

Play types of the Moesian Platform of Romania and Bulgaria

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The Moesian Platform is well known as a prolific and mature petroleum province on the western margin of the Black Sea. As the promontory of the European Platform, Moesian Platform is bordered to the north and to the west by the South Carpathians, to the south by the Balkanides. The vast thickness (>10 km) of Cambrian to Recent sedimentary cover of the Moesian Platform offers an exceptional record of the Phanerozoic evolution of the European plate. The Paleozoic succession has several source rock intervals (e.g. Silurian shales) and also proven reservoirs (e.g. fractured Devonian carbonates). Above the Hercynian unconformity Permian to Middle Triassic continental to shallow marine sediments deposited in a facies succession quite typical for a period aborted rifting. The extensional period was replaced by the Norian-Rhaetian by a compressional regime in the whole Moesian Platform. Producing a northvergent foreland thrust-fold belt. The Cimmerian unconformity formed during the earliest Jurassic post-orogenic uplift and subaerial erosion of the folded belt and most of the Bulgarian hydrocarbon reserves are directly related to this pronounced unconformity. Above the Cimmerian unconformity the sedimentary facies and thickness relations of Middle Jurassic to Lower Cretaceous carbonates clearly show the development of a northwest-facing passive margin in Romania and a south-facing passive margin in Bulgaria. Whereas the final docking of the Balkans on the Moesian Platform margin has occurred at the end of the Eocene this did not happen on the northern edge until the Late Miocene when the Carpathians stopped moving onto the platform. Unlike the Balkans, the Carpathians produced a wide and deep foreland basin with a very pronounced foredeep unconformity reaching far to the S within the platform succession. The generally E-W trending normal faults which were formed due to the flexural extension of the Moesian Platform do not extend more than 100 km to the S from the non-emergent leading edge of the Carpathians. These Miocene normal faults, however, provided the traps for most of the hydrocarbon reserves in the Romanian side of the Moesian Platform.

In addition to the successful and well-known play types, several un(der)explored play types exist in the central part of the Platform. The first set of plays is related to the Middle Jurassic-Lower Cretaceous carbonate platform which straddles the Romanian part in a general NE-SW direction. The trap for this play is a roll-over anticline trend just basinward from the platform edge (e.g. Nenciulesti-Buzescu Field). Additional traps within the Albian are expected to be associated with the compactional anticlines over the platform edge and local patch reefs behind it. Also, the talus on the paleoslope of the platform remains untested.

Another set of underexplored play types can be found in the broader Rosiori/Giurgiu area. There are several generations of normal faults in this area, related to the incipient Permian to Triassic rifting and to the reactivation of some of the faults during the Neogene. Whereas most of the traps above the Cimmerian unconformity were tested in the past, the normal-fault related Triassic-Paleozoic targets have not been addressed in a systematic manner.

The last set of plays is associated with the Latest Triassic Cimmerian anticlines which could be found both in Romania and Bulgaria but predominantly to the north of the Danube. Some of these large fault-bend fault structures were already tested by drilling, but without the proper understanding of their internal geometry. On the level of the mid-Triassic carbonate reservoirs some of these anticlines still have their critical Upper Triassic seal sequence preserved. Deeper, Paleozoic targets such as Devonian carbonates, are dependent on the presence of a Carboniferous shale seal which is difficult to assess due to the small number well penetrations.

Additional plays, as an upside, are provided by stratigraphic traps associated with the Cimmerian unconformity. These subtle traps contain the majority of oil and gas found to date on the Bulgarian side and therefore they are considered important analogues for exploration in southern Romania. In addition to the conventional exploration aspects, parts of the Moesian Platform may also present an unconventional shale gas exploration opportunity as several prominent Paleozoic shale intervals (e.g. Tandarei Formation) exist with not fully understood source rock characteristics. Similarly, some Jurassic shale intervals, such as the Dogger Bals Formation in Romania and the Lias Etropole Formation in Bulgaria, should also be considered as shale gas exploration targets.