coastlines, and drowned Holocene barrier coastline features have been described on the continental shelves. Pre-Holocene linear sandstone bodies resembling barrier islands have been described in ancient rocks of Pennsylvanian, Cretaceous, and Tertiary ages.

Probable barrier island sandstone bodies in ancient rocks have been described by previous investigators on the basis of comparison with features of modern analogs: geometry, sedimentary structures within the sand lens, physical properties of the sand, and the nature of associated environments. Recognition criteria used in this report are based partly on previous work and partly on recent studies along the Texas and North Carolina coasts.

Barrier islands are linear, have a length to width ratio generally greater than 10:1 and commonly are less than 60 ft thick. Padre Island, Texas, consists of four morphological units that have characteristic sedimentary structures: beach, foredune, barrier flats, and wind tidal flats—though the development of the foredunes and wind tidal flats changes considerably from north to south. Along the North Carolina coast, wind tidal flats are absent, but accretionary beach ridges are locally prominent. Superimposed on the islands of both coasts are storm washovers of hurricane origin that breach the foredunes and channel inlets that cross the island and connect the sea with the lagoon behind the islands. Beaches contain laminae of different thicknesses that dip principally seaward; the sand is locally shelly and fine laminae of heavy minerals may be prominent. The foredunes are markedly cross-bedded in an oriented pattern that reflects strongly the predominant wind direction. Barrier flats are underlain by sand which ranges from structureless to highly laminated; vegetal remains are common. Wind tidal-flat sediments that border the lagoon are an interlayered mixture of sand beds containing some fine shell fragments, and laminae of clay and algal remains. Sand is fine grained throughout. However, shell fragments, locally abundant, exhibit greater variability in size, shape, and sorting. Sand which refills channel inlets ranges from horizontally bedded to structureless; this contrasts sharply with the cut-and-fill cross-bedded sand common in stream-channel deposits.

The associated lagoon sediments are organic and calcareous mud which interfingers with barrier-island sand; the fauna is less diverse than that of the open sea and unbroken shells are abundant. Tongues of sand —washover deltas and fans which are built by storm flood tides—are prominent local features of the lagoons. Marshes overlying peat are characteristic of the inshore side of the bays along the North Carolina coast.

The geometry and alignment of the barrier islands and the close association of the sand in the barrier island with the organic mud of the lagoon are the key factors for the recognition of a barrier coastline. Attendant washover deltas and fans, cross-cutting inlet fill, and associated biota are important supplementary aids.

JOÃO JOSÉ BIGARELLA, Univ. Paraná, Paraná, Brazil

DUNE SEDIMENTS: CHARACTERISTICS, RECOGNITION, AND IMPORTANCE

One of the most important criteria for recognizing wind-laid deposits is based on their sedimentary structure. Eolian sandstone generally has large- and medium-scale cross-beds of the tabular-planar and wedge-planar types. Trough-type cross-beds are less abundant. The cross-beds commonly are composed of steeply dipping laminae which normally are concave upward. In modern dunes the foreset beds near the top of the slip face have steep (29–34°) dips but, in paleodunes, this value is somewhat less (20–29°) because of erosion which precedes deposition of the overlying set.

Dune cross-beds are distinguished from other similar structures on the basis of their more homogenous grain size. The nature of the adjacent and/or intercalated beds may help to determine the environment of deposition. The attitude of the bounding surface also is a diagnostic feature.

In the absence of cross-beds, other criteria are used to identify dune environments. Textural and mineralogical characteristics are not sufficiently conclusive. The mean grain size seems to be of little use. Although dune sand is slightly better sorted than other sediments, sorting is not distinctive. Positive skewness has been considered as an indication of dune environment. However, negative skewness also has been reported for dune sediments. Dune sand usually is more rounded than beach sand.

Dune and beach sediments can be separated on the basis of the heavy-to-light mineral ratio, and the relation between the settling velocity of two or more minerals of different density values.

Several criteria, together with the stratigraphic relations of the deposit to adjacent beds, should be used to identify the dune-sand environment.

ARNOLD H. BOUMA, Dept. Oceanography, Texas A&M Univ., College Station, Tex.

NEW TYPE OF SEDIMENT-DISTRIBUTION MAP: PRELIMINARY RESULT FOR GULF OF MEXICO

Normal sediment-distribution maps present the lithologic characteristics of only the upper 4–6 in. of the sedimentary column.

Cores collected from any area commonly reveal considerable changes in lithologic character through the thickness of the beds which are cored. Such variations can be expressed in vertical sections or in fence diagrams. Information concerning the upper sediment column to a depth of at least 30 ft is important for studies on sediment transport and deposition, basin filling, geotechnical properties, placing of laboratories on the sea bottom, salvaging sunken objects, acoustical measurements, and interpretation of high-frequency, shallow-penetration, and continuous seismic-reflection profiling.

"Standard patterns" have been determined from samples collected in long piston cores which penetrated different lithologic units and successions. The new sediment-distribution map constructed on the basis of the 30-ft cores shows the distribution of these standard patterns and thus reveals the sedimentary characteristics of the upper 30 ft. The patterns can be portrayed by colors, shades, and symbols, or combinations.

Other properties, such as geotechnical characteristics, can be added to the standards of the map or can be superimposed on the standard presentation.

The main divisions of the sediment-distribution map correspond to the boundaries of the physiographic provinces of the Gulf of Mexico.

CARL O. BOWIN, JOSEPH PHILLIPS, K. O. EMERY, ELAZAR UCHUPI, S. T. KNOTT, K. E. PRADA, and E. T. BUNCE, Woods Hole Oceanographic Inst., Woods Hole, Mass.