

River, but apparently rests unconformably on units B and A and on rocks of Paleozoic age near Indian Grave Creek. Unit D is several thousand feet thick and is provisionally correlated with non-marine clastic rocks of Early Cretaceous (Albian) age near Eagle, Alaska.

The oil shale within unit A is a potential source bed for petroleum, but none of the Mesozoic rocks cropping out in the Kandik basin seem to have enough porosity to make them potential reservoirs. Although the oil possibilities of the Mesozoic rocks are not encouraging, some of the Paleozoic rocks contain oil and therefore deserve further investigation.

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OFFSHORE OREGON: OBSERVATIONS ON REGIONAL GEOLOGY

The continental margin west of Oregon consists of a generally convex-upward surface 35 to 60 mi. (nautical) wide. The continental shelf, which forms the upper part of the surface, slopes seaward at less than 1° and ranges irregularly in width from 9 to 35 mi. Several elongate hills or banks rise above the general shelf level. The lower portion of the continental margin (continental slope) increases in average declivity from about 1° – 10° , and is modified by numerous ridges, hills, benches, and submarine canyons.

Off the central part of the Oregon coast the shelf widens from 13 mi. at $45^\circ 00'N$. to 35 mi. at $43^\circ 58'N$., and then narrows abruptly to 16 mi. at $43^\circ 55'N$. Two essentially north-trending shoals, Stonewall Bank and Heceta Bank, dominate the topography of the shelf in this area.

The apparent overlap relationship of late Eocene to middle Miocene marine sedimentary rocks along the shore and the occurrence of Pliocene marine sedimentary rocks on the two banks suggest that one or more Tertiary sedimentary basins exist beneath the continental shelf and slope. Gravity measurements indicate that thick sections of sedimentary rocks may be present. From echo soundings, Stonewall and Heceta Banks are interpreted to be the surface expressions of structures associated with the Tertiary basins.

Fine to very fine detrital sands and glauconite-rich silts and clays cover the shelf in areas between the gravel and rock outcrops common on and in the vicinity of the shoals.

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ACCUMULATION OF DIATOMACEOUS SILICA IN SEDIMENTS OF GULF OF CALIFORNIA

Sediments of the deep basins of the central and southern Gulf of California contain high concentrations of diatom and radiolarian tests. Determinations of the amounts of opal in the sediments, by X-ray diffraction, show that the diatoms contribute the greater proportion of biogenous SiO_2 to the sediments. An opal-rich area is confined to the central Gulf, which is also the site of most intense phytoplankton production. Over an area of approximately 2,500 km.², sediments containing 50 per cent by weight opal are accumulating at a rate of ~ 3 mm./yr. Within this region, the ratio of the rate of accumulation of opal to that of terrigenous material is highest for the whole Gulf.

The Gulf is in open communication with the Pacific Ocean, and the annual exchange of water through the mouth is estimated to be $\sim 5 \times 10^{16}$ liters. With northerly winds, the surface waters, depleted of plant nutrients, are driven out of the Gulf, to be replaced by upwelled nutrient-rich waters flowing into the Gulf at depth from the Pacific. In this way, sufficient silica is supplied to the euphotic zone, where it is utilized by diatoms, to account for all the silica known to be accumulating on the floor of the Gulf. River supplies are 100 times less than the ocean supply. In view of numerous observations of a so-called genetic association between diatomaceous sediments and volcanism, the mechanism operating in the Gulf of California should be considered as a means of concentrating dissolved silica, at concentrations of 1–2 ppm, as siliceous sediments. Sufficient silica is present in sea water, in the form specifically utilized by diatoms, to form deposits of purity comparable with the Monterey diatomites of California.

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STUDIES OF SOME MARINE PHOSPHORITES FROM BAJA CALIFORNIA

Along the western coast of Baja California, between approximately 24.5° and $27^\circ N$. lat., extensive fine-grained phosphate deposits occur on a 100-km.-wide continental shelf. They are found from a depth of 100 m. to the shore where carbonate apatite makes up to 25 per cent by weight of present and more ancient barriers built up in front of coastal lagoons. Their similarity with ancient phosphorites, believed to have developed on large shallow submarine platforms, prompted a study of these sediments. Intense seasonal upwelling of deep nutrient-rich waters from the California Current controls the hydrography of the whole shelf, and shallow ridges form an effective sill restricting circulation over it. A reducing environment has developed and iron sulfides are present nearly everywhere. Locally produced organic matter is being supplied continuously to the bottom through the oxygen-deficient waters, this at a fairly high rate because of shallow depths. Conditions favorable to the preservation of large quantities of non-oxidized inorganic phosphate in the sediments are in this way maintained. Whether or not this situation results in the present formation of calcium phosphate minerals cannot be ascertained. Apatite could be measured quantitatively by X-ray diffraction down to very low levels. This shows the persistence of a rich zone over 20–30 km. along the coast between depths of 60–100 m. From several evidences these deposits represent ancient barriers reworked during the last transgression. Onshore similar phosphatic sands over 50 ft. thick are known to exist in the vicinity of the lagoons. From geological considerations and geochemical arguments the average age of these deposits is Pliocene to Pleistocene. They could be as old as Miocene. They appear in equilibrium with their modern environment and, if so, could continue to develop, but unambiguous evidences concerning their present growth have been difficult to obtain.

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CORRELATION OF STUART FORK FORMATION WITH
ROCKS OF WESTERN PALEOZOIC AND TRIASSIC
BELT, KLAMATH MOUNTAINS, CALIFORNIA