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SEGMENTATION IN THE PALOS VERDES FAULT, SAN PEDRO BAY, AND DETACHMENT ATTENUATION WITHIN THE INNER CONTINENTAL BORDERLAND, OFFSHORE SOUTHERN CALIFORNIA

High-resolution seismic reflection data in San Pedro Bay reveal many asperities that divide the Palos Verdes fault (PVF) into at least four distinctive segments along strike from Los Angeles Harbor to Lasuen Knoll, some 25 km south. These four segments are characterized by different degrees of fault complexity, presence of associated folds and minor faults, evidence of Holocene activity, and alternating transpressional and transtensional tectonics. Our data also indicate temporal variation; a late Miocene transtensional episode was succeeded in Repettian time by transpression.

The current PVF is the product of a complex history involving detachment from the overlying plate, and transform “slivering” of the Inner Borderland (IB) as it was partially captured by the Pacific plate. Although the PVF offsets Catalina Schist basement, it appears not to penetrate the entire thickness of the IB, and may be rooted in one of a series of stacked detachment faults within the Catalina Schist. This relatively shallow nature of the PVF may be related to the many asperities discussed above, and to the fact that the PVF slip rate diminishes from 3 mm/y to 0 going north into Santa Monica Bay. Segmentation of the fault may be related to detachment attenuation within the IB as it was extracted from the subduction zone. Complex stacked detachment structures with listric normal faults rooted in them could have played a role in segmenting the upper basement prior to the onset of extensive local slip faulting.