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Colorado Basin Structure and Rifting, Argentine passive margin

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The Argentine margin presents a strong segmentation with strike-slip movements along the fracture zones [e.g. Moulin et al., 2010]. We focus on the volcanic segment (between the Salado and Colorado transfer zones), which is characterized by seaward dipping reflectors (SDR) all along the ocean-continent transition [e.g. Franke et al., 2006; Gladczenko et al., 1997; Hinz et al., 1999]. The segment is structured by E-W trending basins, which differs from the South African margin basins and cannot be explained by classical models of rifting. Thus the study of the relationship between the basins and the Argentine margin itself will allow the understanding of their contemporary development. Moreover the comparison of the conjugate margins suggests a particular evolution of rifting and break-up. We firstly focus on the Colorado Basin, which is thought to be the conjugate of the well studied Orange Basin [Hirsch et al., 2009] at the South African margin [e.g. Franke et al., 2006].

This work presents results of a combined approach using seismic interpretation and structural, isostatic, gravimetric and thermal modelling highlighting the structure of the crust. The general basin direction is almost orthogonal to the present-day margin trend. The most frequent hypothesis explaining this geometry is that the Colorado Basin is an aborted rift resulting from a previous RRR triple junction [e.g. Franke et al., 2002]. The structural interpretation partly supports this hypothesis and shows two main directions of faulting: margin-parallel faults ($\sim$N30°) and rift-parallel faults ($\sim$N125°). A specific distribution of the two fault sets is observed: margin-parallel faults are restrained to the most distal part of the margin.

We can recognise 5 main structural parts in the study area. (1) The western segment shows few small syn-rift depocentres (1800 m) and a thick post-rift cover (5850 m) with a NW-SE trend. (2) The central segment shows deep syn-rift (5000 m) and post-rift (5850 m) depocentres in its southern part with a E-W trend. (3) The eastern segment presents the thickest syn-rift (4700 m) and post-rift (7000 m) depocentres with a NW-SE trend. (4) The distal step is bounded by major NE-SW faults and depocentres but NW-SE-trending depocentres with short length are also observed. The distal step reaches the margin slope and opens into the oceanic basin. (5) The oceanic crust is 6 km-thick and bounded by SDRs corresponding to the Continent-Ocean Boundary.

Starting with a 3D structural model of the basin fill based on seismic and well data the deeper structure of the crust beneath the Colorado Basin can be evaluated using isostasy, gravity and thermal modelling. The evolution of the basin and the subsidence history are strongly linked to the emplacement of a high density body at the base of the crust.

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