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Sequence Stratigraphic and Diagenetic Controls on Trap Development of a Miocene Diatomite-Sandstone Reservoir, Lost Hills Field, San Joaquin Basin, California

Trap geometries of Monterey Formation (Miocene) reservoirs at Lost Hills field, San Joaquin basin, California result from superposition of diagenetic surfaces on the sequence architecture of a tectonically active basin margin. Coarsening-upward parasequences of diatomite and sandstone in the Belridge, Antelope, and Brown shale zones of the Monterey were deposited on an anticline with paleotopographic expression. Deflection of sand-rich flows around this paleohigh resulted in diatomite accumulation on the crest, with clay and sandstone on the flanks.

Burial diagenesis changed porous (50-65%) Opal A phase diatomite at Lost Hills to lower-porosity (25-40%) Opal CT. Subsequent transformation during deeper burial to brittle chert created 2,000 ft (600 m) of non-reservoir Opal CT with Opal A diatomite above and fractured chert (quartz-phase) reservoirs below. Because diagenesis postdates anticlinal growth, diagenetic surfaces separating Opal A from CT, and CT from Quartz intersect more steeply dipping stratigraphic surfaces. Thus, Opal A diatomite (upper reservoir) wedges out along the southward plunge of the anticline due to crosscutting of three unconformity-bound depositional sequences in the Belridge diatomite by the underlying A-CT surface. On the anticlinal crest, detrital clay inhibited diagenesis in a condensed section of Antelope diatomite, thereby encasing porous clayey diatomite (middle reservoir) in non-reservoir Opal CT. On the SW flank, the CT-Quartz surface cuts across strata onlapping an incised valley in the lower Brown shale, thereby trapping fractured quartz-phase sandstones (lower reservoir) below the surface by CT-phase rocks above. Thus, the reservoir architecture reflects stratigraphic, structural and diagenetic controls.