Permian-Jurassic Tectonic and Depositional Control on Oil Fields Distribution in the Central Moesian Platform, Romania

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The study area is located in the Central Moesian Platform between Oltet–Teleorman Rivers, the Danube River and the Peri-Carpathian fault.

The target of this paper refers to the recognition of the main Permian–Jurassic fault systems in order to define the connection between the major events concerning tectonics, eustacy and sedimentation in basin evolution, using sequence stratigraphy. Depositional sequences, systems tracts and parasequences were also identified on wells to predict reservoir lithology in facies model terms.

The Jurassic hydrocarbon fields lie in the northern part of the study area.

The well data were integrated on the seismic lines highlighting the seismic markers, formation succession and fault systems, as well.

The analysis of the seismic data was achieved using the seismic stratigraphic techniques, the identification and correlation of regional stratigraphic markers using reflector termination, sequence boundaries defined by unconformities and their correlative conformities.

A few representative North-South and West-East seismic profiles were selected in order to recognize the main fault systems (Figure 1).

The basement faults present a North-South and a West-East trend and the latter are responsible for several igneous intrusions and extrusions associated with pyroclastic rocks along Craiova-Optasi uplift due to Hercynian and Cimmerian Orogenesis.

In the north of the Moesian Platform, the Permian-Triassic magmatism is associated with an extensional deformation, along W–E trending fault system, generating horst – graben structures with Mamu-Mitrofani-Spineni northern horst; Fauresti-Iancu Jianu and Optasi-Ciesti-Buzoiesti median horst; Strejesti-Oporelu-Mogosesti and Braniste southern horst, structurally attached to Slatina-Ciuresti highest horst.

Three types of Jurassic intracratonic basins were recognized: a basin characterized by normal syndepositional faults and thermal subsidence; a strike-slip basin with two main faults; and a fossil extensional basin (rift type), with normal, en echelon external faults (Figure 2).

The Jurassic deposition in the first basin took place as a result of subsidence and eustacy interaction; the source areas are the former Triassic uplift (Leu, Corabia, Harlesti, etc.). The main transport trend was SE-NW, and locally NE-SW.

In the second basin, the strike-slip faults system, with 2km. displacement, consists of: two main faults, a sinistral SS1, and a dextral one SS2; four normal splay faults, Fx1, Fx2, Fx3, Fy; antithetic and synthetic en echelon faults (Mamu, Fauresti, Ciuresti); a normal transfer fault and a horsetail splay fault (Varteju and Golumbu structures). The direction of sedimentary influx was the same with the direction of the uplifted block movement. The source area for this basin was located laterally on Iancu Jianu, Fauresti and Mamu uplimorted horst, the latter one, being cannibalized to the north.
(escarpment fault with conglomerate facies in Mitrofani – Dumitresti area), and to the south towards the deeper basin (Draganu).

In the third extensional basin Spineni, the direction of the Jurassic sediment influx was opposed to the block movement, generating the active bi-directional erosion along the normal fault escarpment of the fossil rift shoulder externally. Internally an active depocenter shifted to the source area.

The Middle Jurassic depositional systems are represented by coastal fluviatile domain, littoral and offshore bars, strand plain, delta system, shelf, margin shelf, slope, fan delta and basin. Offshore distal sandbars, littoral bars, deltafront and fan delta represent the prospects for hydrocarbon fields (Iancu Jianu, Fauresti, Spineni, Oporelu, Ciuresti, Bacea) (Figure 3).

In the Upper Jurassic, the depositional domain consists of carbonate shoals, banks or reef on the internal and external shelf, a marginal shelf, faulted slopes and basin. The main prospect is represented by Tithonian carbonate shelf margin with diagenetic control on the pore system (Ciuresti).

The reconstruction of the major events in the basin evolution in the Central Moesian Platform led to the following conclusions:

Based on older and new considerations, Permian-Jurassic successions may be interpreted in terms of intracratonic extensional basins followed by subaerial erosion and strike-slip deformation in the northern part of the study area, while in the central and the southern areas, the thermal subsidence basin conditions prevailed. The hydrocarbon fields are distributed asymmetrically. The fields producing from the Triassic and the Dogger are located in Malu Mare, Iancu Jianu, Negreni; South Ciuresti, Fauresti, Spineni, Simnic, Ghercesti, Carcea, Malu Mare, Ciuresti fields are producing from the Dogger, only, while North Ciuresti and Barla fields are also producing from the Tithonian.

It is worth noticing that most of the commercial hydrocarbon accumulations are encountered in the strike-slip basin and they are controlled by antithetic and synthetic “en echelon” faults and other typical secondary features.
Figure 1. Interpreted seismic profile across Draganu - Fauresti area representing Getic Depression formations thrust over Moesian Platform and Fauresti highly eroded horst showing scarp splay fault of the strike-slip system SS; tilted and rotated blocks within strike-slip system SS₂ and syndepositional normal faults.
Figure 2. Restored Jurassic structural setting in Central Moesian Platform
Figure 3. Middle Jurassic depositional system-Shelf Margin System Tract (Upper Bajocian)