Origin and Development of Barrier Islands on West-Central Peninsula of Florida

The origin of barrier islands has been discussed and debated in the literature for nearly a century. Virtually all interpretations have been based on stratigraphic and geomorphic data. Two small barriers have formed in Pinellas County during the past 2 decades. Both aerial photography and field data show that these islands originated as shallow subtidal shoals. Continued accumulation of sediment occurred through normal low-energy waves and currents with assistance from occasional intense storms.

North Bunces Key became intertidal in 1957 and showed marked growth after Hurricane Donna in 1960. It is now 1.5 km long and rises more than 1 m above mean sea level. South Bunces Key was subtidal until 1974. It is 1.3 km long and rises nearly a meter above mean sea level. Anclote Key, which is 35 km north of Bunces Keys, is 4 km long and shows remarkable geomorphic similarities to North Bunces Key. Caladesi Island, located 9 km south of Anclote Key, is 6.5 km long and displays a "drumstick" configuration. Interpretation of depositional environments from 17 cores reveals that this island also originated as a shallow shoal on the inner shelf. Initial development of Caladesi Island has been dated at 5,000 to 7,000 years B.P.

Data from the modern environment and the stratigraphic record lead to the postulation that shoaling of shallow linear sand bodies has been a common mode of origin for barrier islands along the west-central peninsula of Florida.

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Statistical Zonation of Oil Shale on Basis of Chemical Characteristics

Several objective statistical techniques have been used to isolate zones of distinctive chemical characteristics within the saline facies of the Eocene Green River Formation. The data consist of measured concentrations of Al, Si, Na, K, Ca, Sr, Fe, and S in 374 composite samples collected at 0.61-m intervals in a 232-m section of the saline facies from a core of the Green River Formation, Piceance Creek basin, Colorado. The techniques were also applied to the oil-yield (Fischer assay) data for the entire core. The first statistical technique used was analysis-of-variance zonation. Zone boundaries determined by this technique separate portions of the core that have maximum between-zone variance and minimum within-zone variance. The second technique involves computation of moving correlation coefficients between two variables over successive 31-sample intervals. This technique isolates zones of strong positive and negative associations among geochemical variables.

On the basis of these two statistical techniques, the saline facies and underlying Garden Gulch Member of the Green River Formation have been divided into six geochemical zones. The most useful variables for zoning are Si, Al, Fe, S, Na, and oil yield. Concentrations of silicon and aluminum exhibit considerable variation and are positively correlated throughout the saline facies, expressing a strong correlation between quartz and dawsonite. The minerals most characteristic of the saline facies of the Green River Formation are dawsonite and nahcolite. Concentrations of iron and sulfur (present mainly as pyrite and marcasite) are positively correlated with oil yield in zones of higher salinity (as indicated by zones containing highest concentrations of nahcolite) and negatively correlated with oil yield in zones of lower salinity. This suggests that the effect of organic content on iron diagenesis, probably through controls on pH and Eh, was optimum during periods of higher salinity.

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"Kriging" of Top of Reservoir from Seismic and Borehole Data

This paper is part of an ongoing study to assess the performance of a natural sandstone reservoir considered for underground storage of gas. The specific problem dealt with is contour mapping the top of the structure in order to assess the closure zone. Data are from 56 wells, most of which were drilled in the central part of the dome, and four seismic surveys. A particular difficulty encountered is the small number of reliable velocity measurements.

The method used is "kriging," an optimal interpolation procedure based on random-fields theory. Its advantage over conventional methods is the use of the variogram, a structure function that depicts the spatial variability of the phenomenon under study. This method results in an interpolation algorithm tailored to each particular data set. Furthermore, error variances are attached to kriging estimates, telling how reliable the estimates are.

Depths to the top of the structure are obtained by adding estimated thicknesses of the intermediate layers to estimated depths of the seismic marker. Kriging of the thicknesses is performed after aggregation of the intermediate layers into approximately uncorrelated sets. For seismic-marker depths, three different methods, combining seismic and borehole information, can be used.

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Interpretation of Pleistocene Coastal-Barrier Complexes from Holocene Models, Southeastern Delaware

The Pleistocene Columbia Group in Sussex County, Delaware, has long been identified as a complex of nearshore marine and coastal deposits. However, interpretation of the internal geometry of the sedimentary lithosomes has proved to be difficult because of the extreme variability of these units. Environmental lithosome models of the morphology and internal geometry of the Holocene transgressive shoreline complex along the present Delaware coast provide an analog for the interpretation of the Pleistocene sedimentary sequences.

On the basis of sedimentary structures, lithologic se-