HOPKINS, D. M., C. H. NELSON, and D. W. SCHOLL, U.S. Geol. Survey, Menlo Park, Calif.

Proposed Model for Cenozoic Sedimentary History of Bering Sea

The Bering Sea consists of an abyssal basin and a large continental shelf area. The basin apparently was isolated from the Pacific Ocean by the development of the Aleutian ridge near the end of Cretaceous time; the continental shelf area first became submerged near the middle of the Tertiary Period. It is postulated that the sediment eroded from Alaska and Siberia during Cenozoic time (1) was trapped mainly in subsiding basins on the Bering shelf during the Tertiary, (2) was collected mostly in continental rise and abyssal plain deposits of the deep Bering Sea during the low sea levels of the Quaternary, and (3) was transported generally from the Bering shelf northward through the Bering Straits during periods of high sea levels in Pleistocene and Holocene times.

Basin-filling was dominated by continental sedimentation in the early Tertiary and by marine deposition in the later Tertiary. Miocene uplift of the Alaska Range more than doubled the drainage area of the Yukon River and established it as the dominant river source (up to 90%) of the Bering Sea; this greatly increased sedimentation in the submergent basins. Subaerial drainage of this and other major river sediment sources during the glacial stages of the Pleistocene resulted in channeling great amounts of sediment across the shelf to the deep Bering Sea basin and cutting of the largest submarine canyons in the world.

Occurrence of the thin Holocene marine deposits near the present Yukon delta, of mainly relict sediments in the northern Bering Sea north of St. Lawrence Island, and of several meters of Holocene sediment in the Chukchi Sea permits speculation that now, as in the past, large volumes of Yukon sediment are flushed from the northern Bering Sea into the Chukchi Sea.

HOPPIN, R. A., Univ. Iowa, Iowa City, Iowa, and T. V. JENNINGS, Purdue Univ., Lafayette, Ind.

Relations of Cenozoic Tectonics of Central Rockies to Possible Movements of North American Plate

Detailed studies of major uplifts in the central Rocky Mountains indicate that Cenozoic structures developed through predominantly vertical movements. This kinematic configuration in upper crustal levels is not necessarily incompatible with the concept of a laterally moving lithospheric plate, particularly if the plate overrides an oceanic rise or other undulation in the upper mantle.

Lineaments are important tectonic elements in the movement plan. Some are well established, but others are only provisionally located or speculative. Much more work is needed to determine precisely the presence or absence of these large features and to define their characteristics. These lineaments could be entirely Cenozoic in age and represent crustal adjustments above transform faults, or could be reactivated zones of deformation along much older, even Precambrian lines of weakness.

Evidence of intracontinental mobility through much of the Cenozoic suggests one possible sequence of events. In Early Cretaceous the west coast was east of the Pacific rise and bordered a subduction zone. By the Eocene, the plate had moved west over the subduction zone, the effects of which may have been Laramide deformation in the eastern Cordillera. Widespread erosion and gravel deposition beginning in the Oligocene may be related to a slowing or ceasing of drift 38 m.y. ago. A considerable change in patterns, rates, and relative motions of plates 20 to 10 m.y. ago and subsequent renewed westward drift coincides with the increased tectonic activity in western North America since the Pliocene.

HOWARD, J. D., Skidaway Inst. Oceanog., Savannah, Ga., J. DÖRJES, Senckenberg Inst., Wilhelmshaven, Germany, R. W. FREY, Univ. Georgia, Athens, Ga., S. GADOW, G. HERTWECK, H.-E. REINECK, and F. WUNDERLICH, Senckenberg Inst., Wilhelmshaven, Germany

Usable Beach-to-Offshore Model for Tide-Dominated Shoreline; Sapelo Island, Georgia

This study represents a cooperative effort by sedimentologists, zoologists, paleontologists, and mineralogists to determine what facies characteristics exist in a present-day sedimentary record. The results show that geologically recognizable subfacies can be established by primary physical and biogenic sedimentary structures.

Beach zone—The rather low energy of the Sapelo Island shoreline and the low dip of the beach surface, combined with a tidal range of 2.1 m, result in characteristic morphology, grain-size distribution, and types of sedimentary structures. Most beach features are controlled by wave activity, and obvious bioturbation is not abundant in the beach zone. The backshore and upper foreshore contain few species and few individuals. The lower foreshore has few species but numerous individuals.

Nearshore zone—At 100 m offshore (water depth, 1.5 m) there is a marked increase in the fine fraction; at the same place, biogenic sedimentary structures increase. Dominant sedimentary structures are ripple-laminated sand. Species of infaunal organisms are more abundant than in the beach but few individuals are present.

At a distance of 2,500 m offshore (water depth, 2.7 m) biogenic sedimentary structures become the dominant characteristic of the fine silty sand. The unreworked part of the substrate is characterized by parallel to subparallel laminated sand. These beds, referred to as "laminated-to-burrowed" are separated by erosional bedding planes.

Farther seaward at a distance of 5,500 m (water depth, 6 m) the substrate is almost completely reworked due to increased biogenic activity. This is the most densely populated zone in the beach-to-offshore sequence.

Offshore zone—At a distance of 10 km seaward (water depth, 10.5 m) the substrate consists of clean, medium- to coarse-grained sands. Megaripples are the dominant physical sedimentary structure in the offshore area and few species and few individuals are found, but biogenic reworking by heart urchins is abundant.

HOWER, W. F., R. M. LASATER, and R. G. MIHRAM, Halliburton Services, Duncan, Okla.

Compatibility of Injection Fluids with Reservoir Components

Abstract *in* Am. Assoc. Petroleum Geologists Bull., v. 55, no. 11, p. 2086.