occluded by later equant intergranular cements. Grainstones in each sequence were subject to at least 2 phases of facies-selective dolomitization. The earliest phase mimicked the preexisting texture, whereas the later phase was texture-destructive with rhombic dolomite crystals.

Dolomitized grainstones have highest porosities and permeabilities resulting from calcite dissolution and physical compaction. Calcite dissolution within ooids occurred after the second dolomitization phase; thus, oomoldic porosities are not related to meteoric leaching during or after Smackover deposition. Subsequent physical compaction enhanced permeability. Later, partial porosity occlusion was by anhydrite calcite.

Dolomitization was caused by refluxing brines during deposition of the overlying Buckner evaporites. Dolomite $\delta^{13}C$ values are compatible with Smackover/Buckner seawater; $\delta^{18}O$ values become lighter with time, a probable function of dolomitization during progressive burial. A change to coarse clastic sedimentation coupled with syn-Buckner faulting modified the hydraulic regime of the area. This may have been the stimulus for calcite dissolution and hence porosity development within the Smackover grainstones.

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Structural Characteristics and Evolution of Vicksburg Formation: Javelina and East McCook Fields, Hidalgo County, Texas

The major structure at Javelina and East McCook fields is a decollement surface on the Jackson Formation. Movement along this glide plane was contemporaneous with sedimentation and has resulted in extreme rollover (up to 50°) and great vertical and horizontal displacement of overlying Vicksburg sediments. Changing rollover trends observed in dip logs of lower Vicksburg strata, and structure of this glide plane surface demonstrate its listric nature both updip and along strike.

Structure within the Vicksburg Formation is dominated by 3 major listric, normal growth faults. The faults penetrate the entire Vicksburg section, which is over 8,000 ft (2,438 m) thick. These faults have significantly affected Vicksburg deposition, as the entire section expands more than 40% or 2,500 ft (762 m) across the field. Expansion ratios for individual units are higher. Structural displacement and complexity of the section increase with depth, with stratigraphic throws greater than 2,000 ft (610 m) in deeper Vicksburg beds. Fault drag is commonly observed in dip logs. Antithetic faulting is conspicuously absent.

Structural evolution of the Vicksburg was controlled by formation of a diapiric shale ridge updip early in Vicksburg deposition. Diapiric uplift resulted in evolution of a major growth fault on the basinward shoulder of the ridge. Once initiated, the fault maintained itself throughout Vicksburg deposition and resulted in decollement on, or within, Jackson shales. Development of this fault aided in formation of the other 2 growth faults. Formation of these faults was also related to movement along the glide plane, shale diapirism, and sediment-loading stresses.

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Thermal and Hydrocarbon Maturation Models for Coastal California

Hydrocarbon maturation models for coastal California must consider thermal and geochemical constraints imposed by plate tectonics, diagenetic reactions, and the sedimentation history of the region.

Plate tectonism drastically effects the thermal history of California basins in many ways. Initially, temperatures in the crust of coastal California are suppressed during subduction of the Farallon plate. With the passage of the Mendocino triple junction, subduction ceases and a void is created into which asthenosphere moves. This elevates temperatures in the basins in a complex manner depending on the time of passage of the Mendocino triple junction and the location of a specific basin. Finite-difference numerical models were developed to approximate the thermal effects of subduction and lithospheric upwelling.

Diagenetic reactions and sedimentation history affect both the maturation model and thermal history of a basin. Diagenetic reactions through time in the Miocene Monterey Formation may change thermal conductivity values by 70%. Facies changes also have an important effect on sediment thermal conductivity and hence sediment temperatures.

Maturation models indicate varying levels of maturity depending on the method used. Models using the Time Temperature Index of Lopatin indicate the lowest level of maturity. Tissot and Espitalie's method, which uses multiple activation energies and varying constants for the kerogen types, results in an intermediate level of maturity. The highest level of maturity results from the use of the Tissot and Espitalie method modified by using a single activation energy of 178.69 kJ mole^{-1} and a constant of 4.92×10^{13} hour^{-1} as reported by M. D. Lewan for shale from the Phosphoria Formation.

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Origin of High-Permeability Reservoirs in Upper Minnelusa Sandstone (Permian) Powder River Basin, Wyoming and Montana

Petrographic analysis of samples from 8 Minnelusa cores from Campbell County, Wyoming, and Powder River County, Montana, reveals that high-permeability reservoirs (up to 3,200 md) are the result of extensive dissolution of early precipitated gypsum or anhydrite cement. The Minnelusa reservoirs are in eolian sandstones (dune and interdune facies) that are very fine to coarse-grained, moderately to bimodally sorted quartzarenites, subarkoses, and sublitharenites. Dune and interdune sandstones exhibit differences in detrital mineralogy that are the result of postdepositional dissolution of labile grains.

The most common cements in the sandstone are anhydrite (0-30%), quartz overgrowths (0-10%), dolomite (0-10%), kaolinite (<5%), and illite (<1%). Most cementation occurred during the pre-Jurassic when the sandstones were buried less than 1,500 ft. The porosity network within the sandstone is a combination of primary and secondary porosity created by the dissolution of anhydrite cement. Burial history curves suggest that anhydrite dissolution occurred during the Late Jurassic to Early Cretaceous, when the top of the sandstones was still near the surface. During this time, 3 periods of uplift and erosion occurred in which meteoric waters undersaturated in calcium sulfate may have flowed through the sandstones. The distribution of the reservoirs is probably controlled by the regional structure during the periods of flushing.

Dune sandstones are the most productive facies in the high-permeability reservoirs. Porosity in the dune facies averages 21% compared with an average of 9% in the interdune facies. This difference is the result of both lower depositional porosity and greater quartz and dolomite cementation in the interdune sandstones. Porosity loss due to mechanical compaction is similar for both facies.

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Joint Geosat-NASA/JPL Test Case Program: Field Evaluation of Future Geological Satellite Remote-Sensing Systems

The principal industrial users of land-observation satellite systems are several hundred oil and gas, mining, and engineering or environmental companies worldwide. The primary system used is Landsat/MSS (Multispectral Scanner), the data from which are now used operationally as an improved geologic mapping tool to help direct more expensive geophysical surveying and drilling, thus assisting exploration decision making. Use is also made of SKYLAB photography, SEASAT and SIR-A (Shuttle Imaging Radar) radar, and the new Landsat/TM (Thematic Mapper) data. Industrial use will soon be made of data from France's SPOT (1985), India's IRS (1986), the European Space Agency's ERS (1987), Canada's RADARSAT (1990), and Japan's JERS (1991) remote-sensing satellites.

Data representing these systems were evaluated during the 7-yr, $10-million joint Geosat Committee-NASA/JPL Test Case Program. Begun in 1977, the objective of this program was to assess, in known geologic areas, the value of existing and potential satellite remote-sensing methods for petroleum exploration, mineral exploration, and engineering geology applications. The published study includes an evaluation of sensors, data-processing techniques, and interpretation methods.

Some conclusions include the following. The Landsat/TM combines the visible and very near Infrared (IR) spectral bands of the MSS, with the shortwave IR 1.6-2.2 μm band region, which can indicate the presence of clays, carbonates, and sulfates. This system allows greater rock and soil discrimination than the MSS alone. Similarly, the TM bands demonstrate numerous, as yet little understood, geobotanical anomalies clearly related to leaking gas over oil and gas deposits. Landsat data, as well as that