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Productive Large Scale Folding Associated with Igneous Intrusions: El Trapial Field, Neuquen Basin, Argentina

El Trapial is the second largest oil field of the Neuquén Basin, having accumulated 31.2 MMm³ oil (195.6 MMBO) since its discovery in 1991. Production comes from the Lower Troncoso and Avilé fluvial and aeolian sandstones, two lowstand deposits of Cretaceous age.

El Trapial field is part of a rim of productive domes that surround the Cerro Bayo igneous complex. This series of peripheral bulges was generated by Tertiary sills and dikes that intruded the Jurassic and Cretaceous section, thickening and updoming the host strata. The main feeding conduit for the intrusives might be located beneath the Cerro Bayo igneous complex. Individual domes are enclosed by arcuate faults which, in turn, are dissected by linear, radial faults. Semicircular faults display reverse sense of displacement in cross-section, whereas radial faults are generally extensional. Many of these structural lineaments are in fact subtle, subvertical fractures without, or with sub-seismic throw. However, these faults and fractures can act as fluid barriers, because some of them are filled with igneous material and because reservoirs are thin (< 25 m). Thus, detailed structural mapping is required to define reservoir compartmentalization and to plan and monitor secondary recovery.

The complex pattern of intersecting, semicircular and radial faults is best imaged in plan view. Horizon slices and time slice animation of seismic attribute cubes are key tools to visualize this peculiar structural style. Dip, edge, amplitude, and semblance maps properly image the arcuate faults, whereas spectral decomposition (phase and amplitude volumes) significantly enhances radial fault definition.