by sparry calcite. More recent episodes of cementation have left some gravitational voids.

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Influence of Various Fold Mechanisms on Fold Geometry in Growth Faulted Areas

Growth faults and associated folds are the dominant structural features along many passive margins, including the U. S. Gulf Coast. Most of the exploration effort in these areas is directed toward prediction of fold geometry and location of fold crests. Previous attempts to explain geometry have focused on only one folding mechanism per fold. A new concept presented in this paper is that multiple folding mechanisms are operative and variously contribute to the geometry of each fold. Recognition of the dominant fold mechanism enhances prediction of fold geometry.

Folding caused by growth faulting, or tectonic folding, causes fold crests to shift basinward with depth. Drape compaction causes vertical alignment of fold crests, and differential compaction puts fold crests in the area of greatest sandstone percentage. Folds dominated by tectonic folding lie within the concave trace of growth faults. Tectonic folds bulge upward above regional dip, a phenomenon here termed "upfolding." An isopach of an interval above an upfold reveals thickening in all directions away from the fold crest. If upfolds have sufficient relief, shallower layers may align vertically due to the dominance of drape compaction. Subsurface studies of gas fields along the central Texas Gulf Coast provide examples of the contribution of various mechanisms to a single fold. Separating the contribution of fold mechanisms aids in prediction of fold geometry and has important implications for hydrocarbon exploration.

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Stress Release, Joints, and Instability on Submarine Slopes

Mass movements related to gradual stress release within a sediment section may be quantitatively important on submarine slopes, particularly when such stress release involves joint sets. The sequence of events that promotes this phenomenon has been established by numerous terrestrial studies. The process involves: (1) mass wasting or erosion to remove vertical stress (overburden) or lateral stress (such as through canyon cutting); (2) consequent elastic rebound of the unloaded section; and (3) opening of existing joints and/or formation of new joint sets. The presence of joints, which constitute planes of weakness within the sediment section, controls and reduces the stability of the affected slope; that is, the stability of the slope may no longer be dependent on the inherent strength of the sediments.

The results of this process have been observed on the continental slope off the Mid-Atlantic coast of the United States. There, exposed Tertiary sediments have a well-developed joint pattern that has been observed in sidescan-sonar images, from submersible operations, and in a piston core. The measured preconsolidation stress on an Eocene core sample suggests that more than 100 m (330 ft) of overburden may have been removed from parts of the area. Intact Eocene blocks, which represent apparent failure along joint planes, have fallen from canyon walls on the lower slope and moved onto the upper rise.

We suggest that this process has the potential to operate on most deeply eroded surfaces and that exhumed (overconsolidated) sediments do not necessarily represent stable conditions despite their typical relatively high shear strengths.

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Sedimentary Processes Along Sagavanirktok River, Eastern North Slope, Alaska

The Sagavanirktok River is the second-largest river on the North Slope of Alaska (drainage basin area = 14,364 km^2, 5,500 mi^2; length = 267 km, 165 mi). Maximum discharge recorded during the spring breakup was 2,320 m^3/sec (82,000 cfs); flow ceases during the winter freeze. The river flows through terrain underlain by continuous permafrost ranging up to 300 m (1,000 ft) thick. It is a coarse-gravel, braided river that is degradational through most of its length, becoming aggradational on the last 20 km (12 mi) of delta plain. The active channels contain longitudinal bar complexes and large transverse bars, including T-bars at the ends of chutes incised into the inactive fluvial plain. Chutes form during spring breakup owing to blockage of the river by ice from icings (aufeis), or by ice drives that jam and direct the river laterally onto the inactive fluvial plain.

Relict fluvial systems also exist as terraces elevated 10-30 m (30-100 ft) above the active river. This terrain contains wind-aligned lakes developed in the permafrost active layer. Next to the terrace scarp is an eolian levee composed of silt and fine sand derived from the active river.

Numerous small, high-gradient alluvial fans have formed along hills adjacent to the lower alluvial plain. Coarse gravel is transported downfan to the Sagavanirktok River primarily by debris flows that have prominent sieve lobes at the ends of U-shaped channels. The flows are fed by spring runoff, melting of ground ice during the thaw season, and by ground-water-fed springs (small icings).

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Petrography and Diagenesis of Upper Smackover Formation (Oxfordian), Atlanta and Pine Tree Fields, Southwestern Arkansas

The upper Smackover Formation (Oxfordian) in Atlanta and Pine Tree fields is a regressive, shallowing-upward sequence that was deposited on the upper part of a carbonate ramp that sloped gently to the south. Low-relief salt anticlines active during upper Smackover deposition led to the localization of high-energy grainstones.

In the study area, the upper Smackover is divided into the following rock types: (1) bioclast-oncoid-ooid grainstone, (2) sandy ooid grainstone, (3) sandy peloid-ooid grainstone, (4) sandy calcareous shale, and (5) well-sorted ooid grainstone. The 5 rock types represent deposition in subtidal to supratidal environments.

The upper Smackover was affected by diagenesis in the marine-phreatic, freshwater-phreatic, freshwater-vadose, and late-burial diagenetic environments. Early cementation in the marine-phreatic and freshwater realm preserved primary interparticle porosity. Dissolution of unstable minerals in the freshwater realm created secondary porosity. Preservation of porosity during late-burial diagenesis was controlled by 2 sedimentologic factors: (1) presence of abundant detrital quartz, and (2) sorting. Porosity was also affected by late-burial cementation.

Atlanta and Pine Tree fields are productive from the upper Smackover Formation and the Schuler Formation. In Atlanta field, the producing zone in the well-sorted ooid grainstone is a structural-stratigraphic trap. The producing zones in the bioclast-oncoid-ooid grainstone in both Atlanta and Pine Tree fields are structural traps.

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Characteristics of Mississippi Fan Sediments, DSDP Leg 96

Sedimentologic, paleontologic, geochemical, and geotechnical studies were conducted on cores drilled at eight sites on the Mississippi fan during the Deep Sea Drilling Project Leg 96. Together with seismic and well log data, these studies allow development of a number of depositional facies within an overall fan-lobe model. The central middle-fan channel of the youngest Mississippi fan-lobe was an effective conduit for the transport of coarse-grained material; only clays and minor amounts of silt spilled over the channel margins. The channel fill deposit is basically an upward-fining sequence, commencing with coarse-grained sands and gravels, overlain by sands, sandy-silty muds, and muds. The basal coarse-grained sediment interval is approximately 134 m (450 ft) thick. The swale deposits, the overbank deposits adjacent to the meandering channel, and the marginal overbank deposits, are characterized by fine-grained turbidites and hemipelagics. Basically, both sites contain a minor upward-coarsening sequence.

Deposits on the lower fan, in the area where the channel shifts position frequently, show alternating sequences of channel fill, levee, and over-