Composition and Diagenetic Controls of Bed- to Formational-Scale Deformation in Siliceous Sedimentary Rocks, Santa Maria Basin, California

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Abstract

The distribution and intensity of deformational patterns in fault related folds of siliceous sedimentary rocks are generally controlled by time-transgressive interplays of sedimentation, kinematic history, burial diagenesis, and thickness of competence contrasting stratigraphic layers at different scales. Structural surface analysis of the primarily diatomaceous Sisquoc Formation and the chiefly cherty/porcelanitic Monterey Formation in the southern Santa Maria basin, CA documented significant strain variation along fold strike due to competence contrasting layers at formational scale. At outcrop-scale a variety of structural responses within alternating mechanical packages showed that even in a single anticlinal structure fold kinematics may be dramatically different in various positions of a stratigraphic section. In other words, qualitative characterization of reservoir rocks in structural traps may differ dramatically over short stratigraphic distances that are difficult or impossible to capture if not integrating surface observations. Structural surface studies, outcrop photographs, and cross-sections serve as examples that observations made at the surface can be used to reinterpret deformation in the subsurface that is not always easy to capture by just using geophysical data.

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