COMPARISON OF REGIONAL-SCALE THROUGH OUTCROP-SCALE SHORTENING ACROSS THE SANTA MARIA BASIN, CALIFORNIA: IMPLICATIONS FOR TECTONIC HISTORY AND RESERVOIR GEOLOGY

Yannick Wirtz
Geological Sciences, California State University, Long Beach, Santa Monica, California
ywirtz@earthconsultants.com

The Santa Maria basin (SMB) in California underwent a complicated tectonic history from Miocene basin development to the formation of a fold and thrust belt by several phases of north-south shortening. Accurate quantification of structural deformation in the SMB is essential to unraveling the tectonic history of the California active plate margin and test models of major block movements and rotations. Namson and Davis (1988) quantified shortening across the basin by balancing regional-scale cross-sections. However, examination of outcrop-scale structures of Miocene rock units in the southern SMB and preliminary quantification of map-scale structures show that there is significant internal deformation and shortening within structural panels that were assumed to maintain constant volume in the reconstruction. The objectives of this study are to assess the quantitative contribution of map-scale and outcrop-scale structures at the southern boundary of the SMB to existing balanced cross-sections and evaluate how failure to measure these smaller scales affects the assessment of the regional deformation and tectonic history. Namson and Davis used surface mapping and well data to create a regional-scale balanced cross-section across the SMB. Their 7.4 km part through deformed Monterey and Sisquoc rocks in the study area measures 6.6 % of total shortening. Preliminary quantification of map-scale structures, provided by geologic maps, contributes an additional 8.9 % of shortening to the regional-scale cross-section suggesting a total deformation of 15.5 %. Structural mapping and restoration of continuous outcrops will document how much deformation at outcrop-scale will be further additive to the map-scale.

AAPG Search and Discovery Article #90249 2015 Grants-in-Aid Projects