Presentation format: Poster presentation

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Presentation title: New high-resolution seismic data reveals the Holocene active structures and deformation events in offshore Ventura basin, CA.

Key words: Active faults, Submarine paleoseismology, Ventura Basin

Abstract (max 2500 characters):

During the last 2-5 Ma, the Transverse Ranges (Southern California) have been subject to a N-S compression related to the formation of a regional restraining bend in the San Andreas Fault and resulting in the development of an E-W trending thrust-and-fold belt system. The eastward striking Ventura basins and its offshore extension, which is filled by more than 5 km of Pleistocene sediment, cross the western Transverse Ranges. The analysis and inversion of GPS data reveal a north-south convergence at 7–10 mm/yr and fast contraction rates along the Ventura Basin. Although the different thrust and folds are fairly well known in the onshore areas of the western Transverse Ranges, there is still uncertainty about their continuation in the offshore. The analysis of dense seismic dataset consisting in new high-resolution (SIO CHIRP) and existing (USGS mini-sparker and chirp) profiles and covering the zones close to the coastline has allowed us to characterize better the active geological structures in the offshore Ventura basin. In the dataset, we have identified two different seismostratigraphic units separated by a regional erosional unconformity, which corresponds to a transgressive surface (LGTS) associated to the Last Glacial Maximum and subsequent sea level rise. The LGTS developed over the Pleistocene units at 10-8 ka BP and since then it has been uplifted and folded. We interpret this deformation as probably related to blind thrust and backthrust faults. Below the LGTS, there are the Early to Late Pleistocene units, which are folded (anticlines and synclines) and being some of them also associated with the folding of LGTS. Above the LGTS, there is the Holocene unit, which presents an irregular distribution and thickness and shows less deformation (folding and faulting) than the LGTS and Pleistocene units. Based on the correlation of the identified faults and folds between the different profiles, we have been able to tie them to the main fault systems mapped onshore, the Pitas Point, the Red Mountain, and the Mesa Rincon Creek faults, and to the Ventura-Avenue anticline. Furthermore, we have interpreted between 3 and 5 different Holocene deformation events (i.e. earthquakes) on the different structures due to the recognition of anticline scarps, growth strata sequences, onlap unconformities and erosion surfaces in the Holocene unit.

Select category: Earthquake Geology

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