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Mesozoic Half-Graben Inversion and Associated Petroleum Systems. South Eastern Neuquén Basin, Argentina

A series of grabens and half-grabens were originated at the Neuquén basin as a result of pervasive lithospheric stretching during the late Triassic to early Jurassic. Throughout this interval, and associated to a regional wrench fault system, an extensive depocenter was developed at the basin eastern boundary, where extensional and compressive systems coexisted and exerted a strong control in sedimentation. More than 4000 m of sediments, accumulated in a wide variety of continental environments (Pre-Cuyo Group), compose this rift-related infill, which allows the recognition of two rift and two post-rift stages.

During the early rift stage (late Triassic?-early Jurassic) a set of tuffaceous, volcanoclastic, fluvial and lacustrine deposits were accumulated in a roughly triangular and large depocenter, bounded at the east by an NW-SE master fault. After that, compressive stresses gradually reduced the depocenter, favoring progradation-erosion processes, and generating a large arch (Kaufmann High) against which, the late rift (early Jurassic) volcanic, tuffaceous and lacustrine sequences onlap. Basin-wide shelfal and marginal marine deposits (lower Cuyo Group) compose the early post-rift (Toarcian-Aalenian?). During the late post-rift (Aalenian-Calloviaian) the main inversion phase occurred coupled with synthectonic deposition of fluvial and marginal marine sequences (upper Cuyo Group).

The existence of source rock, reservoir and traps, generated by tectonic inversion, provided essential elements for two prolific petroleum systems, actually producing from ten oil fields. The early rift lacustrine source rock charged early rift and both post-rift reservoirs, while the marine organic-rich shales sourced early rift and both post-rift clastic reservoirs.