

Early Cretaceous Syn-Rift Deposition in the Western Black Sea: Insights from Outcrops in the Zonguldak Region, Northern Turkey

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Geodynamic reconstructions of the Black Sea region identify an episode of extension within the Barremian-Aptian period. This extension is expressed as a series of tilted fault blocks visible from regional outcrop mapping and on regional seismic data. Associated sedimentation patterns include the transgression of structural highs with clastic and carbonate shelfal sediments, while in the basins created during extension, clastic turbidite systems are present along with potential source rocks. A regional seal is created by the pelagic carbonates of the Late Cretaceous post-rift drift succession.

Outcrop analogues in northern Turkey, Romania, and Crimea suggest that shelfal sandstones might have reservoir potential in porous and permeable quartz-rich sands derived from local Pre-Cambrian massifs. Shelfal carbonates are highly cyclic and have multiple phases of exposure within them, possibly creating enhanced reservoir quality in the subsurface. In the structural lows between the highs, deeper-water clastic facies are prevalent, and these form a variety of facies types dependent on proximity to uplifted blocks, angle of slope, and provenance source. However, relatively clean sands can be present in those rock units derived from the Ukrainian Shield.

In the Zonguldak region of northern Turkey, excellent exposures of the Early Cretaceous shelfal sediments exist that would have been deposited on the shoulders of one of the rifts. These lie unconformably on Jurassic carbonates (with which they have been confused) and Palaeozoic sediments. The succession represents a complex interdigitation of shallow marine carbonates with a variety of fluvial, shoreface, and offshore siliciclastic sediments. Detailed logging of outcrops supported by subsequent petrographic and micropalaeontological analysis resulted in a better understanding of the precise depositional environment of the sediments present and their age relationships. Results are presented in the form of a new chronostratigraphic chart and a series of palaeogeographic maps.