Maximum sedimentation rates for the middle Eocene Narizian Stage (Kreyenhagen Shale) are less than 100 m/m.y., for the late Eocene (Refugian Stage) about 100 m/m.y., for the Oligocene Zemorrian Stage about 166 m/m.y., for the early Miocene about 140 m/m.y., for the middle Miocene about 500 m/m.y., for the late Miocene about 250 m/m.y., and for the Pliocene-Pleistocene they are almost 2,000 m/m.y. The very rapid sedimentation rates, following the second major change in tectonic patterns about 4 m.y. ago, are similar to those today in Santa Barbara basin; they are less than the much higher rates recognized for the late Pleistocene in basins of the continental borderland.

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FORAMINIFERAL PALEONTOLOGY OF UPPER MIOCENE IN OCEAN CITY AREA, GRAYS HARBOR COUNTY, WASHINGTON

Detailed study of Foraminifera from the subsurface in the Ocean City area indicates the presence of more than 3,000 ft of upper Miocene marine sediments equivalent to the Montesano Formation. The lithologic sequence consists of a lower clay shale unit up to 2,000 ft thick, a middle sand unit to 800 ft thick, and an upper silty shale unit about 1,000 ft thick. The lower clay shale unit does not appear to be present in the Montesano Formation outcrop area. In the Ocean City area the Montesano lies with apparent unconformity on older sediments and volcanic rocks ranging in age from late Eocene to middle Miocene. It is unconformably overlain by Plio-Pleistocene continental to shallow-marine sediments.

The absence of key foraminiferal species prevents recognition of the upper Miocene stages as defined in California. Comparison of the fauna with recent foraminiferal faunas indicates deposition in mostly middle to lower bathyal depths for the lower clay shale unit. The overlying sand contains a sparse shallow-marine fauna and physical sedimentary characteristics of a beach or bar deposit. The overlying silty shale unit contains a neritic fauna. Of particular significance is the abrupt transition from middle bathyal clay shale to shallow neritic sand without evidence of a break in sedimentation, thus indicating tectonic uplift rather than simple basin filling.

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CRITERIA FOR BIOSTRATIGRAPHIC CORRELATION

Biostratigraphic correlations are established using stratigraphic sequences in which a succession of congregations of taxa have been recognized as standards of reference. Recognition of a succession of congregations in any part of the overall geologic column results from (1) detailed measurement of many stratigraphic sections through a part of the overall stratigraphic column under close study with fossil collections obtained from the measured sections such that the precise stratigraphic position of each collection is known; (2) identification of taxa in each collection (commonly one organismal group such as the foraminifers is selected for close taxonomic analysis); (3) plotting of the stratigraphic ranges of each of the taxa in every measured section; (4) recognition of superpositionally unique associations of taxa in each section by analysis of the overlapping stratigraphic ranges, section by section; and (5) recognition of congregations in the area in which the stratigraphic sections were measured, based upon comparisons among the superpositionally arranged unique associations in each individual section. A composite succession of unique associations or congregations recognized in an area provides a standard of reference with which collections of fossils from rocks in the same and adjacent areas may be compared and correlations established on the basis of the closest match between the new collection and the congregations in the reference suite.

New data in the form of new fossil collections from additional stratigraphic sections may reveal range extensions for certain taxa because those taxa may be found associated with congregations other than those in which they were initially found.

Divisions or lumping of congregations may be indicated by new data. Analysis of taxa may include those from a wide range of environments in the steps toward erecting a reference suite of congregations. Alternatively, separate reference suites may be established for each different biofacies within coeval rocks in the area under study. Therefore, criteria for correlation must include analysis of the fossils found to determine their facies relations as well as their stratigraphic superpositional relations. These determinations will aid in erecting the reference successions of congregations, as well as in making comparisons with the reference suites.

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DELLWOOD SEAMOUNT AREA, POSSIBLE NEW SPREADING CENTER, AND OTHER TECTONIC FEATURES OF PACIFIC OCEAN WEST OF BRITISH COLUMBIA

The Juan de Fuca lithospheric plate lies between a series of spreading segments offset by dextral transform faults on the west, and a zone of subduction along the continental slope between Cape Mendocino and the Scott Islands on the east. At its northern end spreading commenced in the Dellwood Seamount area less than 2 m.y. ago. Normal faults which cut the sediment and volcanic basement in the valley between Dellwood Knolls, and high heat flow here and in adjacent Revere-Dellwood fracture zone, suggest the valley is a median valley. However, basalt north of the valley is younger and less chemically differentiated than that on the south, suggesting that the northern Dellwood Knolls may be a spreading center. The Dellwood spreading segment and the Revere-Dellwood fault connect the Explorer Ridge to the Queen Charlotte fault. The Queen Charlotte fault zone has an east-west width of 100 km from the Queen Charlotte Islands to the Queen Charlotte trough. Its southern end is near Dellwood Knolls. The Explorer Ridge is less than 6 m.y. old and contains several discontinuous median valleys characterized by high heat flow and fresh basalt. Turbidites and coal-bearing strata 300 m thick dip northeast from Paul Revere Ridge into Winona basin, which contains a deformed sedimentary sequence at least 6 km thick. The fault separating Explorer and Dellwood Ridges widens on the north where it constitutes Revere-Dellwood fracture zone. Explorer Ridge is connected to Juan de Fuca ridge by the Sovanco fault, identified by its topographic and magnetic character, but lacking a clear seismologic expression. The continental slope west of Queen Charlotte Islands is steep in its upper and lower reaches, but complex with dammed sediment sequences in the middle. On the south, the continental slope has faulted and crumpled strata suggesting slow contemporaneous or recently ceased subduction. Magnetic anomalies indicate that Juan de Fuca, Explorer, and Dellwood Ridges formed by apparent left-lateral transcurrent offsets of an older meridional ridge.

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FUTURE OIL AND GAS POTENTIAL OF SANTA MARIA BASIN

(No abstract available)