# Deciphering the tectono-stratigraphic evolution of the East Pisco Basin (southern Peru): new insights from the geological mapping of its central portion

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The Cenozoic fill of the East Pisco Basin (EPB) preserves the sedimentary record of several episodes of deformation of the forearc crust along the Peruvian margin. The 1:50,000 scale geological map presented here covers an area of about 1,000 km$^2$ lying astride the Ica River and, by establishing a first-order tectono-stratigraphic frame for the exposed mid-Eocene–upper Miocene succession, contributes to our understanding of the timing and mode of basin filling and deformation.

In the study area, deposition initiated onto the PaE0 nonconformity during the middle Eocene time and continued under an extensional regime until early Oligocene time, with a break in deposition recorded by the OE0 unconformity separating the Paracas and Otuma sequences (megasequence P). During this time interval, a single forearc Pisco Basin extended between an offshore outer forearc high and the Western Cordillera. An Oligocene relative sea-level fall, probably resulting from a combination of tectonic inversion and multiple events of eustatic lowstand, led the Pisco Basin to become subaerially exposed. Evidence for this phase of deformation is recorded by the conspicuous CE0 angular unconformity interposed between megasequences P and N.

The oldest normal fault populations documented here consist of NNW- and ENE-trending faults largely predating the CE0 erosional hiatus. This widespread extensional faulting was accompanied by the exhumation of the Outer Shelf High-Coastal Cordillera, which segmented the earlier, Paleogene Pisco Basin into the present-day inner EPB and outer West Pisco Basin. Different tectonic processes have been invoked to explain the Oligocene uplift of the extensional Peruvian forearc basins and formation of the Outer Shelf High, including crustal thickening by underplating at an erosive margin or inversion by propagation of basement-rooted, west-verging thrust faults.

By earliest Miocene time, uplift ceased and subduction erosion and thinning of the overriding plate resulted in renewed subsidence, rise in relative sea level, and marine transgression over the CE0 unconformity with deposition of the lower Miocene Chilcatay and middle to upper Miocene Pisco composite sequences (megasequence N). The early Miocene phase of extension and associated subsidence was followed by a late Miocene contractional tectonic event, with shortening being accommodated by: (i) oblique-slip (reverse plus dextral) reactivation of inherited NE-trending extensional faults, and development of associated fault-parallel hanging-wall anticlines; and (ii) renewal tectonic uplift of the southwestern basin margin, as suggested by the fanning geometry of the northeast-dipping strata of the Pisco composite sequence and their progressive onlap on top of the basement towards the northeastern, internal margin of the basin.