



Crustal structure and tectonic deformation of the southern Ecuadorian margin

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Multichannel seismic lines acquired during the SISTEUR cruise (2000) provide new constraints on the structure and deformation of the subduction zone at the southern Ecuadorian margin, from the deformation front to the continental shelf of the Gulf of Guayaquil.

The pre-stack depth migrated images allows to characterise the main structures of the downgoing and overriding plates and to map the margin stratigraphy in order to propose a chronology of the deformation, by means of integrating commercial well data and industry seismic lines located in the gulf area.

The 100-km-long seismic lines show the oceanic Nazca plate underthrusting the South American plate, as well as the subduction channel and inter-plate contact from the deformation front to about 90 km landward and ~20 km depth.

Based on seismic structure we identify four upper-plate units, consisting of basement and overlaying sedimentary sequences A, B and C. The sedimentary cover varies along the margin, being few hundreds of meters thick in the lower and middle slope, and ~2-3 km thick in the upper slope. Exceptionally, a ~10-km -thick basin, here named Banco Peru basin, is located on the upper slope at the southernmost part of the gulf. This basin seems to be the first evidence of the Gulf of Guayaquil opening resulting from the NE escaping of the North Andean Block. Below the continental shelf, thick sedimentary basins of ~6 to 8 km occupy most of the gulf area.

Tectonic deformation across most of the upper-plate is dominated by extensional regime, locally disturbed by diapirism. Compression evidences are restricted to the deformation front and surrounding areas.

Well data calibrating the seismic profiles indicate that an important portion of the total thickness of the sedimentary coverage of the overriding plate are Miocene or older. The data indicate the extensional deformation resulting from the NE motion of the North Andean Block and the opening of the Gulf of Guayaquil, evolves progressively in age from the southern edge of the gulf near Banco Peru, where main subsidence seems to be Miocene or older, toward the northern limit, where high subsidence rates are early Pleistocene.