faults coincide with the regional onshore (Willimar) trend oriented subparallel with the coast. Most are down-to-basin faults, but up-to-basin faults also occur.

Some topographic highs on the seafloor apparently formed by differential erosion of zones preferentially cemented by fluids migrating along fault planes. Seafloor expression of diapiric structures with radial faults is negligible; however, surface sediments near these structures exhibit subtle changes, which suggests minor differences in slope. Quaternary sediments, specially fluvial sediments, were also locally controlled by faulting.

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Late Holocene Depositional History of Regressive Barrier Island—Kiawah Island, South Carolina

Kiawah Island is an anomaly among barriers along the United States East Coast. Whereas most barriers today are actively eroding and transgressing landward, Kiawah displays a history of seaward progradation. The island is composed of a series of parallel beach ridges, which are morphologic evidence of a period of long-term accretion.

To examine the Holocene stratigraphy of Kiawah Island, 35 core holes were drilled to an average depth of 12.9 m into underlying compact Pleistocene clays of the Talbot Formation. The Holocene stratigraphy is a regressive sequence of environments with fine-grained, rooted, trough and planar cross-bedded beach-ridge, berm, and washover sands overlying burrowed, laminated, interbedded silts and clays. Faunal analysis suggests a shoreface to continental-shelf depositional environment for the *Mulinia*-rich silts and clays that comprise the lower half of the Holocene section. Carbon-14 dates of shell, wood, and peat material indicate a history of seaward progradation and beach-ridge development over at least the past 2,500 to 3,000 years. In contrast, the most landward beach ridge consists of a very thin (3.0 to 4.5 m) Holocene section of leached, poorly sorted, fine to coarse-grained sands capped by a poorly developed soil profile suggesting that this beach ridge represents the initial or primary barrier deposited during an earlier transgressive phase of history for Kiawah Island prior to 3,000 years B.P.

Understanding the unique depositional history of regressive barrier islands is especially significant in that these barriers have the highest potential for preservation in the rock record.

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Sedimentology, Petrology, and Geotectonic Properties of Athabasca Oil Sands, Alberta

No abstract available.

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Sedimentology, Petrology, and Geotechnical Properties of Athabasca Oil Sands, Alberta

The Athabasca oil sands deposit is not only one of the largest petroleum reservoirs in the world (870 billion bbl of oil in place), it is virtually the only supergiant oil accumulation that can be examined at outcrop. Sedimentologic and petrographic knowledge, gleaned both from the outcrop and from many subsurface cores, has direct and immediate implication for surface mining and in-situ reservoir engineering.

Most of the Athabasca reserves are contained in the Lower Cretaceous McMurray Formation, a 40 to 100-m-thick sequence of uncemented quartz sandstones and associated shales, saturated with heavy oil in virtually all zones where there is significant primary porosity and permeability. Through most of the deposit region, sedimentation was dominated by fluvial and related depositional systems, culminating in the localized development of very large channels in which were deposited distinctive solitary sets of epsilon cross-strata up to 25 m thick.

Insight into the characteristic facies patterns of the McMurray Formation sediments has important applications in surface mining; for projecting high-grade trends and locating prospective mine sites; for predicting variations in reservoir grade and designing mine layout accordingly; for identifying natural discontinuities (e.g., the sloping epsilon beds) that adversely affect pit high-wall stability; and for numerous other engineering uses. In the subsurface, detailed knowledge of the reservoir facies is of critical importance: in outlining the geometry of steam- or fire-flood patterns; in selecting zones which optimally may be treated with solvents, emulsifiers, or heat in order to establish inter-well communications; in identifying permeability barriers that can be exploited to contain a given stimulation flood; and, given the current context of fledgling experimental technologies, in explaining what went wrong in specific pilot programs.

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Late-Stage Subsurface Dolomites—Problems of Origin

The origins of most secondary dolomites are difficult to determine. Currently, many secondary dolomites are being interpreted as resulting from the mixing of fresh and marine waters in the phreatic zone (Dorag model), although no situations are known from the Holocene and Pleistocene, where widespread and complete dolomitization has occurred.

In some sequences, coarse, well-crystallized dolomites are the last significant diagenetic event to have occurred, postdating the main stages of cementation and lithification.

In areas where there is no evidence of evaporites of supratidal dolomites, and the geologic and diagenetic histories have been worked out in detail (as for some isolated Devonian reef complexes in Alberta), the following evidence supports an origin from compacting subsurface brines: (1) late-stage formation of dolomites and their transection of earlier burial cements and stylolites; (2) insufficient subaerial exposure during deposition and early burial for extensive Dorag-type dolomitization; (3) geochemical and isotopic data; and (4) burial by relatively impervious calcareous clays, pre-

venting downward percolation of fresh waters during periods of exposure and erosion in younger, overlying strata.

The transection of stylolites indicates that dolomitization took place at moderate depths of burial, from 500 to 1,000 m or greater.

The only fluids available for dolomitization during intermediate burial were subsurface brines released from adjacent and underlying compacting strata, a model first proposed by L. V. Illing. Detailed information on the diagenetic and geologic histories is needed before the origin of secondary dolomites can be interpreted widely.

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Dissolved Hydrocarbons in Coastal Waters of North America

No abstract available.

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Coorong Model for Penecontemporaneous Dolomite Formation in Middle Proterozoic McArthur Group, Northern Territory, Australia

Many types of penecontemporaneous dolomites have been explained in the literature by involving the well-known sabkha model. The various carbonates now precipitating in the ephemeral lakes of the South Australian Coorong Lagoon are the products of a more humid climatic and hydrologic regime. The distribution of carbonate rocks in the Coorong region is largely controlled by the hydrology of the depositional environment. Both primary and early diagenetic mineralogy can be related to regional hydrology as it has varied throughout the Quaternary. Characteristic sedimentary structures (including stromatolites) are formed in specific parts of the Coorong system, and these can be confidently identified in an ancient analogue, the 1,600-m.y.-old Yalco Formation of the McArthur Group of Australia. The resemblance between the ancient and modern environments, in terms of both sedimentary structures and mineralogy, is striking. The following conclusions can be drawn from the comparison:

1. All penecontemporaneous dolomites are not necessarily formed in an arid sabkha environment; a significant number may be formed in a more humid environment analogous to that of the Coorong, in which distinct climatic and seasonal factors prevail.

2. The lack of evaporite minerals or evaporitic casts in an ancient dolomite sequence does not mean that concentrated brines were never present. In the modern Coorong system, minor evaporite minerals are precipitated in the dolomite lakes during dry summer months, but are flushed out during winter by a reflux mechanism.

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Seismic Facies and Depositional Processes of Modern Off-Platform Carbonate Rocks in Northern Bahamas

Seismic facies analyses of more than 1,200 km of high-resolution air-gun seismic reflection profiles, combined with sedimentologic data from 150 bottom samples, and observations from submersibles, have resulted in correlation of reflection patterns with sedimentary facies for various off-platform carbonate environments in the northern Bahamas. Divergent to oblique progradational reflection patterns have been recorded from large (100 km × 50 km × 600 m) carbonate-sediment drifts of well-sorted fine sands off the northwest corners of both Little (LBB) and Great Bahama Bank (GBB). These drifts have been constructed since the middle Miocene by contour-following near-bottom flow of the Florida Current with velocities of up to 50 cm/sec and greater. Discontinuous subbottom reflections were observed at the base of the slope south of LBB and were found to correlate with proximal turbidites. An even, parallel, continuous subbottom reflection pattern is typical of basinal areas of pelagic oozes, deposited uniformly over wide areas, interbedded with thin, distal turbidites.

Large-scale (1 to 5 km across) mounded, chaotic to contorted-discordant reflection patterns were observed predominately on the upper slope south of LBB and appear to be indicative of large slumps. Smaller scale (less than 0.5 km across), mounded, chaotic reflection patterns, however, were found to correlate with in-situ constructional deep-water bioherms (lithoherms) found at the base of the slope west of LBB. Chaotic reflection patterns are common on upper slopes and are interpreted as a highly variable sediment gravity-flow and slump facies. Lenses of wavy, subparallel, chaotic reflectors found on the slope north of GBB are interpreted as channelized debris-flow deposits.

Recognition of similar reflection patterns from ancient off-platform limestone sequences may be useful in the seismic stratigraphic interpretations of paleo-environments and lithofacies.

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Application of Potential Field Data to Structural Interpretations in Idaho-Wyoming Thrust Belt

The integration of gravity and magnetic data is used to aid the determination of the structural configuration along a regional profile in the Idaho-Wyoming thrust belt. The magnetic data can be used for depth estimations of the crystalline basement. At the eastern limit of the thrust belt, the crystalline basement is conformable with the overlying autochthonous sediments. In this area, the magnetic data suggest that basement structures are present beneath the leading thrust sheet and thereby provide an attractive potential for hydrocarbon accumulation. Toward the west, the leading thrust cuts down to the basement so that structures indicated by the magnetic data are essentially of the basal decollement. Seismic data indicate that the allochthonous sediments above the decollement are essentially concordant with the basement; therefore, structures determined by