

## SEISMIC SEQUENCE STRATIGRAPHY AND STRUCTURAL STYLES IN THE TARFAYA BASIN (MOROCCAN ATLANTIC MARGIN, LOWER CRETACEOUS TO PRESENT)

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2D marine seismic reflection data from the Tarfaya Atlantic margin of southern Morocco, interpreted in the light of well log data, allowed us to define a structural and stratigraphic framework of the Tarfaya basin from the Lower Cretaceous to the Present and to quantify the interplay between the developing structure, sedimentary systems and the resulting sequence stratigraphic architecture.

In the first step of this study, the stratigraphic framework of the area was established by the application of a general seismo- and tectonostratigraphic analysis. We defined 9 seismo-stratigraphic sequences based on a classification of seismic facies, reflector patterns and regional unconformities that allow to correlate the deposits of the Tarfaya shelf since the Precambrian:

- 1) The seismic basement is formed by Precambrian- Paleozoic (Pr-Pz) folded and metamorphic rocks that are bounded at the top by a major erosional Hercynian unconformity and is marked by hummocky seismic facies with high amplitude and low frequency reflectors. This sequence is affected by ENE-WSW trending faults.
- 2) On top of the Hercynian the Late Triassic - Early Jurassic mega-sequence was deposited (Tr-J1-1). It is already syn-rift and consists of terrigenous clastics and minor evaporite sediments and basaltic sills. It is bounded on top by the Jurassic breakup unconformity. The seismic facies is characterized by subparallel reflections, indicating uniform subsidence. This sequence is marked by half graben structures which are bounded by NE-SW striking, offshore dipping listric normal faults.
- 3) The formation of Puerto Cansado (Upper Jurassic (J2.1) is composed of oolitic and bioclastic limestones, laterally grading into marls or sandstones, indicating the installation of a well structured rimmed carbonate platform with associated lagoon. Its seismic image is characterized by subparallel reflections with high amplitude on the shelf and the upper slope and condensed reflectors on the lower continental slope and the rise
- 4) The formation of Tan Tan (Lower Cretaceous (Kr1)): marine-deltaic sandstones and shales. The sequence overlies unconformably the Jurassic sequence and is characterized by parallel to subparallel reflections with good continuity and high amplitude disrupted by an area of discontinuous lower amplitudes which indicate intervals of sands and shale. The succession is characterized by growth faults due to the Pyrenean orogenic events and gravity sliding.
- 5) The formation of Aguidir (Upper Albian - Lower Cenomanian (Kr2.1)) consists of transgressive deposits (marls and limestone). According to extrapolated well and seismic information, this sequence consists of lagoonal, tidal and shallow marine muds and sands. In seismic lines this sequence is characterized by parallel to subparallel reflections with varying amplitude.
- 6) The formation of Labtaina (Upper Cenomanian - Maastrichtian (K2.2 and Kr2.3) is composed of dark brownish and greyish laminated hemipelagic chalks, alternating with nodular limestones. The sequence is reduced in thickness and marked by parallel seismic facies with continuous and variable amplitude and constitutes of hemipelagic marls and carbonate.
- 7) The formation of Samlat (Paleogene (M01.1 and Mo1.2) is characterized by marine clastic sediments and siliceous chalks with chert concretions. The base of the unit is formed by the second major regional erosional unconformity, as a consequence of Alpine movements. The sequence is marked by low amplitude and subparallel to chaotic reflectors.
- 8) The formation of Tah (Neogene (M02.1)): shallow marine sandy claystones, calcarenites and sandstones. This formation is marked by transparent to parallel reflectors with low amplitude.
- 9) Plio-Quaternary (M02.2): marked by an erosional truncation that separates the shallow marine sandy claystone of Miocene formation and the Plio-Quaternary Sandstone. In seismic lines this sequence lies unconformably over the older sequences, marked by a downlapping low-stand wedge and characterized by low amplitude reflectors and transparent to parallel seismic facies.