

Sequence Stratigraphy and Basin Development - Tarfaya Basin, Morocco

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Although sufficiently mature source rocks (Early Jurassic, Late Cretaceous) and suitable reservoir facies (e.g. Late Jurassic, Early-Middle Tertiary) exist in the Tarfaya Basin (TB), past exploration has yielded few oil/gas shows but no commercially producing wells. In order to better understand the HC system of the TB, an integrated basin analysis approach has been applied including numerical modeling of the source and sink areas. Key methodologies include sequence stratigraphy, thermochronology, biostratigraphy, source-to-sink analysis, geochemistry and basin modeling. This contribution focuses on sequence stratigraphy and numerical modeling in the sink area.

The current 3D basin model is based on i) well correlation, ii) seismo-/sequence stratigraphic interpretation; iii) data from outcrop analogue. At least 18 sequences have been identified in the Jurassic-recent basin fill. The Mesozoic to Early Cenozoic basin development includes 5 major basin stages i) Permian to Pliensbachian rift- and sag, ii) Toarcian to Cenomanian drift, iii) Turonian to Early Eocene drift with initial Atlasian deformation, iv) Middle-Late Eocene drift with major Atlasian compression; v) Late Eocene to Early Miocene drift with major Atlasian uplift and inversion.

Triassic to Liassic is represented by continental to marginal marine clastics and evaporites. A Lower Jurassic sequence shows mixed carbonate-clastic shallow marine environments. Middle-Late Jurassic carbonate shelf ramps include five sequences. Four Early Cretaceous sequences comprise continental to deltaic clastics followed by carbonate platforms in the Late Cretaceous. Two Paleogene sequences unconformably overlie the Late Cretaceous. Paleocene siliceous carbonates and mainly Eocene clastics are widely exposed onshore. The northern Early to Middle Paleogene shelf margin features strong bypass sedimentation. Related to a marked regression, the Oligocene shelf margin and upper slope collapsed. Lower slope and basin margin settings have been preserved in the recent offshore. The Neogene basin fill covers the outer shelf, slope and basin margin and comprises four sequences. A high-resolution sequence stratigraphic and architectural model focused on source-rock and reservoir intervals is in progress.