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-