sets of avalanche cross-stratification, cuspate cut-and-fill structures, and antidune cross-stratification also characterize the lower Sespe conglomerate facies. These features all indicate a braided stream model for lower Sespe deposits.

Steep gradients during lower Sespe deposition are suggested by: (1) clast size data (average maximum clast size = 41 cm), (2) a predominance of upper flow regime structures (85% of all structures measured), and (3) high consistency ratios (mean consistency ratio = 0.78) of paleocurrent data.

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Eustatic Sea-Level Control of Silurian (Niagaran) Reefs, Michigan Basin

Eustatic sea-level changes controlled Niagaran reef and off-reef facies and eogenesis both in the Michigan basin and on the adjacent platform, as shown by surface (Thornton, northeast Illinois; Pipe Creek Jr., central Indiana) and subsurface reef studies (Onandaga, south Michigan). We recognize four stages of development defined by alternating highstands and lowstands of sea level. (1) During Llandoverian-Wenlockian time, a highstand resulted in growth of reefs with 10s to 100 m depositional relief with a basal stromatactis mudstone facies capped by volumetrically dominant crinoidal wackestone to grainstone-coral boundstone facies. Reef growth was below wave base and was characterized by extensive submarine cementation. (2) A relative fall of sea level in the late Wenlockian caused a saline brine to develop in the restricted Michigan basin, halting pinnacle reef growth and resulting in A-1 Evaporite deposition and anhydrite replacement of reef fossils and sediment. This fall of sea level did not expose the shelf or bring reef tops above wave base. It may be expressed in the surface reefs as distal megabreccias containing normal marine stromatoporoid-coral-*Renalcis* fauna and in the subsurface reefs (basin) by a hiatal break. (3) A Ludlovian-Pridolian highstand resulted in basinal reef rejuvenation (stromatoporoid-algal boundstone facies and followed by the stromatolite facies) and dissolution of replacement anhydrite. The deep-water basinal A-1 Carbonate was deposited at this time. (4) A subsequent lowstand (Pridolian?) resulted in basinal hypersalinity, cessation of pinnacle reef growth, and A-2 Evaporite deposition.

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Canadian "Deep-Water" Carbonate Deposits: Distinction from "Analogous" Siliciclastic Deposits and Their Hydrocarbon Potential

"Deep-water" carbonates accumulate by gravitational processes which have many similarities to, but important differences from, those responsible for "analogous" siliciclastic deposits. For example, recently there has been much emphasis on the accumulation of "deep-water" siliciclastics in submarine channel-fan complexes. In contrast to this type of point source origin, carbonate basin slopes are mainly the result of processes from shelf and slope-centered linear sources, and processes from basin water-mass-centered area sources. The resulting carbonate slope accumulation is most commonly a debris apron which has a geometry and petroleum potential that is distinct from a fan.

Much of the worldwide petroleum interest in deep-water carbonates is in chalks which in the last 100 million years have become the major type of deep-water carbonate accumulation. However, in Canada almost all of our major deep-water carbonates are Paleozoic or older and, therefore, we are confronted with mainly hemipelagic slope deposits and peri-platform talus. There will be no new advances in understanding the process of accumulation of these latter types of basinal carbonate deposits until the premise that the processes and their resultant deposits are identical to those responsible for similar siliciclastic deposits is examined critically. An understanding of the obvious differences, combined with recognition of interactions between carbonate processes and process sets and of the factors that modulate carbonate process systems, leads to a more realistic understanding of the resulting "deep-water" facies and the physical and chemical controls on diagenesis.

The spectrum of Canadian deep-water carbonate basinal slope deposits which will be discussed cannot be integrated into one single model. Four major depositional facies models will be presented which are dependent on the nature of the adjacent margins (by-pass versus depositional) and type of margin sediment (reef versus lime sands). These models can be distinguished as separate seismic facies. Still other models are possible, underlining both the complexity of this type of carbonate accumulation and the challenge involved in its exploration, especially in the frontier areas.

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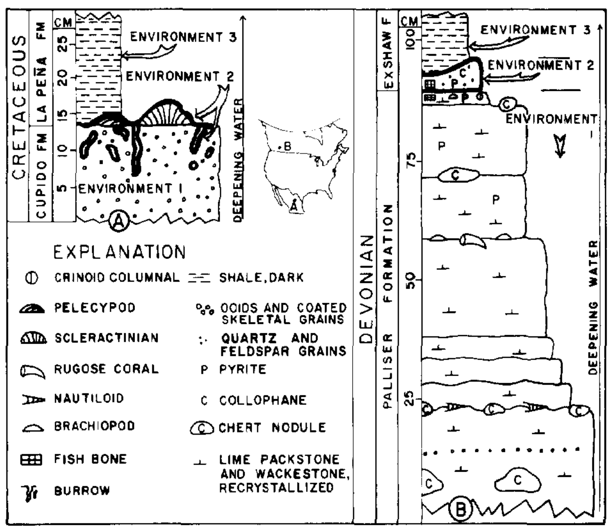
Comparison of Two Enigmatic Contacts: Palliser-Exshaw, Devonian, Southwestern Canada, and Cupido-La Pena (Cretaceous), Northeastern Mexico

In both the Palliser-Exshaw and Cupido-La Pena sequences, uncommonly sharp contacts separate carbonate bank deposits from overlying dark shales. Three environments discernible in each sequence may be attributed to gradual deepening of water during detrital influx.



At Potrero de la Mula, Coahuila, the uppermost Cupido consists of poorly sorted, oolith lime grainstones (environment 1). Abundant filled scolecoid burrows 1 to 2 mm in diameter extend 8 cm down into the Cupido from the iron-stained upper surface on which occur gastropods, pelecypods, and unabraded, hemispherical scleractinian colonies (environment 2). Dark shales of the La Pena Formation (environment 3) rest on this surface. Environment 1 was an active shoal with a shifting substratum which may have been stabilized as a result of deepening water (environment 2) permitting occupancy by corals and small burrowers. Bypassing prevented sedimentary accumulation except for