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Seismic crustal structure of the Rivera subduction zone (western Mexican margin) between 19ºN and 21ºN

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Three thousand kilometers of multichannel (MCS) and wide-angle seismic profiles, gravity and magnetic, multibeam bathymetry and backscatter data were recorded in the offshore area of the west coast of Mexico and the Gulf of California during the spring 1996 (CORTES survey). The seismic images obtained off Puerto Vallarta, Mexico, in the Jalisco subduction zone extend from the oceanic domain up to the continental shelf, and significantly improve the knowledge of the internal crustal structure of the subduction zone between the Rivera and North American (NA) Plates. Analyzing the crustal images, we differentiate: (1) An oceanic domain with an important variation in sediment thickness ranging from 2.5 to 1 km southwards; (2) an accretionary prism comprised of highly deformed sediments, extending for a maximum width of 15 km; (3) a deformed forearc basin domain which is 25 km wide in the northern section, and is not seen towards the south where the continental slope connects directly with the accretionary prism and trench, thus suggesting a different deformational process; and (4) a continental domain consisting of a continental slope and a mid slope terrace, with a bottom simulating reflector (BSR) identified in the first second of the MCS profiles. The existence of a developed accretionary prism suggests a subduction–accretion type tectonic regime. Detailed analysis of the seismic reflection data in the oceanic domain reveals high amplitude reflections at around 6 s [two way travel time (twtt)] that clearly define the subduction plane. At 2 s (twtt) depth we identify a strong reflection which we interpret as the Moho discontinuity. We have measured a mean dip angle of 7 ± 1 at the subduction zone where the Rivera Plate begins to subduct, with the dip angle gently increasing towards the south. The oceanic crust has a mean crustal thickness of 6.0–6.5 km. We also find evidence indicating that the Rivera Plate possibly subducts at very low angles beneath the Tres Marias Islands.