

Pre-salt Seismic Sequence and Depositional Evolution of the Campos Basin, Brazil

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A seismic and well based pre-salt stratigraphic evolution model is presented for a +10000 km² region of the Campos Basin. Five sequences were mapped using 3D seismic and analyzed in conjunction with core, sidewall, cuttings and biostratigraphic data. The sequences are; pre-rift, syn-rift, thermal-sag and post thermal-sag Sequences 1 and 2.

A pre-rift sequence was defined by seismic basement and a top pre-rift unit that may be equivalent in part to the Cabiunas Formation. This pre-rift succession may be analogous to the late Carboniferous, early Permian, Jurassic or early Cretaceous pre-rift units within the Sergipe-Alagoas Basin.

The overlying syn-rift comprises an oblique, en-echelon rift system with numerous diachronous sub-basins and orthogonal accommodation zones. The size, style and orientation of the major syn-rift structures have similarities to those modeled for a forty-five degree oblique rift system. Seismic geometries indicate substantial variation regionally between sediment balanced, sediment overfilled, and sediment under-filled syn-rift successions.

The ensuing thermal-sag sequence has a thin, flat, seismic internal reflection character interpreted as passive-fill. This sequence thins in multiple directions and was affected locally by structural reactivation. Depocenters are displaced relative to their syn-rift counterparts with renewed subsidence and accommodation in areas of previous syn-rift low accommodation and/or uplift.

Two post thermal-sag sequences were defined. The basal Sequence 1 is clinoformal locally, whereas the overlying Sequence 2 is largely aggradational. Sequence 1 contains an incipient pre-salt carbonate shelf margin to platformal area, which becomes more pronounced and aggrades during Sequence 2. The identification of a pre-salt platform and margin is fundamental to the basin reconstruction, as this margin affected later Aptian salt movement as well as post-salt Albian platform development.

Pre-salt reservoir facies in this area of the Campos Basin are predominantly bioclastic limestones with subordinate sandstones and volcanics. By comparison of well data and biostratigraphy to regional seismic correlation it appears that many producing bioclastic limestone ("coquina") intervals are part of the post-rift succession defined as Sequences 1 and 2. This assertion is a major departure from previous models, which derive facies and architectural geometries based on an association of "coquinas" with syn-rift tectonics.