Recent discoveries of oil and gas in the Neuquen Basin have highlighted the importance of syn-rift to early post-rift sediments, as these hydrocarbons are distinctly different from the better-known petroleum systems of the basin. The pre-Cuyo source rocks generate hydrocarbons from lacustrine sequences that developed in fresh to brackish, anoxic water columns. Understanding the syn-rift sedimentary and structural patterns is therefore crucial for exploration in the pre-Cuyo interval of the Neuquen Basin. Several field campaigns (1998-2000), centered in the exposed syn-rift succession (Zapala area, SW Neuquen), lead to production of a series of event and facies distribution charts. This work is key to the understanding of the geologic processes that control the sediment distribution patterns, and defining the location of source rocks, reservoirs, and seals.

A series of depocenters over the area were controlled by three major tectonic events in the Late Triassic-Pliensbachian. The size, thickness, and sedimentary characteristics of each depocenter are shown to depend on timing and extent of fault activity. All depocenters in the area are created during an initial rifting stage, and later reactivated or abandoned during successive tectonic events. The syn-rift sedimentary packages are characterized by rapid facies and thickness changes. The rift tectonic pattern evolved into widespread differential regional subsidence during the early post-rift stage, leading to a change in facies and sedimentary style and the establishment of the prevalent marine systems of the Cuyo Group (Early-Middle Jurassic).