Geometric and Kinematic Tests of Contractional Fold Models Using Some Exceptional Natural Examples

by Randall A. Marrett, University of Texas at Austin.

A wide variety of geometric models have been introduced to aid the interpretation of folds in the subsurface of fold-thrust belts, but the models have received little kinematic validation. Fragmentary data describing the geometry of a specific prospect-scale anticline typically can be modeled equally well using several different models, each of which implies a distinct kinematic development of the fold. The non-uniqueness of any interpretation in such cases results in two problems. First, an inadequate understanding of fold development limits the degree that one anticline favorably imaged by seismic profiling may be used to guide the interpretation of other anticlines or even the same anticline along strike. Second, without an understanding of fold kinematics, the impact of fold-related deformation on reservoir quality cannot be confidently assessed.

In order to study the applicability of fold models to natural folds, we have been using growth strata and strain markers to constrain fold kinematics in several exceptional surface and subsurface examples: the Monterrey salient and San Julian uplift of the Sierra Madre Oriental, Mexico; the Sardinero and Catemaco folds in the southern Neogene belt of Mexico and the Reed Wash fold train in the Cordilleran belt of Utah. Preliminary results from these folds suggest that the kinematic development of geometrically analogous folds may be different, and that the predictive capability of our geometric models is quite limited.