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Plate Tectonic Control of Structural and Basin Development, Northern South American Fold-Thrust Belt

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Abstract

Most fold-thrust belts are driven by the convergent component of relative motions at plate boundaries. Oblique convergence produces fold-thrust belts with coeval boundary-parallel strike-slip systems. Such transcurrent faults can allow isostatic adjustments within the orogen and adjacent flexed foreland areas by severing the link between them. Variation in convergence can permit periods of transtension within the longer-term convergence.

The Cenozoic paleogeographic evolution of the dextrally-obliquely convergent plate boundary producing the northern South America fold-thrust belt shows these elements: (1) timing of arc-continent collision is accurately predictable from plate motion histories, useful if local geology is complex or poorly known: the point of Paleocene-Recent "collision" between the dextrally-converging Caribbean arc and South American passive margin progressed westward from Colombia to Trinidad, driving diachronous foreland-basin formation; (2) the position of peak subsidence and HC maturation associated with thrusting, the line of stratal onlap beyond the foredeep basin, and position and effect of the peripheral bulge are predictable from relative plate motions, matching local geological elements and events; (3) the distribution and character of source rock units, and provenance and character of sandstone reservoir units, can be clarified from palaeogeographic modelling that uses relative plate motions; (4) transition from transpression to transtension and consequent isostatic rebound can be predicted from relative plate motion history, and these motions can create entirely new basins (Falcon), and arrest maturation in others (Maracaibo, East Venezuela basins), and (5) subtle changes in relative motion can cause significant changes in structural style and stratal accumulation (Maturín Basin).

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