

Deformation of the continental shelf of Ecuador during the Quaternary and consequences on coastal evolution

C. Martillo¹, J.N. Proust², F. Michaud³, M. Muthre¹, J-Y Collot³

¹Escuela Superior Politécnica del Litoral (ESPOL), Grupo de Geología Marina y Costera, Facultad Ciencias de la Tierra, Guayaquil, Ecuador

²Université de Rennes, CNRS, UMR6118, Geosciences, F-35000 Rennes, France

³Université Côte d'Azur, IRD, CNRS, Observatoire de la Côte d'Azur, Geoazur, F06560 Valbonne, France

Advances in the techniques of seismic acquisition and interpretation provide the chance to explore with unprecedented details, at outcrop scale, the stratigraphy of the sedimentary basins preserved on active subduction margins. Moreover, when exploring the quaternary sedimentary record, the seismic stratigraphy analysis offers the access to climatically driven sedimentary events that can be tied to global chronological charts. Such a chronometer is an excellent tool that helps to untangle the tectonic history of active fore-arc domains. We propose here a detailed stratigraphic analysis of the Middle to Upper Pleistocene sedimentary cover of the central Ecuadorian Margin illustrating, at different scales, the link between the subduction of oceanic reliefs and the deformation of the continental shelf, influencing the coastal morphology.

In this study, we use data collected during the ATACAMES-2012 Campaign along the Ecuadorian margin, aboard of the French vessel L'Atalante. The set of data comprises high-resolution multi-channel seismic and bathymetry data and sediment cores.

The data show that the main sedimentary depocenters are located on the shelf and along the continental slope. The main basin on the shelf is located to the North of the margin, at the northern rim of the Carnegie Ridge, between Galera Point and Cabo Pasado. Its depocenter is 1.6 sec. TWT, i.e. ≈ 1600 m-thick, in front of Cojimíes. The slope basins are abundant in the central part of the margin, between Cabo Pasado to Salinas in front of the cities of San Vicente, San Lorenzo, Ayampe and Montañita-Salinas. They are usually small with an average thickness of 500 m.

In these basins we identified three groups of Transgressive-Regressive (TR) sequences bounded by unconformities of interregional extend (LTR, MTR and UTR). ¹⁴C age dating of sediment cores and correlation to well dated onshore exposures show that these 100kyrs and 40kyrs-long. The ages proposed for LTR sequences range from 1782 Ka (MIS 63) to 1.06 Ma (MIS 30), for MTR sequences from 1.03 Ma (MIS 29) to 0.81 Ma (MIS 20), and for UTR sequences from 0.790 Ma (MIS 19) to present (MIS 1).

The base of regional unconformity at the base of the LTR could corresponds a changes of relieve of the Carnegie ridge, which cause also the increment of subsidence in the Guayaquil Gulf at the southern side of CR and the inversion of the onshore "Canoa basin", which correlate in ages with the base of LTR. The unconformity at the base MTR base and the UTR may be related to the global eustatic-climatic changes.

The subduction of the Carnegie ridge seems to control the current coastal line, which mimics the platform behavior described above. Where the platform is uplifted, in the central Ecuadorian margin, the littoral appears uplifted too, while where the continental shelf presents main Pleistocene depocenters, like Cojimíes-Jama basins or Guayaquil Gulf basins, the littoral reveals a flatted coastal morphology with the presence of well-developed estuaries.