

New-Potential in a Mature Petroleum Province: The Carpathians

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ABSTRACT

The Carpathian fold and thrust-belt is one of the oldest producing hydrocarbon provinces in the world, with the first exploration drilling commencing in the 1850's. During the 20th Century, the Carpathians of Poland, Slovakia, Ukraine and Romania were explored and exploited by state companies, with more than 8 billion barrels of oil and 32 TCF of gas discovered, primarily in shallow reservoirs. Despite this long history of exploration, there is likely to be significant additional reserves, particularly at deeper levels, which may be unlocked through the application of modern exploration and production techniques. Utilising a multi-disciplinary approach, and integrating focused exploration fieldwork, new biostrat and geochem analysis, modern 2D seismic data and recent drilling results, new structural and stratigraphic models have been developed which enable improved prediction of play elements in the sub-surface. Exploration has to date been hampered by existing lithostratigraphic schemes which are often only applicable locally and, most importantly, are not predictive. Our approach has been to replace these with sequence stratigraphic schemes which predict the presence and nature of play elements (reservoir, seal, source) in the subsurface. Contrary to previous interpretations, which invoke the migration of foreland basins with classic 'in sequence' thrusting and associated large thrust transportation distances, we observe evidence for extensional tectonics in the Jurassic through to early Miocene. We interpret extensional tectonics, and related thermal subsidence, as the dominant subsidence mechanism during deposition, with late Cretaceous to late Oligocene units deposited within half-graben basins, which were inverted during Miocene contractional deformation. The new structural and stratigraphic models have significantly upgraded the understanding of play fairways in the Carpathian petroleum province and have resulted in the development of new play concepts and identification of sweet-spots. We believe these new insights have the potential to open-up a new phase of exploration across the Carpathians.