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CONCERNING STABILITY OF THE SOUTH CAROLINA COAST

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Much of the sediment comprising the present beaches along the South Carolina coast was derived since Cretaceous time from the decayed crystalline rocks of the Piedmont and Appalachian regions. Beginning in Late Cretaceous time the sea withdrew and there began a gradual emergence of the Southeastern United States. This withdrawal of the sea can be traced oceanward from the Fall Zone by successively younger beds of several Tertiary formations. During Pleistocene time as a result of the accumulation of continental ice sheets, the sea retreated rapidly and todays' continental shelves are in part the coastal plains of low-stage Pleistocene seas. The Recent epoch, in which we live, began about 5,000 years ago, after the Pleistocene ice sheets had melted and the sea had advanced to its present position along the margins of the continent. Russell (1957, p. 420) believes the main rise of sea level took place between about 18,000 and 5,000 years ago as based on carbon isotope studies of wood samples from Mississippi alluvium. Since then, the fluctuations of the sea have been minor and directly related to climatic conditions. During the twentieth century, mainly between 1930 and 1950, glaciers have waned and sea level has risen something on the order of 2.5 inches (Russell, 1957, p. 428). Russell also believes that there is some slight suggestion that the trend has reversed very recently.

Observations made along the South Carolina

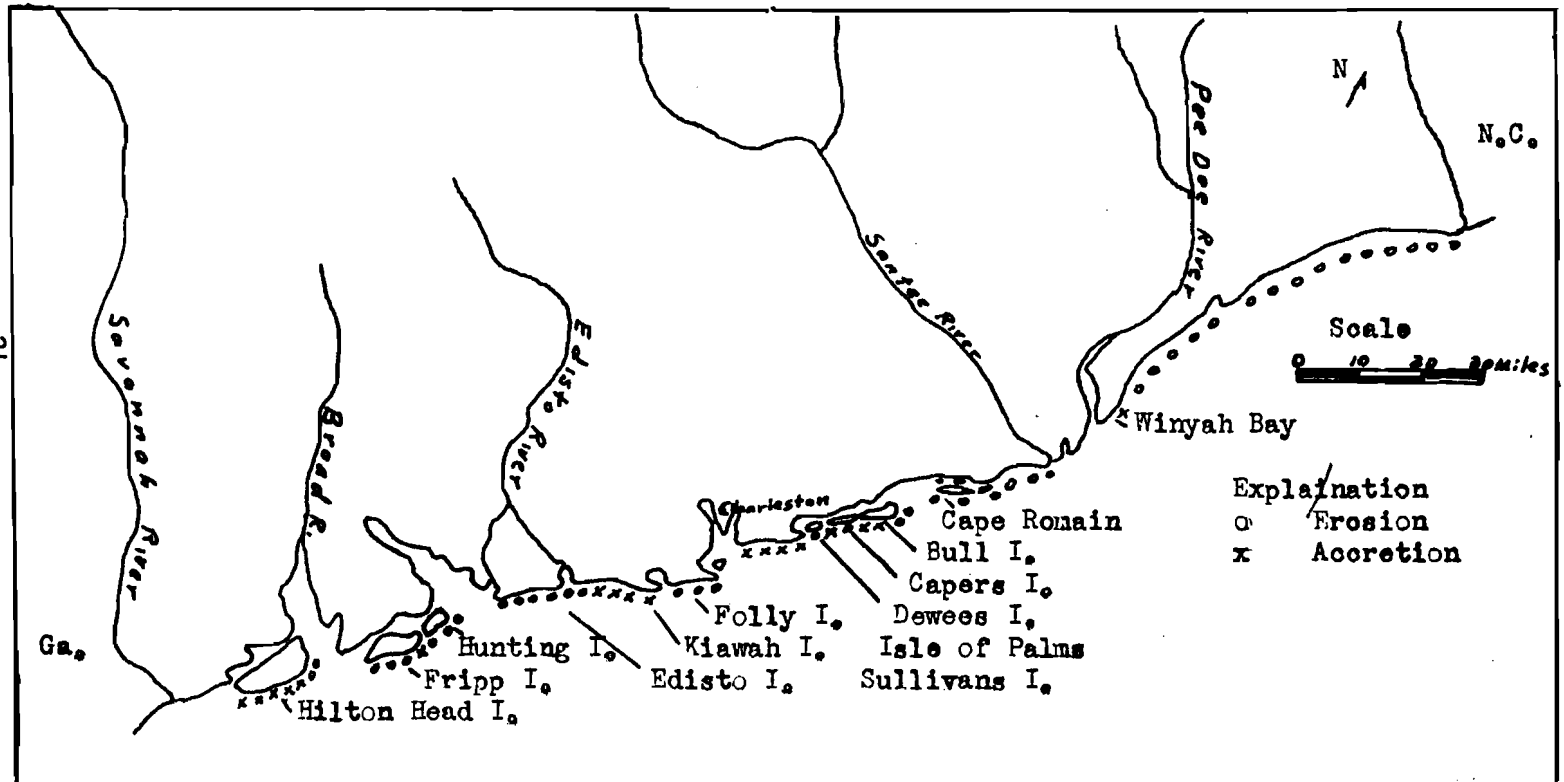

Figure 1 : Areas of Erosion and Accretion Present Along the South Carolina Coast

beaches during 1956 and 1957 (Neiheisel, 1958) seem to indicate a near static sea level. Sections of the coast are undergoing various degrees of erosion and accretion. Erosion is evidenced along beaches by mud flats exposed on the foreshore, by trees extending many yards into the littoral zone, by wave-cut foredunes containing thick vegetation, and by a comparison of recent and older topographical surveys. Accretion may be observed in progress where there are wide beaches and migratory sand dunes barren of vegetation as well as by a comparison of topographical surveys. In general, erosion is more active on headlands exposed directly to the stronger northeasterly forces of the wind, and accretion is more active toward the southwest end of these areas (Figure 1).

General erosion prevails along the coastal arc from the North Carolina boundary to the Winyah Bay area. Strongest erosion occurs at Pawleys Island, near the center of the arc, where an entire barrier beach is being removed by wave action. Marked erosion also prevails from south of the Santee River to Bull Island (Figure 1). Mud flats and wave-cut dunes prevail on most of the Cape Romain Island group.

A large dissected offshore bar, separated from the mainland by from 1 to 3 miles of marsh, comprises Bull, Capers, Dewees, Isle of Palms, and Sullivans Islands. Erosion is evident on the headland of Bull Island and on the central part of Capers and Dewees Islands; it is marked by densely covered wave-cut dunes and by trees many yards in the littoral zone. Accretion is evident in the vicinity of inlets and over the major portion of this section of coast. The headland of the Isle of Palms is the area of strongest accretion. A wide beach and two small lines of dunes have developed here since 1918.

Folly and Kiawah Islands, situated south of Charleston harbor, are respectively areas of strong erosion and accretion. Many of the resort houses on Folly, formerly high and dry, are suffering wave attack. Much of this sediment is being deposited on Kiawah beach. Bass Creek near the headland of Kiawah has been silted over, and 300 feet of beach has been added in little more than a decade. Edisto Island, to the south of Kiawah, is undergoing marked erosion on the northern beach as is evidenced by mud flats and trees in the foreshore beach. Slight erosion prevails on the southern beaches of this island.

Hunting Island is exposed to strong northeasterly wind and wave action and is being strongly eroded. A small portion of Fripp Island is accreting, but elsewhere on this island moderate to strong erosion is taking place. Hilton Head Island appears to be strongly eroding on the headland but accreting over most of the downcoast area.

A near static sea level is suggested from observations of the presence of both strongly eroding and accreting sections of the South Carolina coast. In general, areas of greatest erosion are those which are more exposed to the stronger forces of the winds that govern wave attack. Areas of accretion are most prevalent on the downcoast side of eroding areas. Sediment from the eroding areas is being transported southwestward in the direction of predominant littoral drift.

References

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Note to the Reader

Publication of the following article is in line with our basic belief in the value of pure science. The description of these Russian beach deposits may very well guide us in evaluating the beach deposits of South Carolina. We would like your reaction to this article.

CERTAIN CONDITIONS OF CONCENTRATION OF HEAVY MINERALS IN LITTORAL MARINE DEPOSITS: Doklady Akad. Nuak, U. S. S. R.*

By

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Translated and Condensed by
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Review of Russian Geology

A study was made of the littoral deposits of the Anadyr Gulf of the Bering Sea. This study revealed a concentration of heavy minerals in zones of the shore-line that are characterized by definite dynamic characteristics.

Samples were taken at depths of 6 to 16 feet and the fraction 0.1 to 0.05 mm. was analyzed. The heavier were first separated with bromoform and then studied with the microscope. A single mineral assemblage was found; it carries weathered and opaque non-metallic minerals, opaque ore minerals, pyroxene, brown hornblende, green hornblende, epidote, zircon, apatite, garnet, chlorite, sphene, rutile, sillimanite, zoisite, staurolite, leucoxene, biotite, and kyanite. The most abundant are the ore minerals, pyroxene, and the hornblendes. Minerals of metamor-

* Tom 118, p. 384-386, 1958

phic rocks are not common. The heavy mineral fraction is 9 to 20 percent and up to 48 percent (average is 14.5 percent). There is doubtless a connection between the composition of the heavy minerals and the ubiquitous development of the intermediate and subsilicic extrusives in the region.

Several parts of the beach have a distinctively high content of very heavy minerals (specific gravity greater than 4, zircon and ore minerals). In addition, the usual content of heavy minerals commonly does not increase, but even becomes less in comparison with neighboring zones. The content of ore minerals reaches 40 to 58 percent and zircon 10 to 15 percent.

The increased content of heavy minerals was observed in a variety of accretion features. Erosion of these features is marked by erosion terraces and by a considerably less width in places.

Concentration of the heavy minerals is distinctive of the narrow eroded parts of the bar of Russian Koshka (Fig. 1). The lighter minerals

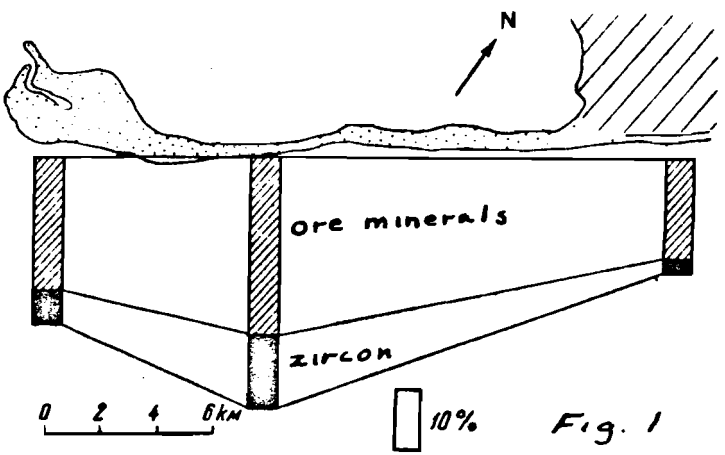

Fig. 1

were washed out and the extra heavy lagged behind.

The concentration of extra heavy minerals in the deposits of the Meechken bar (Fig. 2) are explained by other causes. Here the increase of the content of ore minerals and zircon are registered on the ends of the bar. At present both ends of the bar extend out and are curved to the side of the dry land. They terminate with an abrupt falling to depths of 30 to 60 feet and have many other characteristics of accreting bars. As is known, long-shore agitation of the deposits occurs under the action of waves and currents. At the curvature of the coast line, the coarse or heavy fractions, which are being moved by waves, pursue a movement lengthwise of the coast. Fractions of relatively finer or lighter are picked up by the flow of the current and, following in the previous direction, are carried away to deep water. At the same time just as with the erosion of the shore, heavier fractions are accumulated in the littoral zone.

The following general position is formulated: concentration of extra heavy minerals in littoral deposits takes place in those places where processes of selection of material according to hydraulic size are possible; this depends on the specific characteristics of the dynamics of the beach.

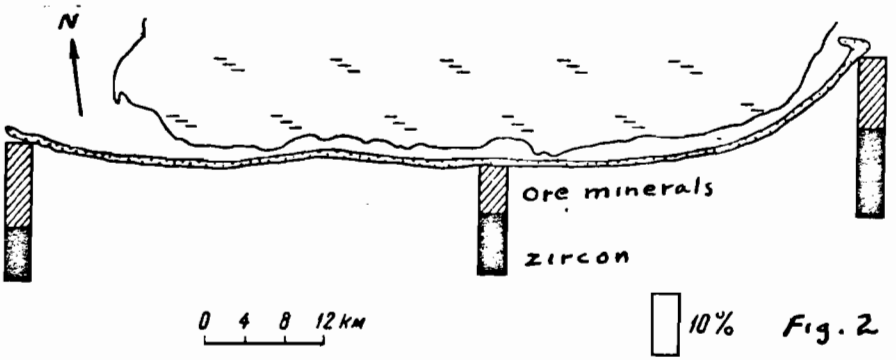

Fig. 2