Observations from the Black Sea Region: Their Importance for Predicting Reservoir Facies in the Black Sea Basin in a Sequence Stratigraphic Context

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A critical risk in petroleum exploration in the Black Sea is reservoir presence and quality. Mesozoic–Cenozoic onshore successions provide valuable data which can assist in piecing together the tectonostratigraphic history of the Black Sea. Using a sequence stratigraphic methodology, this data can be used to predict reservoir occurrence in the Black Sea.

Much of the Permian-Triassic sedimentary succession exposed in the Pontides comprises phylites and metabasites, deformed in the closure of Palaeo-Tethys and the formation of the Izanca Ocean. A further deformation event occurred in the Late Cretaceous as a result of the collision of the Tauride Block with the Pontides. As a result of these deformation events, the provenance of sediments deposited by secondary reworking into potential reservoirs is a significant reservoir quality issue.

A Tethyan passive margin developed during the Late Jurassic-Early Cretaceous, leading to the deposition of region-wide platform carbonates. Comparison of facies between Crimea, the Caucasus and the Pontides indicate that grainy facies may be present on Black Sea basin highs. The onset of Western Black Sea rifting may have led to the formation of syn-rift clastic reservoirs, but more importantly, rift shoulder uplift may have caused the prolonged exposure of older platform carbonates, enhancing porosity by exposure at multiple sequence boundaries.

Subsequently, the accretion of the Tauride Block generated fine-grained flysch deposits throughout the Pontides. The subduction of Neotethys also generated the Late Cretaceous Pontide magmatic arc which affects the reservoir quality of younger derived sediments.

Creation of the Eastern Black Sea in the early Tertiary resulted in a further episode of rift shoulder uplift. Coincident with eustatic drops in sea-level, major episodes of turbidite deposition have been recorded; these are the direct analogue of potential subsurface reservoirs. Intra-Maykop clastic turbidites developed extensively across the Black Sea due to uplift related to the collision of Arabia with Eurasia, as did Messinian-Pliocene deep-water clastic successions. Sequence stratigraphy can be used to predict times of more extensive lowstand deposition within these packages.

Awareness of outcrop geology and an applied understanding of sequence stratigraphic methodology can lead to a greater understanding of provenance in this area and therefore of the quality and distribution of potential reservoirs in the Black Sea.