that is, alteration products of crude oil. This interpretation is further supported by microscopic examination revealing fracture-infilling by bituminous material. Finally, uranium was provided by ground waters rather than by concentration due to the oil-pyrobitumen transition.

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Clastic Lacustrine Sedimentation in Triassic of Southwestern Colorado

Very fine sandstone and mudstone facies of the Upper Triassic Dolores Formation of southwestern Colorado provide evidence for shallow lacustrine deposition coeval with clastic lacustrine systems of the Dockum Group in Texas. Dolores and Dockum lakes had frequent water-level fluctuations; however, Dolores lakes were filled primarily by shoreline sequences, in contrast to the delta-filled Dockum lakes.

Typical Dolores shoreline sequences fine upward, are laterally continuous over 3 km, are 5 to 15 m thick, have sharp nonerosional planar bases, and grade upward from very fine sandstones into mudstones. The very fine sandstones contain wavy, 1-cm thick bedding; low-angle trough and planar tabular cross-bedding; and isolated symmetrical channels. The overlying silty mudstones are commonly intensely bioturbated. These fine-grained shoreline deposits suggest that weak longshore currents distributed sand away from distributary mouths, and/or that sediment was transported by flow across the low-gradient, lake-margin plain.

Frequent subaerial exposure of these shoreline sequences is documented by abundant desiccation-cracked and rain-textured mudstone drapes, and by well-developed caliche profiles. During low stages of Dolores lakes, distributary channels locally prograded across and sometimes incised into the shoreline sequences. These symmetrical channels, 8 to over 50 m wide, commonly contain basal mudstone-clast/caliche-pebble conglomerates and were abandoned episodically as indicated by alternating beds of very fine sandstone and mudstone. Lake-edge distributary channels contain fillings of wave-reworked, wavy-bedded to rippled very fine sandstone.

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Cenozoic Radiolarian Paleogeography of Eastern Pacific

Along the east Pacific margin two dominant factors influence the distribution of planktonic radiolarians: east boundary ocean currents and the physiography of the southern California borderland. The east boundary current system is mainly wind driven on the surface and geostrophically controlled at depth. It is stratified into distinct water masses owing to differences in salinity, temperature, and current direction. The California borderland is a unique geomorphic province of successive basins and ridges with local circulation patterns. These factors influence present-day radiolarian assemblages but have also influenced such assemblages during the Cenozoic.

Nassellarian and spumellarian radiolarians reflect the temperature and depth of the water masses at the time of deposition. The California borderland serves as an environment similar to, yet distinct from, the boundary currents. Thus, this area seemingly has isolated species and increased their chance for allopatric speciation. These borderland species would eventually have been dispersed into the equatorial region.

Samples studies are from the DSDP Sites 33, 77, 173, 289, 468, and 469, where deposition was influenced by east boundary currents, and from the U.S. Geological Survey dart-core samples from the southern California borderland, to trace the development of the water masses through time. Once the dynamics of the water masses is determined, speciation and extinction events may be more easily postulated. Whereas previous investigations have dealt with present-day circulation, this study is the first attempt to map the influence of the dynamic current systems through time.

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Shelf Break on Modern Passive Margins: Structure, Sedimentation, and Progradation

The time-integrated structural-stratigraphic configuration of the shelf-to-slope break of many modern margins records the interplay of tectonics, submarine erosion and/or depositional processes. A simple process-response model may be used to help interpret the variations of shelf-break configuration and progradational patterns of passive continental shelves. The key factors are (a) the amount and nature of the sedimentary flux (F) provided to and across the shelf, and (b) the depth at which particles come to rest (H), which is largely a function of the local hydrodynamic and boundary layer conditions and of the grain size and density of the particles being transported. By maintaining factors F and H as constants, we can evaluate the role of structural displacement and importance of the relative position of the shelf surface to sea level in the development of the shelf-to-slope configuration.

In places where a shelf subsides, or when there is a demonstrable eustatic rise while an ample sediment supply is provided, a sediment layer may accumulate over much of the shelf; excess seaward-transported sediment will accumulate at and beyond the shelf break. If a shelf remains relatively stable or if there is an appreciable eustatic drop in sea level, much of the sediment can bypass the shelf and will accumulate beyond the shelf break, on the slope, rise, and abyssal plain. As equilibrium is attained, we can expect that D (shelf depth) $\leq$ H on a continental shelf, and D $>$ H on a continental slope. Thus, in this example, H becomes coincident with the depth at the shelf break.

The model is tested at shelf-slope interfaces on the Tuscany and Ligurian margins in the western Mediterranean, and on the Iberian margin in the eastern Atlantic. Seismic profiles indicate that the structural-stratigraphic configuration and progradational patterns at shelf breaks observed on subbottom profiles are variable. We correlate this variability with age and tectonic development of a margin, and thus with the successive structural stages through which a passive margin evolves.

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Past and Potential Mass Movement on Continental Slope Off Northeastern United States

Although evidence of mass movement is common on continental slopes, the importance of mass movement as a geologic process in most slope areas remains unknown, and questions concerning the likelihood of future events are still largely unanswered. Accordingly, the U.S. Geological Survey