

Post-orogenic sedimentary evolution of the Aquitaine and Bay of Biscay retro-foreland basins

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The Mesozoic Aquitaine Basin (alternations through time of rifts and intracratonic to passive margin basins) is inverted during Cenozoic times to become the retro-foreland of the Pyrenees Mountain Belt.

A lot of studies were carried out on the paroxysmic phase of the retro-foreland activity, few paid attention on the latest –post orogenic – stage, the so-called “Molassic” periods. This can be explained by the monotonous facies distribution along poor outcrops with few dating available.

For a better understanding of the last stage evolution of both the Pyrenees and Massif central relief – and their consequences on the sediment routing system – we performed a stratigraphic study of the “Molassic” deposits and their marine equivalent, from the upstream part (Lannemezan area) to the distal part (Landais Plateau and Biscaye Bay abyssal plain). This study was mainly based on subsurface data, seismic lines and wells (industrial and BSS) provided by the BRGM and TOTAL. Wells correlation was based on the principles of stacking pattern calibrated in age and facies on cuttings and clabs. The seismic lines were interpreted using the principles of the shoreline trajectory and calibrated in age and facies on wells.

The main results are as follows.

(1) A sharp transition between continental and marine environments characterized by mixed carbonate-siliciclastic (clays and silts) platforms. The Bartonian to Priabonian shelves are reefal platforms, the Priabonian wedge is a major lowstand (LNR) which continue during Early Rupelian. . The Late Rupelian and the Chattian are progradational agradation. A major unconformity occurred during the Chattian (establishment of a large lowstand). This one is also located in the offshore part, in the Chattian wedge in front of the current basin of Arcachon.

(2) Continental environments (Priabonian to Chattian) are made up of palustrine to carbonate lacustrine sediments passing to mixed to suspended-load rivers, local base level of conglomeratic alluvial fans located in the extreme inner part of the basin at the feet of the Pyrenees.

(3) A major erosion occurred in the Late Chattian with present-day preservation of the Chattian in the inner part of the basin along the Pyrenees (500 to 1500 m-thick wedge). Chattian sediments were partly removed by erosion in the western part of the Lannemezan Plateau area and are mostly missing along the Aquitaine Basin.

(4) Lower to Middle Miocene sediments (with the same facies than above) are quite thin (50 to 200 m – low preservation). They record a major fall in the subsidence pattern.

(5) A two phases major uplift of the Lannemezan and Ger Plateaus occurred during Serravallian and base Tortonian times sealed by weatherings and fluvio-lacustrine sediments (Orignac lignites)

(6) From Late Miocene to today, the Aquitaine Basin is a sediment transit zone with deposition on the Landais Plateau as thick siliciclastic prograding wedges. That's why we performed a seismic transect between Toulouse (onshore) and the Cantabria Dome (offshore, abyssal plain)

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