



Structure and physical properties of the subduction channel off the Gulf of Guayaquil (Ecuador) from seismic reflection data

A. Calahorrano B. (1,2), V. Sallarès (3), **J.-Y. Collot** (1), F. Sage (1) and C. Ranero (4).

(1) UMR Geosciences Azur, Villefranche sur mer, France, (2) Instituto Geofísico-EPN, Quito, Ecuador, (3) Unitat de Tecnologia Marina, Barcelone, Spain, (4) IFM-GEOMAR, Kiel, Germany, calahorr@geoazur.obs-vlfr.fr

This work focused on the southernmost Ecuadorian margin, off the Gulf of Guayaquil. We use multichannel seismic data acquired during the SISTEUR-2000 survey to image the subduction channel (SC) and inter-plate contact across ~ 97 km from the trench and down to ~ 20 km depth. A remarkable feature of the SC is its thickness variation, particularly below the margin's front where it is systematically thicker than the incoming sedimentary column. We suggest that these thickness variations may be due to heterogeneous distribution and nature of incoming sediment, as well as to basal and frontal erosion of the overriding plate.

P-wave velocity analysis performed during pre-stack depth migration of line SIS-72 provided an accurate velocity model over the first ~ 32 km of subduction down to a 8-km-depth. This model revealed that the velocity at the SC ($2800 \text{ m/s} \pm 150 \text{ m/s}$) is significantly lower than that of the overriding plate basement ($\sim 3800 \text{ m/s}$), and reflects the existence of fluid overpressures as high as $\sim 40 \text{ MPa}$ at 25 km from the trench down to a 4-km-depth. The overpressure parameter (λ^*), corresponding to the ratio of fluid overpressure and overburden pressure, allowed to identify three zones with different mechanical behaviours in the SC: **a)** at the margin's toe (up to 9 km from the trench), λ^* lower than 0.5 indicates an effective fluid drainage related to high permeability of the incipient young accretionary prism; **b)** between ~ 9 -25 km from the trench, λ^* increases to ~ 0.8 suggesting highly undrained sediments and fluid retention due to a low permeability, attributed either to the underthrust sediments,

the décollement or the overriding-plate basement. Such high fluid overpressure may induce hydrofracturation favouring basal erosion and subsequent thickening of the SC. It could also indicate low inter-plate friction and shear stress, preventing earthquake nucleation but favouring rupture propagation; c) Beyond 25 km from the trench, λ^* drops down to ~ 0.6 indicating that fluids are expelled, probably across ancient faults of the overriding-plate basement. In this zone, decreasing fluid pressures are likely to increase the inter-plate coupling. Consistently, this zone roughly coincides with the area in which the first diagenetic and low-grade metamorphic processes associated to the updip limit of the seismogenic zone occur. Analogous analysis was carried out on line SIS-18 situated 60 km northwards of SIS-72, showing a similar evolution of velocity along the SC, but higher velocity values at the trench consistent with the lateral heterogeneity of incoming sediments nature observed all along the margin.

Our analysis shows also a direct relationship between fluid pressures and reflectivity variations of the décollement, which could probably explain deeper reflectivity variations along the downdip subduction thrust.