

PILKEY, ORRIN H., Duke Univ., Durham, NC, and RAFAEL W. RODRIGUEZ, U.S. Geol. Survey, San Juan, Puerto Rico

Mixed Carbonate and Clastic Sedimentation: North Insular Shelf of Puerto Rico

Light-colored carbonate sands and dark-colored muddy clastic sands are deposited in distinct and sharply defined bands across the narrow (less than 3 km, 1.9 mi) and steep insular shelf of northern Puerto Rico. The narrow bands of clastic sands are found adjacent to the mouths of each of the rivers. These bands are in textural equilibrium with the present-day physical conditions on the shelf and are deposited as a result of successive hurricane-related flooding events. Dominant sand-sized components are quartz, feldspar, and rock fragments. The rate of sedimentation in the intervening cross-shelf strips of carbonate sediment is much lower, and the shelf sediment cover here is not in textural equilibrium with the physical environment. Dominant sand-sized components are mollusk, algae, coral, and bryozoan fragments. The boundary between carbonate and clastic bands is very sharp, often occurring within 100 m (330 ft).

The small carbonate fraction of the rapidly deposited clastic sediment and the particles making up the slowly deposited carbonate sediment exhibit strong differences in physical condition. The clastic calcareous fraction is fresh in appearance, highly angular if fragmented, and has original coloration. The relict calcareous material is old appearing, commonly stained and rounded, and has a dull luster. Polished surfaces and highly rounded grains characterize adjacent calcareous beach sands. The striking difference in the physical condition of the carbonate grains in clastic and carbonate sediments is a function of differing lengths of sea-floor exposure.

PITMAN, JANET K., U.S. Geol. Survey, Denver, CO

Regional Stratigraphic and Depositional Study of Rock Units in Upper Garden Gulch and Parachute Creek Members of Green River Formation, Piceance Creek Basin, Colorado

The Eocene Green River Formation in the Piceance Creek basin, Colorado, is well known for its thick sequence of rich oil shale and associated saline minerals. In the subsurface, rocks of economic interest extend from the upper part of the Garden Gulch Member to the top of the Parachute Creek Member. These rocks are lacustrine deposits that represent open- and near-shore sedimentation in ancient Lake Uinta. The depocenter of the lake formed in the northern part of the basin where rates of subsidence exceeded rates of sedimentation. The Garden Gulch and Parachute Creek Members can be divided into a series of laterally gradational rock units that can be traced from the eastern part of the Piceance Creek basin westward into the south-central part of the Uinta basin, Utah. Along the margins of the Piceance Creek basin, the lower and middle units consist of fissile argillaceous shale of low organic content, silty claystone, and siltstone. Toward the depositional center of the basin, these rocks grade into a thick sequence of carbonate-rich, kerogenous shale and lean marlstone that is interbedded with a saline facies composed of nahcolite, dawsonite, and halite. The gradational boundary between these facies represents the contact between the Garden Gulch and Parachute Creek Members. In the subsurface, the contact can be recognized by a change from a low to high resistivity log response which reflects the transition from clay-rich to carbonate-rich rock. The regional thickness distribution pattern of individual units suggest that, during the middle Eocene, Lake Uinta gradually expanded from a shallow, relatively fresh, semirestricted body of water to a saline, alkaline lake that occu-

ried a closed basin. A pronounced thickening of the lowermost units along the southern margin of the basin is attributed to streams that prograded northward into the basin from the southern and southwestern margin of the lake. The middle and upper units, however, thin toward the basin edge, suggesting the lake gradually expanded to the south. During the late Eocene, open-lacustrine sedimentation shifted from the Piceance Creek basin westward into the Uinta basin, Utah, due to a large influx of siliclastic sediment (Uinta Formation). Structural analysis of individual units indicates that present day intrabasinal tectonic features were not in existence during Parachute Creek time.

PITTMAN, JEFFREY G., Southern Methodist Univ., Dallas, TX

Paleoenvironments of Lower Cretaceous DeQueen Formation of Southwestern Arkansas

The Lower Cretaceous DeQueen Formation crops out in a narrow sinuous band extending east-west from Pike County, Arkansas, to near Broken Bow, Oklahoma. Natural exposures are poor, but quarrying has exposed excellent vertical sections of the formation about 75 ft (23 m) thick at several localities. The DeQueen is composed of a lower sulfate facies and an upper sandstone-limestone-shale facies. The lower facies which is correlated with the subsurface Ferry Lake Anhydrite, is about 40 ft (12 m) thick. It is 60% gypsum and 40% dark shale, with minor interbedded mudstones. The upper facies, which is also about 40 ft (12 m) thick, is unconformably overlain by Upper Cretaceous clastic sediments. The upper facies is predominantly shale, with interbedded thin beds of sandstone, sandy limestone, and celestite. This facies is equivalent to the lowermost beds of the Mooringsport Formation of the subsurface.

The environments of deposition of units within the lower sulfate facies have been interpreted from a sparse faunal assemblage, sedimentary structures, and trace fossils. However, the most intensive study has been concerned with the more richly fossiliferous beds of the upper facies of the DeQueen. Present in this unit are well-preserved pseudomorphs of displacive halite hopers, calcite pseudomorphs after gypsum, and preserved intrastatal gypsum nodules. Oscillation ripples, current ripples, and a variety of trace fossils are very common in these beds also. Body fossil assemblages range from a less diverse restricted pelecypod-ostracod assemblage to a more diverse gastropod-pelecypod-ostracod-serpulid worm assemblage. Marine and terrestrial vertebrates are also common in these upper beds.

All of the above information has been incorporated with subsurface data in order to reconstruct the local and regional depositional framework of the DeQueen and its subsurface equivalents. A better understanding of the depositional environment of these rocks will promote interest in, and may lead to the development of, undiscovered hydrocarbon reserves within less-well-known downdip areas.

PLATZMAN, ELLEN, Cornell Univ., Ithaca, NY

Implications for Role of Density Currents in Generation of Hummocky Cross-Stratified Beds in an Upper Devonian Shallow-Marine Sequence, New York

The processes responsible for sediment deposition and the development of internal morphology of hummocky cross-stratified units (HCS) have been the subject of considerable controversy. The results of the present study of the Ithaca Member of the Upper Devonian Genesee Formation in western New York