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Crustal structure and tectonic deformation of the northern Chilean margin between 21 and 23.5žS

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During the CINCA'95 experiment several multichannel seismic (MCS) reflection lines were acquired offshore Chile, using a 3-km-long streamer with 120 channels and a 3,124 cc tuned air gun source. Here we compare three reprocessed consecutive lines (SO104-7, SO104-9 and SO104-13), perpendicular to the trench between 21 and 23.5žS, in order to characterise the structure and tectonics of this part of the margin. The three lines show a strong and continuous reflection corresponding to the top of the oceanic crust. This reflection is irregular, reflecting the roughness of the subducting Nazca Plate that results from (1) the NW-oriented pervasive fabric related with spreading during plate generation and (2) the NS horst-and-graben pattern that disturbs the oceanic crust with normal faults produced by bending as the plate approaches to the trench. The oceanic plate is practically deprived of sediments, and just a small accumulation can be observed within grabens. The top of the oceanic crust reflection, which is clearly observed below the margin until ˜50 km landward, preserves the horst-and-graben undulation after entering the subduction zone. As irregular topography subducts, basal tectonic erosion is likely to occur below the margin, damaging the bottom of the overriding-plate basement and removing upper plate material that will feed the subduction channel. The overriding plate show two slope breaks at ˜18 and 50 km constraining the upper, mid and low slopes. In the upper slope the sedimentary

coverage corresponds to a finely stratified thin layer that truncates in the upper slope break. The top of the overriding-plate basement is interpreted to be a strong reflection that separates the sediment package and a low-frequency seismic facies body displaying a coarser stratification. The presence of landward dipping normal faults perturbing basement and sediment evidences that the system is dominated by extensional tectonics. In the mid and low slope sediments are scarce, and normal faulting changes from land-dipping to sea-dipping oriented. Normal faulting and disparition of sediment coverage suggest mass wasting erosion of the frontal margin, and explains the presence of an incipient $<$10 km-wide sediment prism resulting from debris accumulation at the margin's toe.