THE SOUTHERN MARAÑON BASIN: AN ACTIVE FOREDEEP WEDGE-TOP TRANSITION ZONE INHERITED FROM PRE-CRETACEOUS STRUCTURES

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Introduction

The Marañon and Huallaga Subandean basins located in the Andean-Amazonian transitional area are classically interpreted as the components of a foreland basin system, where the Huallaga Subandean area is correlated to the wedge-top depozone and the Maranon area to the foredeep depozone. The North Amazonian foreland basin started to acquire its modern configuration between 12.9±2.9 Ma and 8.8±2.5 Ma (Kennan L., 2008) with the development of the wedge-top depozone of the Huallaga basin, where the transition from marine to continental environments was directly controlled by thrust propagation (Hermoza et al., 2005).

The object of this paper is to present a revision of the present day structural architecture of the southern Marañon basin, and its relationship with pre-Cretaceous contractional and/or extensional structures. Although our structural revision is based on the interpretation of an exhaustive compilation of seismic data, we just present three examples of seismic cross-sections showing the main tectonic Andean features inherited from pre-Cretaceous structures.

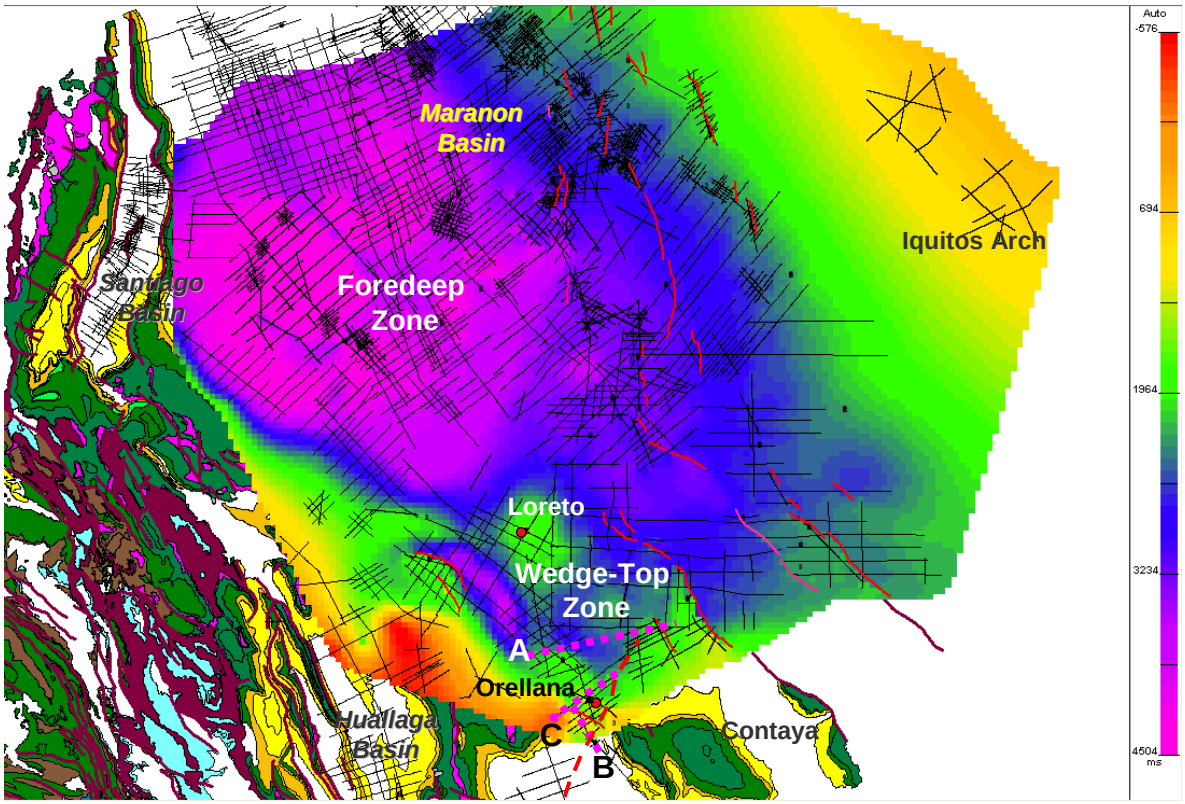


Figure 1. Base Cretaceous TWT structural map showing the eastward propagation of the Subandean front in the

southern Marañon basin. Foredeep depozone is preserved in the northern part of the Marañon basin. Structural cross sections presented in this paper are located in the southern Marañon Basin in magenta dotted lines. The southern limit of the Mitu rift system is also represented in red dashed line.

Structural architecture

The two way time (TWT) map of the Base Cretaceous, illustrating the present-day basin architecture with their regional faults, shows the eastward propagation of the Subandean front in the southern Marañon basin (Figure 1). To the north, the Subandean thrusts die progressively and the foredeep depozone is preserved. Three regional seismic cross sections (see location on Figure 1) illustrate the southern thrust system geometry of the Marañon basin and its pre-Cretaceous inheritance.

In the A-A' cross-section (Figure 2), back thrusts are evidenced in the western part (DX 51 section). They correspond to the reactivation of Late Permian thrust structures deforming the Copacabana and Tarma Formations and which have been progressively sealed by the deposits of the Ene Fm. (growth strata). Structural mapping of these "Ene" thrust structures shows they prolong below the Loreto antiform and form probably a N-S trend. This Late Permian contractional deformation corresponds to the effects of the Jurua orogeny already described in northern Peru (Rosas et al. 2007; Bump et al., 2008). In the eastern part of the A-A' cross-section (Figure 2), the BP 19 seismic section shows an east-verging deep reverse fault which deforms all the Cenozoic series. This regional thrust has an NW-SE Andean orientation (Figure 1). It cuts Late Permian back-thrusts sealed by Ene growth strata and connected to the back thrust system observed more to the west in the DX 51 seismic section. This thrust system is apparently branched to an intra-basement detachment.

In the B-B' cross-section (Figure 3), the SC-95-04 seismic section shows the Cenozoic tectonic inversion of a Triassic half-graben filled by Mitu Fm. conglomerates reached by the Orellana well. Seismic mapping of these inverted normal faults shows they have a NNE-SSW orientation and constitute the southern limit of the Triassic rift system in the Marañon basin (see Figure 1). This orientation is coherent with the Triassic rift system described more to the north in the Oriente basin of Ecuador (Baby et al., in press).

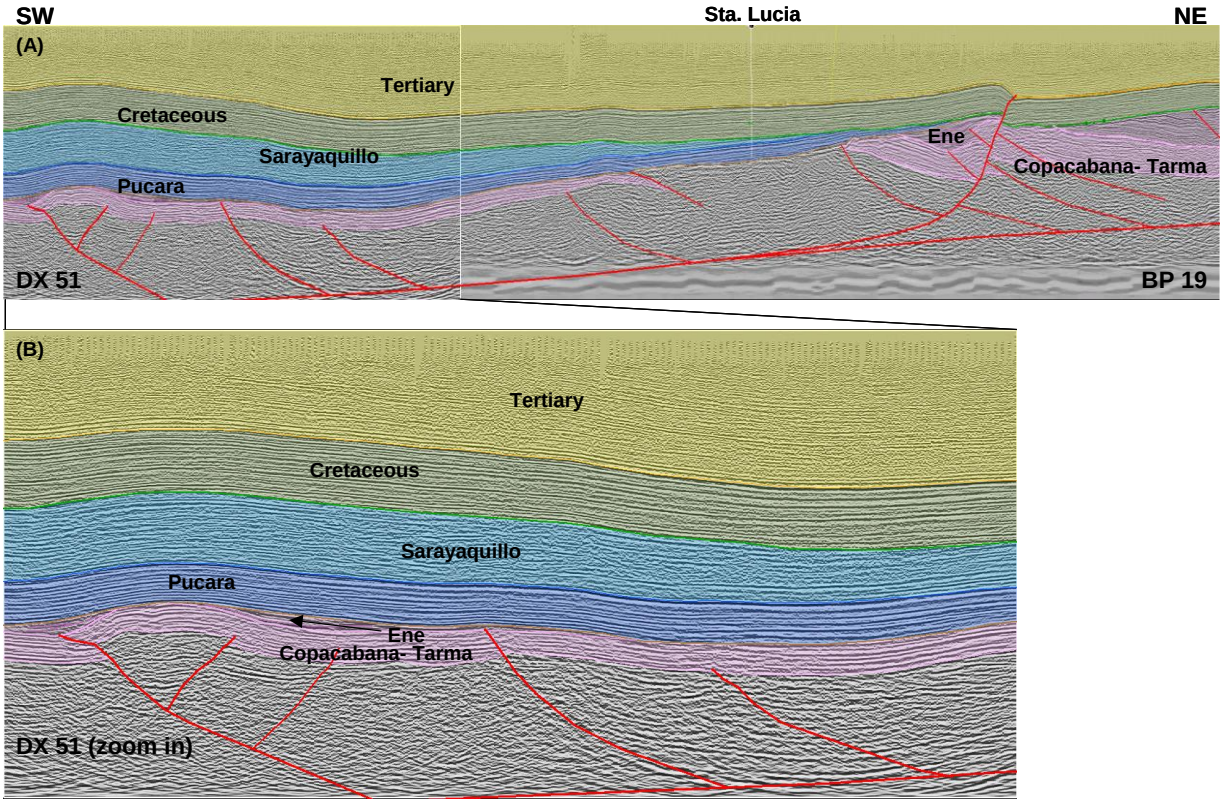
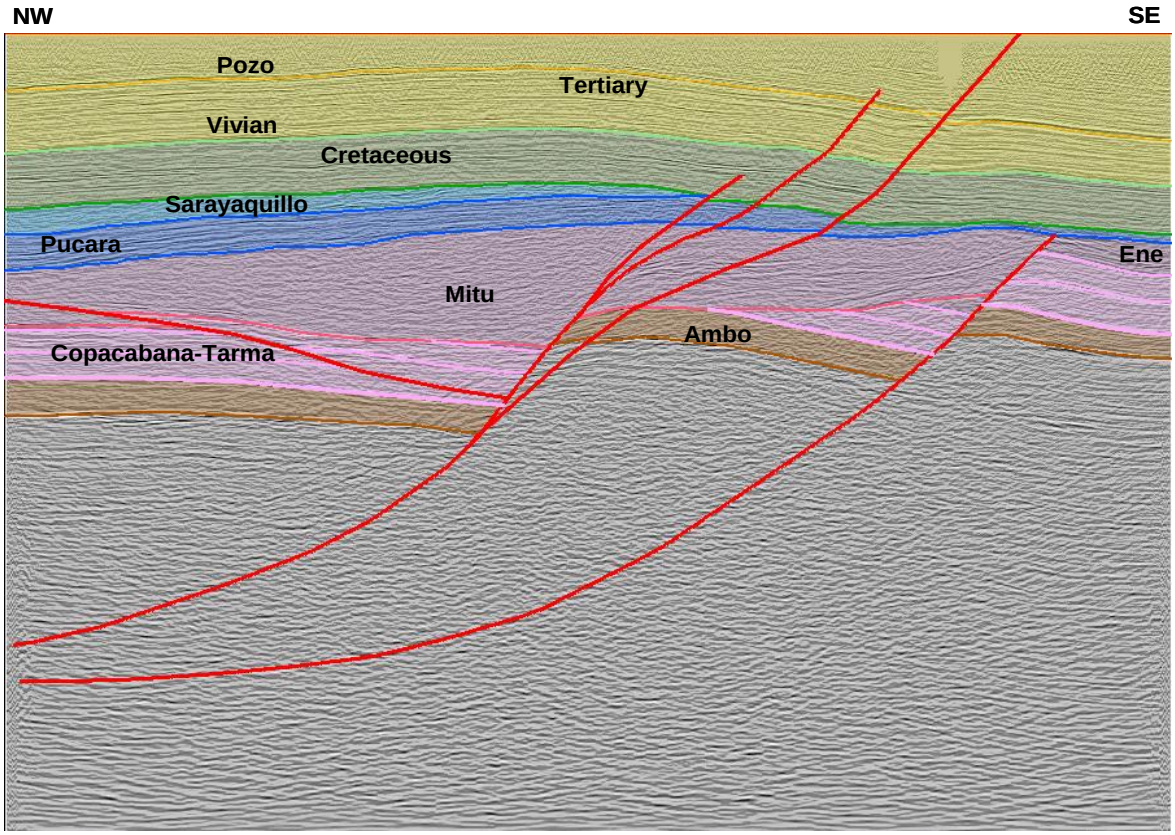


Figure 2. (A) A-A' Regional seismic cross section illustrating the Subandean frontal deformation and the reactivation of Late Permian back-thrusts. In the eastern part, the east-verging Subandean frontal thrust cuts a

Late Permian back-thrust. Both systems are branched to an intra-basement detachment. (B) DX 51 seismic



section shows a reactivated Late Permian thrust fold with growth strata in the Ene Fm.
Figure 3. SC-95-04 seismic section illustrating the inversion of the southern border of the Triassic rift system (Mitu Formation).

The C-C' seismic cross-section (Figure 4) shows the northern prolongation of the inverted Mitu half-grabens system. Inverted faults are NNE-SSW oriented and seem more inclined than the normal because the section is oblique to the faults. The complex antiform corresponds to the Orellana structure (Figure 1) and result from the partial inversion of the Triassic rift system. The eastern border of the rift is poor inverted. It preserved folds of the Jurua orogeny eroded by the base of the Mitu Fm. Growth strata of the Ene Fm. are also preserved in a synclinal below the Triassic unconformity. As in the others sections, the reactivation of the paleostructures seem very young because it deforms the entire Cenozoic series.

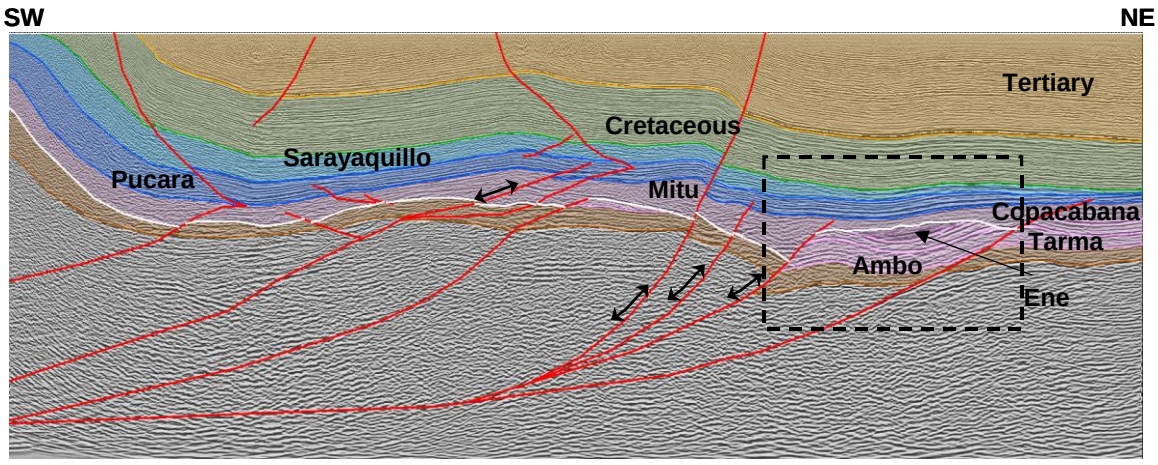


Figure 4. C-C' seismic cross section illustrating the inversion of the Mitu half-grabens system. Jurua deformation is preserved in the eastern border in the area inside the rectangular.

Conclusions

The southern Marañon basin is deformed by Subandean thick-skinned tectonics which affects the entire Cenozoic series and dies progressively to the north. Formation of these structures in the South Marañon has been profoundly influenced by the inherited structures from the Jurua orogeny and the Triassic rifting.

Jurua structures have N-S orientation and mainly correspond to west-verging thrusts. They are sealed by Late Permian growth strata located in the deposits of the Ene Formation. Some of these late Permian structures are reactivated during Andean deformation or cut by Subandean east-verging thrusts. Both systems branch to an intra-basement décollement. Preserved Late Permian folds have probably a strong potential for hydrocarbon entrapment.

In the south Marañon, the Triassic rift system filled by the Mitu Formation is NNE-SSW oriented and comparable to the Triassic rift system of the Oriente basin of Ecuador. It is partially inverted during the Late Cenozoic where it originated complex structures as the Orellana antiform. Folds of the Jurua orogeny are preserved in some Triassic half-grabens. The inversion of the eastern border of the Mitu rift constitutes a transfer zone between the Marañon and Ucayali basins.

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