

Evolution of the Ecuadorian shelf fore-arc basins during the Neogene

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Along the Ecuadorian convergent margin, a dense dataset of industrial multichannel seismic reflection profiles (2009 SCAN cruise, SHE) is used to improve our understanding of the offshore fore-arc basins stratigraphy and their associated tectonic structures.

Based on the seismic interpretation, we recognize 5 seismic units (L1 to L5) above the acoustic basement (Ub) separated by 6 unconformities (U0 to U5). The analysis of their spatial distribution and their tectonic deformations reveals the presence of four margin-scale structural segments (North, Central-North, Central-South and South).

Along the shelf and upper margin slope, we identify several deformation stages, which contributed to the individualization of the margin segments:

- 1) An extensional stage is outlined by E-W and NW-SE trending normal faults in the offshore area between Cabo Pasado and Puerto Lopez. The faults were active during seismic subunit L1b deposition and deformed the basement and early fore-arc basin deposits of seismic unit L1a during the Lower Miocene.
- 2) A compressive and uplift stage resulted in the development of a N-S trending anticline offshore Manta peninsula, and the individualization by uplift of the Central-South Segment during seismic unit L2 incision and erosion phase at the Miocene-Pliocene boundary. The anticline is associated with the boundary zone between the Central-South and Central-North segments.
- 3) A Strike-slip deformation stage formed a localized NE-SW-trending flower structure offshore Cabo Pasado, during the deposition of the Pliocene seismic unit L3. This structure belongs to the boundary zone between the Central-South and Central-North segments. During this Pliocene deformation stage, the Central-North Segment was dominated by subsidence.
- 4) A compressive deformation stage produced a localized E-W trending structural high offshore Pedernales, during the deposition of seismic subunit L3b. This structure, which is spatially associated with a noticeable basement rise from the Central-North segment toward the north, marks the boundary zone between the Central-North and the North segments; the latter individualized during the Upper Pliocene.
- 5) A regional uplift stage modulated by localized deformation and subsidence affected the entire shelf. This deformation stage resulted in a series of well localized, and starved uplifted zones that alternate geographically with confined depocenters filled up by seismic unit L5 during the Pleistocene.

Potential causes and geodynamic processes responsible for these deformation stages include: (1) structural inheritance in the overriding continental crust due to the blocks tectonic accretion between Upper Cretaceous and Paleocene, (2) plate kinematic changes induced by the Farallon plate split during the lower Miocene, (3) the northward escape of the North Andean Sliver since the Mio-Pliocene accommodating the oblique convergence of the Nazca plate and finally (4) the influence of the Carnegie Ridge subduction.