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Synrift And Sag Plays In The Southern South Atlantic: Key Elements And Uncertainties

Author Block: Oscar R. Lopez-Gamundi[1], Hector de Santa Ana[2], Bruno Conti[2], Ethel Morales[3];

[1]P1Consultants, Houston, TX, [2]ANCAP, Montevideo, Uruguay, [3]Univ. de la República, Montevideo, Uruguay.

The early opening of the South Atlantic is characterized by Jurassic to Cretaceous synrift deposits limited to half-grabens followed by more extensive, early postrift (sag) sediments. Asymmetric half grabens with nonmarine to marginally marine synrift fill are common along the South American continental margin in the Campos, Santos, Punta del Este and North Malvinas (Falkland) basins. Presence of source rocks in the synrift and/or sag sections, areal extent and quality of reservoirs, and trap geometry are key elements of these plays. These rifts exhibit common along-strike switches in basin polarity with landward or basinward dipping master faults resulting in variable (landward or basinward) polarity. Landward (westward) vergence, opposite to the present deepening of the continental margin, favors differential compaction at the half-graben border fault margin and thus accentuates and/or creates counter-regional dips necessary to form elongate, structural (four-way) closures at the synrift and sag levels. Half-grabens with basinward (eastward) vergence, defined by basinward dipping master border faults and landward dipping ramp margins, generate gently dipping, counter regional dips and thus contribute to the formation of riskier trap geometries. The synrift fill of these half grabens shows significant thickness changes with depocenters next to the master faults and gradual thinning toward the flexural ramp margins, indicative of sedimentation coeval with the tectonic subsidence generated by displacement along the master fault. Seismic stratigraphic analysis allows to identify a bipartite synrift fill in some of the half grabens: a) an areally confined, early kinetic sequence with strongly divergent pattern toward the border fault, and, b) a late kinetic sequence that laps on the underlying sequence or basement on the flexural ramp border. These two kinetic sequences are separated by a sequence boundary characterized by an angular truncation below and onlap on top. This discontinuity separates the early and late kinetic sequences along the flexural ramp margins where accommodation space is reduced. Laterally they tend to merge into a correlative conformity toward the border fault margin where rate of creation of accommodation space greatly exceeds sediment supply rate. The late kinetic sequence shows a more gradual border fault - flexural ramp change in thickness whereas the same variation is more significant in the early kinetic sequence. Highest rates of creation of accommodation space along the border fault margin during the early phase of the synrift fill may have generated optimal underfilled conditions for lacustrine and/or brackish basinal sedimentation under euxinic environments.

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