110 (anticlines) and N150-160 (strike-slip network) oriented. The development of anticlines (Magesq, Sebastopol/Dax, Louer, Thétieu, Audignon and Siougos structures) is related to the dampening of the pyrenean deformation northward by means of a thick triassic salt decollement level leaded by an important hercynian heritage.

Strike-slip network is materialized by the “Thétieu corridor” which could be due to a late orogenic pyrenean phase during oligocene. Thanks to this strike-slip network, triassic salt would have come back up illustrated by Thetieu cylindrical diapir “grafted” on the his broadest meridional part.

Sedimentary dynamics is interpreted at two observations scales:

-A regional scale where the deposit’s geometry is linked to “long wave tectonic” (subsidence and uplift), halocinise and major eustatic variations.

-A local scale where diachronous growing of diapirs at different velocities explain the local geometry of reflectors.

The cores drilling analysis allows us to display the evolution of at least two carbonate platforms, during Coniacian/Turonian to Campanian and the other one during Danian to Upper Thanetian/Ypresien. During this period, available space seems not to be or slightly affected by salt movements relative to the precinematic form of the seismic reflectors.

These carbonate platforms are characterized by calcarenite deposits with emergences surfaces during Palaeocene, leading to an important primary porosity and permeability. These deposits are separated by fine grained fabrics conducting to cover facies development.

The diagenetic imprint differ between high position where formations are intensely dolomitized with a complex diagenetic history permitting high secondary porosity development and low positions where sedimentary record is preserved, especially for Palaeocene sediments. Upper Cretaceous sediments are not so affected and their diagenetic history is not so complex.

Like this, high positions are better reservoirs than lower ones.

Moreover, an Upper Cretaceous to Ilerdian field analogue has been chosen in the high subsident Tremp basin (South Pyrenees) in order to understand the impact on the diagenetic fabric of high frequency transgressive/regressive cycles with periodic emergences especially during global Danian falling sea level stage.