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Expression of the Atlas Inversion Tectonics in Deep-water Offshore Morocco: Implications for Hydrocarbon Exploration

Neogene to Recent inversion of the Atlas system, the result of African-Eurasian plate convergence, is well documented onshore Morocco. However, recently acquired reflection seismic data in the offshore Essaouira segment of the Atlantic passive margin of Morocco show the presence of inverted structures of mid-Tertiary age in the deep-water area as well.

These unusual structures are best imaged outboard of the widespread salt basin of Late Triassic/Early Jurassic age, some 200 km to the west from the coastline in water depth of 2000-4000 m. The anticlines have a general NW-SE/WNW-ESE trend determined first by a regional-scale 2D seismic reflection data set, also confirmed by a subsequent 3D seismic survey. Compressionally reactivated syn-rift normal faults are responsible for these inverted structures which clearly involved the pre-Mesozoic basement.

The areal extent of the inverted structures coincides with that of the Tafelney Plateau. The Tafelney Plateau is interpreted as a high-relief accommodation zone inherited from the rifting stage of the central Atlantic basin. This regional basement high and the associated anticlines trend perpendicular to the deformational front of the salt basin providing interesting interference patterns, locally enhancing the toe-thrust anticlines. The inverted structures represent a previously unknown play type in the deep-water Atlantic region.