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USING PETROLEUM INDUSTRY 3D SURVEYS TO IMPROVE UNDERSTANDING OF ACTIVE OFFSHORE FAULTS: THE PALOS VERDES FAULT IN SAN PEDRO BAY, LOS ANGELES BASIN, CA

The Palos Verdes fault forms the western boundary of the Los Angeles Basin. Although predominantly offshore, it is close to many densely populated portions of the Los Angeles metropolitan area. We use industry 3D seismic survey (244 km², CDP spacing 24.6 m inline, 50.3 m cross-line) combined with three shallow 2D lines (16 channel, 0.95 s depth, 3.125 m CDP spacing) to map the Palos Verdes fault in San Pedro Bay. The shallow geometry (< 3.0 s two-way travel time) of the fault is mapped in detail with timing provided by reflectors tied to known stratigraphic boundaries using well logs.

We observe five distinct fault segments in the area of the 3D survey. Each segment consists of one primary strand that is near vertical to at least 3.0 s two-way travel time, and one to five secondary strands forming a zone that varies from 700-2400 m width. Several of these fault strands break latest Quaternary sediment, and are associated with bathymetrically observed deformation at the surface. Deformation character at fault bends is consistent with a right-slip dominated fault zone. Seismic reflections of growth and no-growth sequences are seen above anticlines to the west of the fault, and in the Quaternary deposits of the Wilmington Graben to the east of the fault imaged in the 2D surveys. These local changes of deformation style may be associated with lateral movement of sediment along bends in the changing 3D geometry of the main fault strand.