

Intraplate foreland deformation in the Neuquén embayment

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The Neuquén embayment developed along the eastern foothills of the southern Central Andes has a complex history of foreland intraplate deformation. The Paleozoic basement fabrics exerted a conspicuous role in the Mesozoic and Cenozoic deformation. The most important feature is an E-W striking fault system, associated with the Huincul basement high that truncates the basin, and related to a late Paleozoic orogeny, as a result of the accretion of the Patagonia terrane during Permian times. Based on 2D and 3D seismic coverages and subsurface information different sectors have been identified, which recorded alternating contraction and extension episodes.

The deformation east of the thrust front of the Agrío fold and thrust belt, is characterized by periods of transpression, almost orthogonal contraction, extension, and relative quiescence that alternate in different sectors. The analyses of the deformation histories of these sectors show the changing pattern of the stress orientation in each episode. The earliest shortening was produced in the Early Jurassic with the main stress oriented in the N-NW sector. The stress rotated to the northwest up to the Valanginian times, when a more orthogonal orientation to the continental margin was dominant, and prevailed after the Cenomanian times. After a period of quiescence in the Neuquén embayment, with strong oblique subduction during the Paleogene, final deformation took place in Late Miocene times with an orthogonal orientation of the main stress to the continental margin, followed by Pliocene extension. The changes in the stress patterns along time were correlated with the oceanic plate kinematic changes resulting in different orientation of the convergence vectors between the Aluk, Farallon, and Nazca oceanic plates and the Gondwana or South American continental plates.

The Aluk stage is characterized by tectonic inversion by shortening and right-lateral strike-slip concentrated in the Huincul system from Jurassic to Valanginian with subtle deformation in the Chihuidos and Entre Lomas systems. The Early Farallon stage shows a reduced inversion and displacement in the Huincul system, with a general retreat of the deformation up to the Valanginian times. This time marked the change to Late Farallon stage with prominent tectonic inversion in the Entre Lomas system, resulting from the inception of the Agrío fold and thrust belt in the retroarc area. This belt developed during most of the Late Cretaceous, when the embayment showed a general quiescence. The Nazca stage is related to the main episode of uplift, tectonic inversion of the previous halfgrabens and important strike-slip, followed by collapse of some selected structures during Pliocene times.