radiolarian assemblages and their position on the shelf, as well as radiolarian density and diversity can be used to identify winter, spring, and fall physical oceanographic conditions on the south Texas shelf. Radiolarians can also be used as indicators of physical oceanographic conditions in studies of ancient shelves.

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Anoxic Sedimentation in Eagle Ford Group (Upper Cretaceous) of Central Texas

Anoxic conditions prevailed during Eagle Ford deposition. Environmental indicators include the generally dark color of Eagle Ford shale, millimeter laminations, a general absence of infauna, authigenic pyrite, and the high ratio of pelagic to benthic fossils. Benthic fossils are rare and are represented mainly by the bivalve *Inoceramus* and the foraminifer *Cibicides*. In marked contrast, pelagic fossils occur abundantly. Particularly distinctive are the foraminifers *Globigerina* and *Heterohelix* but ammonites and fish scales also occur.

The Eagle Ford Group exposed along the Balcones fault zone in central Texas is subdivided into two formations. The older formation is the Lake Waco Formation consisting in ascending order of the Bluebonnet flags, Cloice Shale, and Bouldin flags Members, and the younger is the South Bosque Shale. The South Bosque Shale is brown to dark gray or black. This contrasts markedly with the fissile, thinly laminated dark gray shales that characterize the Cloice. Interbedded thinly laminated shale and millimeter laminated, pelletal mudstone are typical of the Bluebonnet and Bouldin Members.

The vertical sequence is interpreted to represent a single transgressive-regressive event with the deepest water conditions existing during deposition of the Cloice. We suggest that minimum water depths during deposition of the group were 60 to 100 ft (18 to 30 m) and that the anoxic conditions resulted from a combination of water depth, upwelling, and possibly silled conditions due to the San Marcos arch.

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Provenance and Diagenesis of Clay Minerals in Sediments from Anclote River and Anchorage, West-Central Florida

Surface and subsurface sediments from a small river basin and lagoon (the Anclote River system in west-central Florida) were examined by X-ray diffraction methods to reveal the factors controlling clay minerals distribution in paludal (swamp), fluviatile, estuarine, and nearshore marine environments.

In the swamp environment, smectite is the predominant clay mineral in surface sediments. Relative concentration and crystallinity of smectite increase with a corresponding decrease in kaolin minerals (including kaolinite, halloysite, and kaolinite-montmorillonite mixed-layer) from the surface down the cores indicating kaolinization is prevalent in the upper swampy sediments. In the fluviatile environment, clay minerals in surface sediments are transported from upper stream swamps and mixed with the residual clays of the bed rock. Subsurface clay minerals in the Tampa Limestone are mainly illite with minor amounts of smectite. In downstream estuarine surface sediments, smectite decreases while chlorite, chlorite-vermiculite mixed layer, and illite increase. This change results from the combined effects of tidal inflow and transport by the river as indicated by the study of suspended sediments in this area. The relatively high concentration of smectite in the subsurface sediments of the lower Anclote River, an estuarine environment, suggests that the distribution pattern of clay minerals in this area may have been affected by the lower stand of sea level during the last glacial period.

Clay mineral assemblages in the Anclote Anchorage are a combination of residual sedimentary clays mixed with riverborne and marine clays. The uniformly distributed clays indicated a mixed and reworked environment (by current and wave) rather than one formed by a uniform, single source.

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Response of Bottom Waters on West Louisiana Shelf to Transient Wind Events and Resulting Sediment Transport

The predominantly longshore near-bottom currents in 10 m of water off the southwest Louisiana coast exhibited seasonal variability. Currents in winter were primarily westward, although easterly currents were generated rapidly by cold-front passages. Velocities increased during the spring, and the current motion was to the south-southwest as stratification developed and mechanisms other than the wind became active in the shallow waters. The summer current regime was characterized by slow, easterly motion in response to generally west and southwest winds.

Sediments were entrained by wave action and bottom currents during transient wind events, such as summer storms, winter cold-front passages, and persistent southeasterly wind events during the spring. The summer storm and spring wind events transported sediments to the west at a rate of approximately 30 km/day. Sediments suspended in early winter were moved east and west by bottom currents, but little net transport occurred. Frontal passages in March and early April transported suspended sediments more than 250 km to the west.

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Early Precipitation of Authigenic Clay by Meteoric Water, Pictured Cliffs, San Juan Basin, New Mexico and Colorado

The Pictured Cliffs, which is exposed around the San Juan basin in New Mexico and Colorado, was deposited in a variety of nearshore environments during the last of a series of major regressions of the Cretaceous epicontinental seaway. The Pictured Cliffs is a prolific producer of natural gas. The permeability of the Pictured Cliffs sandstones decreases from the southwest to the northeast, apparently in response to a progressive increase in the amount of authigenic grain-coating clay to the northeast. Gas-production trends are oriented parallel to depositional strike and cut across present-day structure contours. Thus, it appears that most of the authigenic clay was precipitated before the formation of the San Juan Basin.

Oxygen and hydrogen isotopic analyses of eight samples from different parts of the basin suggest strongly precipitation of the clays by meteoric water. The early precipitation of authigenic clay in marine sandstone by meteoric water has not been previously described. However, there are significant differences between the Cretaceous Western Interior basin and marginal basins such as the Gulf Coast basin which might help explain this occurrence. The highest rates of sedimentation and subsidence in the Cretaceous Western Interior basin were near the adjacent highlands, resulting in the stratigraphic rise of the marine sandstones toward the basin. Also, marine