sea level through time to trends in sedimentation in the oceans. For example, sea level lowstands are expected to result in increased supply of both detrital and chemical (biogenic) sediment to the deep sea. Thus, shelf unconformities, resulting from exposure and erosion of shelf sediments, should correlate with relatively high rates of sedimentation and low incidence of hiatuses in the deep sea. Global sea level highstands would have the opposite effect. The co-occurrence of widespread shelf and deep-sea unconformities, as found in the Oligocene and lower Paleocene contradicts such simple models. These and other examples show that terrigenous and biogenic sediment flux to deep-sea basins is not totally dependent on relative sea level, and that there are commonly significant time lags in the response of deep-sea sedimentation to changes in sea level and shelf sedimentation. Rates of rise and fall of sea level, however, are a major determining factor. Additionally, global and regional climate and overall patterns of oceanic circulation, fertility, and chemistry are equally important in controlling sediment supply to the deep sea and in the development of sedimentary lacunae in deep marine basins.

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Evolution of Lower Permian Oolite Shoal in Northwest Anadarko Basin

The Lower Permian (Wolfcamp) Council Grove B-zone in the northwest part of the Anadarko basin in Ochiltree County, Texas, is represented by two carbonate rock types: (1) bioturbated oolitic bioclastic wackestones; and (2) cross-stratified oolite grainstones. These oolite and oolitic facies are underlain and overlain by bioturbated argillaceous bioclastic wackestones.

A Council Grove B-zone isopach map indicates that the oolite shoal has an east-west depositional strike. The presence of north-south-trending tidal bars and channels superimposed on the oolite shoal suggest that the tidal currents responsible for the formation of the oolite flowed north and south. A transverse cross section reveals that the base of the oolite facies is stratigraphically higher in a southward direction, indicating that the direction of maximum tidal flow and/or storm surge and direction of oolite progradation was to the south. Paleogeographic time slice maps from a lower datum reveal that the oolite shoal initially formed as two isolated shoals which were superimposed on prominent structural highs. These shoals later merged and prograded southward.

After deposition, the shoal was exposed to early, freshwater phreatic diagenesis, as indicated by oomoldic porosity and equant calcite cementation. Later diagenesis resulted in bladed anhydrite and coarse baroque dolomite partly filling oomoldic porosity.

Oomoldic porosity results in conventional log-derived water saturations (S_W) that are often overly optimistic. Therefore, to adequately evaluate oomoldic reservoirs using logs, the Production Ratio Index ($PRI = S_{W\ sonic} \times \phi_{neu\text{-}den}$) should be used to predict the ratio of hydrocarbon to water production.

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Flysch-Type Agglutinated Benthic Foraminifera and Maestrichtian to Paleogene History of Labrador and North Seas

Virtually identical agglutinated (arenaceous) benthonic foraminiferal assemblages (ca 30 genera, 45-50 taxa), characteristic of the Alpine-Carpathian flysch basins, occur in the Upper Cretaceous–Paleogene fine-grained clastic (?turbidite) sequences of the East Newfoundland basin, Labrador and North Seas. The assemblages terminate in both areas in the late Eocene or Oligocene although, in the central (deepest) part of the North Sea, elements of this flysch-type fauna have been observed extending into lower or middle Miocene levels.

Independent geologic evidence indicates that these assemblages have an extensive (paleo)bathymetric distribution (< 200 m to > 4 km). Depth alone is not considered a significant factor in their occurrence. In marginal basins, we favor a model which involves relatively rapid deposition of organic rich, fine-grained clastics under somewhat restricted bottom-water circulation conditions, leading to lower pH and low positive or negative eH at the sea floor. The disappearance of the agglutinated assemblage in all but the deepest part of the North Sea may have been due to the shallowing of the basin by sediment infilling resulting in shallower, more oxygenated conditions.

On the Canadian margin, decreases in clay and organic carbon content are associated with the exit of the agglutinated assemblages. In contrast, in the deep Labrador Sea (Site 112), lithology and percent organic carbon are relatively constant across this faunal change. This suggests that, at least in the deep sea, these properties may not be critical to the development of predominantly agglutinated assemblages. We suggest that the exit of agglutinated assemblages in the deep Labrador Sea was due to a change in hydrographic properties associated with the evolution of the psychrosphere. Sedimentologic evidence indicates initiation of northern sources of vigorous bottom water in the late Eocene-early Oligocene which may explain the exit of agglutinated foraminifera. This circulation change resulted in the influx of higher oxygen bottom waters and a lowering of the CCD which may have favored the replacement of predominantly agglutinated assemblages by calcareous assemblages.

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Subtle Stratigraphic Traps in Paleozoic Rocks of Paradox Basin

Significant quantities of petroleum occur in stratigraphic traps of Devonian, Mississippian, and Pennsylvanian age in the Paradox basin. Devonian reservoirs are isolated marine sandstone bodies; the Mississippian and Pennsylvanian traps are biohermal carbonates. Exploration in the past has proven the reservoirs to be elusive and relatively unpredictable, but the realization that the subtle traps are localized on paleostructures simplifies exploration and has led to several recent discoveries.

The tectonic framework of the Paradox basin, which includes a northwesterly series of major basement rifts and a subordinate series of northeast-trending fractures, was already set by late Precambrian. The basin was repeatedly rejuvenated throughout the Paleozoic. Vertical movements along the basement fractures were sufficient to alter sedimentary facies during Cambrian, Late Devonian, and Mississippian throughout the basin. These Paleozoic elements served to localize reservoir facies by creating shoaling conditions that produced Devonian offshore sandbars, Mississippian crinoid banks, and Middle Pennsylvanian algal bioherms.

Algal bioherms grew over subtle paleostructures along the southern and western margins of the Paradox basin in Middle