included in the basal limestone and the variations in the underlying volcanic rocks and serpentinite complex.

Tectonic isolation of the Parguera Limestone is suggested by the internal consistency of the unit, as opposed to the internal abrupt changes which characterize other rock types surrounding the Parguera, and by the contemporaneity of adjacent volcanic units. Contemporaneous tectonism and sedimentation as shown not only by the volcanic flows included in the Parguera but also by the thinning of the Parguera Limestone toward structurally high areas.

Vertical and lateral shifting of upper crustal blocks probably took place in response to deeper crustal movements. In a carbonate-producing environment, carbonate-rich sediments would accumulate on the higher standing blocks while lower areas would be flooded with volcanic debris. Such tectonic isolation of neighboring crustal blocks may have permitted adjacent and contemporaneous development of limestones and volcanic sequences throughout the developing Caribbean island arc.

NOEL E. ANDRESS, FRITZ H. CRAMER, and ROBERT F. GOLDSTEIN, Florida State Univ., Tallahassee, Fla.

ORDOVICIAN CHITINOZOANS FROM FLORIDA WELL SAMPLES

Ordovician chitinozoans recovered from a grayish-black shale are described for the first time for subsurface north-central Florida. The lowest sample of the Sun Oil Company, Earl Odom No. 1 well, Suwannee County, Florida, is dated between late Arenigian and early Caradocian. The Ordovician is overlain directly by Silurian rocks. A new chitinized species is described.

JOHN W. ANTOINE, Texas A&M Univ., College Station, Tex.

GEOPHYSICAL STUDIES OF NORTHERN FLORIDA PLATFORM, GULF OF MEXICO

The western edge of the North Florida platform has been delineated in some detail by seismic-reflection investigations. The platform boundary is not apparent from topographic surveys because of the thick sediment cover. The platform edge appears to coincide with the trend of a probable offshore extension of the Lower Cretaceous (Washita-Fredericksburg) reef trend.

The presence of a more recent reef, normal to the lower Cretaceous reef, is indicated from interpretation of additional reflection records. This feature trends almost east-west and crosses the buried edge of the North Florida platform. It can be traced for approximately 30 mi and can be aligned with an old buried shoreline on the east.

The top of the Upper Cretaceous has been traced over most of the continental slope south of the Florida Panhandle by seismic-reflection profiling. Studies on the outer slope indicate that this horizon rises near the center of the platform, along long. 86°30′, to less than 5,000 ft below sea level. On the west, near the edge of the platform at long. 87°30′, the top of the Upper Cretaceous is at 7,000 ft whereas on the east where the Florida escarpment intersects 85°30′ long., the indicated depth is more than 5,700 ft below sea level.

The reflection surveys show that erosion has played a very important role in the formation of the western part of the platform. It is evident that erosional processes have been active at least since the Late Cretaceous. This can be interpreted to indicate that the circulation in the Gulf of Mexico, and the loop current in particular, has been essentially the same during the entire Cenozoic Era.

DANIEL D. ARDEN, JR., Signal Exploration (Jamaica) Co., Kingston, Jamaica

GEOLOGIC HISTORY OF NICARAGUAN RISE

A study of refraction-seismic velocity data beneath the Caribbean Sea and nearby areas of the Atlantic Ocean reveals that the thickest crust is in the Antillean island belts and the Nicaraguan Rise. In the Nicaraguan Rise, the maximum thickness is about 22 km and is south of the present topographic crest. Isopach maps of total crustal thickness indicate that the Caribbean crust is intermediate between average oceanic and continental crust.

The oldest dated rocks in the Caribbean are Jurassic, a fact which is consistent with the idea that the region had its origin in early Mesozoic time as a result of rifting and subsequent drift between the American and Afro-European continental blocks.

Throughout Jurassic and Early Cretaceous time, the Nicaraguan Rise was a mobile belt associated with vast submarine lava flows and mafic intrusives. Volcanism gradually decreased during the Late Cretaceous. Terrigenous clastic and carbonate strata alternated with tuff, agglomerate, and mixed-origin volcanic-sedimentary units. The first phase of the Laramide orogeny occurred at the end of the Cretaceous, and it may have been at this time that a rift along the southern flank of the rise separated it from the Beata Ridge which now is south of Hispañola.

Normal marine sedimentation—clastic and chemical—prevailed during the Tertiary. Islands emerged and sank as movement occurred between crustal blocks. Tectonism beginning in middle Miocene time markedly altered the topography and depositional pattern of the rise. The Cayman Trough rift formed as a result of left-lateral displacement of at least 250 mi. The Nicaraguan Rise was tilted southward, with the result that the topographic crest was shifted 50–100 mi north.

Recent geophysical work related to petroleum prospecting has aided in interpreting the structure and stratigraphy of the rise. Cross sections and a map of depth to magnetic basement are presented.

MAHLON M. BALL, Inst. Marine Sci., Univ. Miami, Miami, Fla.

ORIGIN OF GULF OF MEXICO AND CARIBBEAN SEA; IMPLICATIONS REGARDING OCEAN RIDGE EXTENSION, MIGRATION, AND SHEAR

The Gulf of Mexico and Caribbean Sea are a zone of north-south extension and left-lateral shear opened between the Americas as those continents moved westward from Africa. The movements are related to ocean-floor spreading from the mid-Atlantic ridge. To accommodate spreading, the ridge itself migrates westward from Africa. Ridge migration is radial outward from Africa and results in opening triangular sheared grabens with apexes against Africa. A new ridge segment extends across these openings. Spreading rates vary and the migrating and extending ridge is sheared on fracture zones in response to these variations.

The currently popular related concepts of plate tectonics and transform faults are inconsistent with ridge migration and shear because those concepts do not allow for shear on fracture zones beyond ridge offsets and in the directional sense indicated by the position of ridge segments. Ridge migration and shear are a