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A Tale of Two Diapirs: The Effects of Shortening on Passive Growth

El Papalote and El Gordo diapirs have similar dimensions and are located 5 km apart in La Popa Basin, northeastern Mexico. Structural and stratigraphic studies of exposed Campanian to Eocene strata show important differences between the two that we relate to variable effects of tectonic shortening during passive diapiric rise. Although most contractional deformation occurred after deposition of the youngest units, minor shortening commenced in the Maastrichtian.

El Papalote is located on a major fold limb and has experienced approximately 100 m of net shortening, whereas El Gordo is along the axis of the same fold and has accommodated over 2 km of shortening. The corresponding halo of diapir-related drape folding, which is at most 800 m wide at El Papalote and up to 2 km wide at El Gordo, created bathymetric highs that are reflected in the thicknesses and facies distribution of surrounding strata. Sandstone units start thinning within 300-800 m of the edge of El Papalote but within 1000-1500 m at El Gordo. Carbonate lentils that formed over the bathymetric highs are shallower, thicker, and broader and record fewer halokinetic sequences at El Gordo than at El Papalote.

The data from La Popa Basin and seismic examples from the northern Gulf of Mexico show that passive diapirs have higher and wider areas of bathymetric relief when they are being shortened than when they grow only by downbuilding. Distinguishing between shortened and simple passive diapirs thus provides a tool for better assessing reservoir risk in salt-flank settings.