

Provençal basin a complex rifting geometry: impact on hydrocarbon exploration

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ABSTRACT

The Provençal Basin is considered a partly oceanized back-arc basin generated from the southeastward rollback of the Apennines-Maghrebides subduction. In the core of the basin there is a 150 km wide NE-SW trending belt composed of oceanic crust bounded by a broad transitional crust. The oceanic crust has been dated as late Aquitanian to late Burdigalian-early Serravallian on the basis of heat flow, tristanite in samples, paleo- magnetism and subsidence analyses.

The basin infill includes a fairly complete succession of lower or upper Oligocene to Holocene deposits that can be subdivided into syn-rift and post-rift series. The rifting phase, that is mainly responsible for the actual structure of the basin, started in late Eocene or early Oligocene and continued until the middle Aquitanian, while the formation of the oceanic sector of the basin occurred from late Aquitanian to late Burdigalian simultaneously to the drifting of the Corsica-Sardinia block; this split from the European mainland and moved from the Provençal coast and the Gulf of Lion to the current position following a 30° counter-clockwise motion.

The central and southern part of Sardinia Island is characterized by a series of rift systems with different ages and different orientations. The geometry of these rifting basins varies along the strike of the basin producing a complex geometry. The exact age of these basins is unclear but the restoration of their position to the pre or early rotation stage (opening of the Provençal basin) highlights a very complex geometry of the Provençal basin rifting and the inheritance of old lineaments that can be identified also in continental Europe.

The unlocking of the geometries of the early phases of the rifting is fundamental to understand the hydrocarbon potentials in the Provençal basin in particular the distribution of the main plays associated to the early rifting stages (early syn-rift), post-rifting stage and in part also of the pre-rifting stage. Our integrated study using analogues, outcrop data and available seismic support the idea that at least 5 different petroleum plays can be identified in different zones of this large basin.