

A characterisation of Late Miocene (Pontian) depositional processes in the Black Sea of Romanian: an application of analogues

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The sediments of the late Miocene (Pontian) to Pliocene Danube Delta, Romania, display abundant evidence for free gas that is currently underexploited. One of the main challenges in exploring this system (both on the continental shelf and beyond) is the ability to predict the distribution of potential reservoir sandstones and seals in this heterogeneous depositional system. An integrated seismic and sequence stratigraphic analysis of these deposits generated a framework for characterisation by mapping the geographical, geometric, and temporal changes in seismic. By inference this leads to an interpretation of depositional facies.

Beneath the current continental shelf, the Late Miocene Pontian rocks display a well-defined progradational form that can be subdivided into lower and upper sequences deposited during separate 3rd-order cycles of sea-level change. In response to the growing Carpathian Mountains, sedimentation rates increased throughout progradation, such that up to 1km of slumped and deformed muds and sands were deposited within <300Ka in the Upper Pontian Lowstand. Progradation occurred across a broad front and is compared with depositional models for a deep marine mud/sand-rich multiple-sourced ramp. Furthermore, the Pontian sequences display an upward transition from an “under-filled” to “filled” depositional systems. These characteristic compare favourably with the early Mid Bashkirian (Kinderscoutian) turbidite-fronted delta of the British Isles, which are capable of providing models for sandstone heterogeneities within these Pontian successions. At the end of the late Miocene (Messinian), a massive sea-level fall, induced by the onset of ice sheet-growth in the Northern Hemisphere, resulted in development of entrenched distributary systems on the delta-top. As a consequence, during the subsequent 3rd-order Pliocene (Dacian and Romanian) lowstands, the nature of the deep-marine sedimentation changed to a mud/sand-rich, point-sourced fan with submarine channels, lobes and levels. These different depositional end-members should be considered when attempting to define play fairways in the late-Miocene to Recent deposits of the Danube Delta.