

# **Multi-Stage Rifting Evolution of the Colorado Basin, Offshore Argentina: Implications for Understanding the Mesozoic Breakup of South West Gondwana and the Evolution of the Passive Margins of the Southern South Atlantic**

**Juan Pablo Lovecchio<sup>1</sup>, Sébastien Rohais<sup>3</sup>, Víctor A. Ramos<sup>2</sup>, Philippe Joseph<sup>3</sup>, and Néstor Bolatti<sup>1</sup>**

<sup>1</sup>Offshore Exploration, YPF SA, Buenos Aires, Argentina.

<sup>2</sup>Universidad de Buenos Aires, Buenos Aires, Argentina.

<sup>3</sup>Geosciences, IFPEN, Rueil-Malmaison, France.

## **ABSTRACT**

The Colorado basin, located offshore Argentina (between 39°S and 43°S), in the volcanic Southern Segment of the South Atlantic, was known to be originated as part of the Mesozoic break-up of the supercontinent of Gondwana. The evolution of the basin is largely conditioned by the pre-existent structures, as it developed on top of a Paleozoic basin in an area affected by the collision of the Patagonia terrane with SW Gondwana during the Permian. By interpreting 300,000 km of 2D seismic calibrated with well data, we characterize the three main basin depocenters and the main structural elements, and provide evidence of fault intersection, that point towards a multi-episodic rift evolution of the Colorado basin before the Early Cretaceous South Atlantic opening. New deep seismic data allowed the interpretation and mapping of the crustal structures that were associated to the Late Paleozoic orogen and that seem to be extensionally reactivated in a first rifting phase, with N-S extension. The area was then affected by a second rifting episode oriented SW-NE. Fault intersection between structures of the first and second extensional events was detected. These two events are considered pre-Cretaceous. By comparing the main episodes recognized along the Argentinean and African margins, we can propose that the first one related to E-W directed faults (N-S extension) is of probable Mid-Jurassic age; while the second was assigned to the Late Jurassic and is restricted to the eastern depocenter and related to NW-trending faults (NE-SW extension). The Early Cretaceous continental rifting event that led to the South Atlantic opening is associated to E-W extension and recorded by fault-related depocenters located to the East (near the zone of transition between continental and oceanic crust) and by the SDRs (Seaward Dipping Reflectors, volcanic wedges emplaced in the continental-oceanic transition zone). The western part of the basin was then mainly characterized by a sag dynamic. SDRs are interpreted to be Hauterivian in the Colorado segment. The basin went through a drift phase since the latest Hauterivian - early Barremian (age of the breakup unconformity), with a first marine transgression during the Barremian-Aptian. A progradational to aggradational stacking pattern characterizes the Late Cretaceous. A regional flooding affected the area during the Maastrichtian-Danian. The Cenozoic stratigraphic evolution shows an increase in accommodation with respect to the Cretaceous.