PRE CRETACEOUS FOLD AND THRUST BELTS IN THE MARANON BASIN

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INTRODUCTION

The evolution of different tectonic events in the present day Andean foreland of Peru is imaged by the seismic data within the Maranon basin, a basin with a 6000 m infill of Phanerozoic sediments in the most important Peruvian foreland system, located in the Northern Amazonian Basin (Roddaz, 2010). Seismic interpretation and published literature present several pre-Cretaceous deformations in the Peruvian Subandean basins; however we show in this article that the proto-Marañon basin is mainly characterized by two pre-cretaceous fold and thrust belts that occurred during the Permian and Late Jurassic times. The Triassic-Jurassic rift event, well known to the west in the eastern Cordillera (Rosas et al., 2007) is not imaged by the seismic of the Marañon basin.

STRUCTURAL FRAMEWORK

The Andean orogeny described by different authors began in the Late Cretaceous in the Western Cordillera and propagated eastward with a major event in the Miocene (Mégard, 1984; Laubacher and Naeser, 1994). The northwest-southeast alignment of the structures in the Maranon basin is influenced by the Andean compression related to the major Mio-Pliocene event.

Our seismic interpretation and balanced cross-sections through the Huallaga and Maranon Basins (Eude, 2015, Calderon et al., in press) show interference between thick and thin-skinned tectonics. Thick-skinned tectonics results from the reactivation of pre-cretaceous verging thrusts sealed by the Late Permian long term sequence of the Ene-Noi-Shinai formations, which have been correlated by seismic from the Ucayali basin to the South Marañon basin (Hurtado et al., 2014; Baby et al., 2014). They are unconformably overlain by a fluvial-eolian sequence interpreted as the eastern equivalent of the western Triassic-Jurassic Mitu Formation (Baby et al, 2014) deposited during extensional events and periods of intense volcanism and plutonism. The Permian compressional tectonics is clearly imaged by the seismic sections DX51 and AH-13 (Fig. 1) showing the reactivation of pre-Late Permian thrust folds that can reach a length of 5 to 15 km. These Permian structures have a North-South arrangement.

On the other hand, in the eastern Maranon basin, we observed structures sealed by the Cretaceous Cushabatay formation, and deforming Late Jurassic sediments of the Sarayaquillo Fm. (Figure 2). More to the south, the Ucayali basin presents duplex structure involving also the Jurassic Sarayaquillo Fm. (Hurtado, 2014).

CONCLUSIONS

In the Southern Maranon and Ucayali basins, seismic data show Permian and Late Jurassic fold and thrust belts partially reactivated by the Andean orogeny. The Permian fold and thrust belt can be associated to the Late Carboniferous-Early Permian San Rafael orogeny described in Argentina and which belongs to the Gondwanian cycle reactivated during Andean orogeny (Giambiagi et al., 2014). The Late Jurassic fold and thrust belt corresponds probably to the prolongation of Jurua orogen defined by Caputo (2014) in the Brazilian Acre and Solimoes basins.

REFERENCES

- Baby, P., Y. Calderon, M. Louterbach, A. Eude, N. Espurt, S. Brusset, M. Roddaz, S. Brichau, G. Calves, C. Hurtado, L. Ramirez, A. Quispe and R. Bolaños, 2014. Thrusts propagation and new geochronologic constraints in the Peruvian Subandean fold and thrust belt: VIII INGEPET 2014 (GEO-EX-PB-10-N).
- Caputo, M.V., 2014. Jurua Orogeny Brazil and Andean Countries. Brazilian Journal of Geology. V 44. N2, On Track, 24, 13–18.
- Calderon, Y., P. Baby, A. Eude, G. Calves, R. Bolaños and E. Martínez, 2014. Pre-cretaceous structures in the Maranon and Huallaga basins and their petroleum implications: VIII INGEPET (GEO-EX-YC-15-N).
- Calderon Y., P. Baby, Y. Vela, C. Hurtado, A. Eude, M. Roddaz, S. Brusset, G. Calvès, R. Bolaños (in press). Petroleum systems restoration of the Huallaga-Marañon Andean retroforeland basin, Peru. AAPG Memoir 112: Petroleum System Case Studies.
- Eude, A., M. Roddaz, S. Brichau, S. Brusset, P. Baby, Y. Calderon and J.C. Soula, 2015. Timing of exhumation and deformation in the Northern Peruvian Eastern Andean Wedge (5 - 8 S) as inferred from Low Temperature Thermochronology and Balanced Cross Section: Tectonics, doi: 10.1002/2014TC003641.
- Giambiagi, L., Mescua, J., Heredia, N., Farias, P., Garcia Sansegundo, C., Fernandez, S. Stier, Perez, D., Bechis, F., Moreiras, S. M., Lossada, A., 2014. Reactivation of Paleozoic structures during Cenozoic deformation in the Cordon del Plata and Southern Precordillera ranges (Mendoza, Argentina). Journal of Iberian Geology 40 (2) 2014: 309-320.
- Hurtado, C. Baby, P., Calderón, Y., Bolaños, R., Pelliza, H., & Monges, C., 2014. Arquitectura estratigráfica y estructural con un nuevo sistema petrolero en la zona noroccidental de la cuenca Ucayali. VIII INGEPET 2014 (GEO-EX-CH-04-N)
- Hurtado, C., Baby, P., Calderon, Y., Bolaños, R., Pelliza, H., & Monges, C., 2014. The role of evaporite levels and precretaceous structures in thrusts propagation of northerm Ucayali subandean basin, Perú. 24e Réunion des Sciences de la Terre-Pau-Francia.
- Laubacher, G., and Naeser, C. W., 1994. Fission track dating of granitic rocks from the Eastern Cordillera of Peru: evidence for Late Jurassic and Cenozoic cooling: Journal of the Geological Society, London, v. 151, p. 473-483
- Mégard, F. 1984. The Andean orogenic period and its major structures in central and northern Peru: Journal of the Geological Society, London, v. 141, p. 8793-900.
- Roddaz, M., W. Hermoza, A. Mora, P. Baby, P. M., F. Christophoul, S. Brusset, and N. Espurt, 2010, Cenozoic sedimentary evolution of the Amazonian foreland basin system, in Amazonia, Landscape and Species Evolution: A look into the Past, 1st edition, edited by C. Hoorn and F. P. Wesselingh.
- Rosas, S., L. Fontbote, and A. Tankard, 2007, Tectonic evolution and paleogeography of the Mesozoic Pucara Basin, central Peru: J. S. Am. Earth Sci., 24(1), p. 1-24, doi: 10.1016/j.jsames.2007.03.002.



Figure 1: (A) DX51 and (B) AH13 seismic sections showing the pre-cretaceous structures Late Permian in age in the Maranon Basin.



Figure 2: (A) PSEP 135-2013-03 and (B) PSEP 135-2013-01 seismic sections showing the pre-cretaceous structures Middle Jurassic in age in the Maranon Basin. (C) PP 107-12 seismic section presents Middle Jurassic structures in the Ucayali Basin (Hurtado, 2014)