

Quaternary active tectonic deformation of the transgressive surface offshore Ventura, CA, constrained by new geophysical data

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ABSTRACT (Max. 2000 characters with spaces)

The Transverse Ranges are a thrust-and-fold belt that accommodates the contraction resulting from a regional restraining bend in the San Andreas fault. The E-W trending Ventura basin, which is filled by more than 5 km of Pleistocene sediment, is shortening at about 10 mm/yr as inferred from geodetic data. Although the geological structure is fairly well known in the onshore areas of the basin, there is still discussion about how the different onshore thrust and folds continue in the offshore, and the deep relationship between the main faults. New high-resolution seismic data (chirp) was acquired in the area, that when combined with existing geophysical information, allows for a better understanding of the current activity of geological structures in the offshore. The dense seismic dataset allows us to identify different latest Quaternary seismostratigraphic units and horizons, with the most regionally recognized being a transgressive surface (LGTS) associated to the Last Glacial maximum and subsequent sea level rise. This surface is cut across and deformed by a series of E-W regional folds that produce elongated and parallel highs and depressions, and some emergent faults. Below the LGTS there is Early to Late Pleistocene units that are deformed by high amplitude regional folds and some local faulting. Above the LGTS we have identified progradational and aggradational units that are related to global sea level rise, and which show less deformation (folding and faulting) than the lower units and horizons. Based on our analysis of the entire dataset, we have mapped the late Quaternary active structures in the offshore Ventura basin, which leads us to propose a new deep structural geological model of the basin. In addition, a preliminary interpretation of some specific fold growth sequences has allowed us to identify different tectonic deformation events (e.g. earthquakes) and, thus, their deformation history may be determined.