Maximum sedimentation rates for the middle Eocene Nar­
ziian 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 200
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 conti­
nental borderland.

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FORAMINIFERAL PALEONTOLOGY OF UPPER MIO­
CENE 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 con­
tinental 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 depo­
sition 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 con­
tains 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 indi­
cating tectonic uplift rather than simple basin filling.

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CRITERIA FOR BIOSTRATIGRAPHIC CORRELATION

Biosтратigraphic correlations are established using strati­
graphic 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 individ­
ual 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

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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 Dnellwood Sea­
mount area less than 2 m.y. ago. Normal faults which cut the
sediment and volcanic basement in the valley between Dnell­
Wood 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 chemi­
cally differentiated than that on the south, suggesting that the
northern Dnellwood Knolls may be a spreading center. The
Dnellwood 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 Dnellwood 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 Dnellwood 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 lack­­
ing a clear seismologic expression. The continental slope west
of Queen Charlotte Islands is steep in its upper and lower
reaches, but complex with damped 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 Dnellwood 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)