bedding, telescoping of mudcracks, and anastomosing wispy argillaceous seams. Pervasive compaction in peloidal grainstone is evidenced by warping and cracking of internal layers that are outlined by wispy seams. Ooid and skeletal grainstones and algal bioherms do not show these compaction features.

Time lines in these Cambrian-Ordovician carbonates converge across depositional strike from east to west, and this coincides with a change in facies from shelf-margin algal bioherms and grainstones showing little compaction to lagoon-peritidal mudstones with abundant compaction features. Volume reduction by compaction is clearly facies controlled and also has influenced the geometry of the time lines.

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Initiation and Reactivation of Proterozoic Aulacogen, Northern Mexico

Geochemical and petrologic affinities of late Proterozoic (~1Ga) bimodal igneous rocks of the Franklin Mountains, west Texas, suggest a rift origin. Scattered occurrences of similar rocks southward into the state of Chihuahua, Mexico, indicate a southerly trend for the feature. The feature is bounded by stable blocks: the stable craton of west Texas to the east and northeast, and the Sierra del Nido block to the west and southwest. Separation of the Sierra del Nido block from the craton occurred about 1 Ga. Gravity gradients mark the boundaries of the blocks, and a northwest-trending Bouger gravity high may mark the axis of the aulacogen. The aulacogen and the Sierra del Nido block are truncated to the south by the Mesozoic Mojave-Sonora discontinuity.

The aulacogen was reactivated, at least in part, in the late Paleozoic as the Pedregosa basin and in the Mesozoic as the Chihuahua trough. These reactivations were apparently not full-fledged rifting events, but did result in basin development. The Sierra del Nido block was a paleographic high throughout the Paleozoic, and the Aldama platform developed on this block during the Cretaceous. The most recent reactivation of the aulacogen is as the southern extension of the Rio Grande rift, as evidenced by trends of high heat flow, recent mafic magmatism, and regional extensional faulting.

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Carbonate Dissolution During Late-Burial Diagenesis of the Terumbu Limestone (Miocene), East Natuna Basin, South China Sea, Indonesia

The Terumbu Limestone is the reservoir for 200 tcf of gas (72% CO_2) in the Esso D-alpha block, offshore Indonesia. During the middle to late Miocene, 5,000 ft (1,500 m) of platform-reef carbonates were deposited. These limestones have a complex diagenetic history determined from study of 960 ft (290 m) of core from 3 wells.

Partial marine cementation and micritization of grains occurred in platform environments during deposition. Freshwater diagenesis followed, presumably below subaerial unconformities within and at the top of the Terumbu. Aragonitic grains were leached, high-magnesium calcite grains were converted to low-magnesium calcite, and pores were partially cemented by low-magnesium calcite. Pressure solution and further cementation during burial of the Terumbu to 10,000 ft (3,000 m) left only minor amounts of preserved primary and moldic porosity.

During late burial, grains that were originally high-magnesium calcite were leached, forming "interpenetrating" pores and stylolites "floating" within pores. Ferroan-calcite and dolomite cements line these pores and fluorite crystals occlude many pores. Whole-rock stable isotopes are depleted in O^{18} (-8.0 ‰ δO^{18} PDB, 0.0 ‰ δC^{13} PDB), suggesting high-temperature alteration of carbonate. The isotopic composition of the CO_2 in the reservoir is similar (-0.8 ‰ δC^{13} PDB), suggesting this CO_2 is derived from dissolved Terumbu Limestone. We envision that fluoride-bearing hydrothermal fluids, derived from the underlying granitic basement, selectively dissolved constituents in the deeply buried Terumbu.

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Stratigraphic Dipmeter Interpretation—Fort Worth Basin Submarine-Slope Systems

Submarine-slope systems pose several exploitation problems. Previous Dipmeter interpretation techniques using the standard Dipmeter with CLUSTER (mark of Schlumberger) processing are highly successful in fluvial to deltaic sequences, but lack accuracy in the anastomosing depositional environment associated with submarine-slope systems. Both the delineation of individual depositional units and the precise trend determination of each are essential for optimum exploitation. A new interpretation technique has been devised to provide accurate and consistent answers to these problems. The technique involves the use of multiple logging passes and detailed stratigraphic correlation to provide a paleocurrent and depositional analysis.

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Correlating Organic Facies and Turbidite Facies in a Hoh Turbidite Sequence (Miocene), Western Olympic Peninsula, Washington

The distribution of organic facies is a function of the environment of deposition. Within each turbidite facies, diverse depositional regimes are present that affect both the preservation and dispersal of organic matter. Proper identification of turbidite facies can lead to a proper prediction of organic content within a particular turbidite facies or turbidite facies association.

The type section of the Brown's Point formation, a turbidite sequence within the Hoh rock assemblage, demonstrates the correlation between organic facies and turbidite facies, as defined by E. Mutti and F. Ricci-Lucchi. Turbidite facies can be matched to organic facies throughout the entire 4,000 ft (1220 m) thick vertical section. Outer and middle fan turbidite associations have been analyzed and correlated for organic facies lateral continuity.

Distribution of organic carbon concentrations and organic carbon types suggests a dominance of terrestrial input. TAI and R_o analyses reflect a marginally mature thermal maturation level (R_o = 0.5-0.6). Visual kerogen inspection reveals a mixed to structured kerogen with a predominance of type III/IV over type IV kerogen. Overall, maturation indices suggest a gas source with poor source potential for oil. Individual turbidite facies display a significant relationship to the amount, type, and level of maturation of organic matter present within each facies and facies association.

Frontier basin analysis of turbidite sequences can be expedited by proper field identification of turbidite facies and subsequent geochemical analysis of the content, type, and maturation level of the organic matter present within each turbidite facies.

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Diagenetic Destruction of Primary Reservoir Porosity in Viola Limestone, South-Central Oklahoma

The Viola Limestone in south-central Oklahoma is a Middle and Upper Ordovician carbonate unit interpreted as being deposited on a carbonate ramp within and peripheral to the Southern Oklahoma aulacogen. Depositional environments within the study area ranged from anaerobic deep ramp through aerobic middle and shallow ramp. TOC analyses of the lower anaerobic deep-ramp facies suggest that, at least locally, the Viola is a potential hydrocarbon source rock. Detailed petrographic examination of the Viola indicates that primary porosity in the shallow-ramp skeletal packstones and grainstones was initially quite high. This combination of source potential and original porosity should make the Viola an attractive target for hydrocarbons in southern Oklahoma. The Viola, however, has been subjected to a complex sequence of diagenetic events that have extensively altered the sediments and occluded much of the primary porosity. A thorough understanding of the timing and nature of these events can be critical in evaluating the economic potential of the Viola.

Petrographic evidence combined with the use of cathodoluminescence indicates that several generations of calcite cementation occurred within the shallow-ramp packstones and grainstones. An initial phase of very early, possibly synsedimentary, marine cementation is evidenced by cloudy, inclusion-rich syntaxial cements on echinoderm fragments. This early phase of cementation was followed by several generations of clear syntaxial calcite, prismatic calcite, blocky mosaic calcite, and bladed mosaic calcite, all of which indicate changes in the pore-water chemistry after precipitation of the inclusion-rich cements. This phase of meteoric-