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Origin and Occurrence of Crude Oils in Molasse Basin (Southern Germany)

In the Molasse basin of southern Germany, a distinct differentiation of four regionally connected groups of oils can be inferred from the results of the $\delta\lambda C_{13}$ values and chemical analyses of the organic fractions. The differences between primary and secondary processes which caused isotope fractionation effects, and the principal correlations of chemical and isotopic data have geologic relevance. Probable models of the origin and occurrence of crude oils in the Molasse basin have been derived from geologic observations and geochemical results.

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Flow of Bottom Water Out of Weddell Sea, Antarctica—700,000 Years to Present

Bottom water produced at the Antarctic continental margin (loosely defined here as Antarctic bottom water, AABW) is thought to exert an important influence on calcium carbonate dissolution and terrigenous sedimentation in basins of the world ocean. Indeed it has been suggested that variation in AABW production and flow causes significant seafloor scouring in the Southern Hemisphere ocean basins. Today, most AABW flowing into the world ocean originates in the Weddell Sea. Piston cores from this vital region taken in the path of proposed present-day bottom-water flow, have been subjected to micropaleontologic, geochemical, and size analyses and their Th^{230} and paleomagnetic stratigraphy determined. These data have been used to reconstruct the history of AABW production and flow in the Weddell Sea during the past 700,000 years.

Variations in standard deviation ranging from 1.473 to 2.339, with sediments laminated and nonlaminated respectively, indicate fluctuations in apparent bottom-water-flow velocity and possibly, in turn, production in the west-central Weddell Sea. These fluctuations between peak and low velocities have occurred over periods of more than 100,000 years. Periods of peak-flow velocity also correspond to times when the calcite compensation depth (CCD) was elevated. Only in the past 300,000 years has the level of the CCD fallen below 4,000 m. Not yet fully understood is what seems to be a more rapid and chaotic periodicity in flow in the northwestern Weddell Sea and an apparent correlation between fluctuations and ice-rafted detritus (IRD). It does, however, seem apparent that during the past 700, 000 years bottom-water flow in the Weddell Sea has not been strong enough to cause scouring.

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Eugene Island Block 330 Field, Offshore Louisiana

The Eugene Island Block 330 field is currently the largest oil-producing field on the Federal outer continental shelf of the United States. The field, located about 150 mi (240 km) southwest of New Orleans, Louisiana, was discovered by the Pennzoil 1 OCS G-2115 well in March 1971, following leasing on December 15, 1970. The field includes Blocks 313, 314, 315, 330, 331, 332, 337, and 338, Eugene Island area, South Addition, offshore Louisiana.

The field is an anticlinal structure on the downthrown side of a large northwest-trending growth fault. Production is from more than 20 Pliocene-Pleistocene delta-front sandstone reservoirs ranging from *Lenticulina* to *Trimosina* "A" zones and located at depths of 4,300 to 12,000 ft (1,290 to 3,600 m). Reservoir sandstone thickness ranges from 20 to 90 ft (6 to 27 m). The reservoir energy results from a combination water-drive and gas-expansion system. Recoverable reserves are estimated to be greater than 225 million bbl of liquid hydrocarbons and 750 Bcf of gas.

Considerable subsurface data provided by 220 exploration and development wells and several seismic grids form the basis for our interpretation of the geology, geophysics, and petrophysics of the Block 330 field and its producing zones.

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Sedimentation Processes and Hydrocarbon Potential of Continental Rise off North America

The continental rise, within the 200-mi (320 km) economic zone, represents both the largest accumulation of terrigenous sediment on this planet and perhaps the largest unexploited hydrocarbon repository.

Several models have been presented for the origin of the rise; in the 1950s and 1960s, R. Dietz, M. Kay, C. Drake, M. Ewing, and others suggested a model of pyroclastics and turbidity-current deposition which produced a thick accumulation (eugeosyncline) of alternating coarse- and fine-grained sediment.

This view of continental-rise sedimentation was proposed prior to the discovery that deep thermohaline circulation could play a significant geologic role at abyssal depths. This latter concept was first hypothesized by the writer, who presented a model for along-slope fine-sediment dispersal driven by thermohaline circulation. This view held that turbidity currents inject sediment into contour-following, near-bottom currents; only fine-grained material is wafted parallel with contours, whereas the coarser turbidite material largely bypasses the continental rise and is deposited on the abyssal plains. This concept is supported by the results of Leg 11 of the DSDP.

The present sedimentary environment of the lower continental rise (3.5 to 5 km deep) in the western North Atlantic is now known to be dominated by vigorous near-bottom, contour-following currents (i.e., "contour currents"). Dense water originating in the Labrador, Norwegian, and Irminger Seas flows south and west through various fracture zones until it reaches the North American continental margin, where it is constrained to flow against the massive sedimentary apron of the continental rise.

The obvious implication of the contour-current concept for petroleum interest is that there would be little or no deposition on the continental rise of sediments suitable for forming reservoir rock during the time that deep circulation has been an important process in the western North Atlantic. This process is thought to have begun about 50 m.y.B.P. There would be deposition only of fine-grained, relatively impermeable, potential source beds.

It is concluded that Cenozoic sediments of the continental rise, at least off the east coast of North America, may not be a likely source for future hydrocarbon recovery. A few deep holes into the continental rise (preceded by complete seismic surveys) are needed to assess the potential of the underlying, deeply buried Paleozoic section.

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Sonobuoy Refraction Measurements from Norton Basin, Northern Bering Sea

Recent discovery of thermogenic gaseous hydrocarbons seeping from the seafloor 45 km south of Nome, Alaska, suggests that the underlying Norton basin may be an important future petroleum province. The results of 38 sonobuoy refraction profiles obtained in 1977 and 1978 show that Norton Sound and Chirikov basin are underlain by a single sedimentary trough approximately 130 km wide and 350 km long; the basin axis trends west-northwest and extends from Stuart Island to a point 100 km west-southwest of King Island. Although average depth to basement is only 2.5 km, two deeper areas, containing up to 5.5 km of sedimentary section, were discovered 75 to 90 km northwest of the Yukon River delta.

Norton basin is floored by an acoustic basement whose compressional velocity is 5.5 to 6.5 km/sec. The basin fill consists of three major units distinguishable on the basis of their compressional velocities; unconformities probably separate each of these units. The basal unit, with a velocity of 4.9 km/sec, is present only in the deeper parts of the basin. A thick (2 to 3 km) section has velocities ranging from 2.3 to 3.7 km/sec and lies on this lower unit and on acoustic basement. Compressional velocities in the 1.2 km-thick upper unit range from 1.6 to 2.1 km/sec. The lower two units are probably Cretaceous and lower to middle Tertiary marine and nonmarine rocks lying on a basement complex of Paleozoic and Mesozoic igneous, metamorphic, and sedimentary rocks similar to those mapped on Seward Peninsula and St. Lawrence Island. The upper unit probably consists of upper Tertiary and Quaternary sedimentary rocks and sediment.

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Microfossils, Macrofossils, and Stromatolites from Middle Proterozoic Belt Supergroup, Montana

Essentially unmetamorphosed strata exposed in the eastern part of the Beltian basin contain a wide variety of middle Proterozoic fossils and stromatolites.

Organically preserved microfossils are abundant in shales of the Chamberlain Shale and Newland Limestone (ca. 1,400 m.y.) in the Little Belt Mountains. This assemblage includes tubular filaments which appear to represent mainly the preserved sheaths of *Lyngbya*-like oscillatoriacean cyanophytes and sphaeromorphs which might in turn represent the preserved outer sheaths of colonial coccoid cyanophytes or possibly the encystment stages of eukaryotic algae. The sphaeromorphs include forms (e.g., *Kildinella* sp.) which are potentially useful for intercontinental biostratigraphic correlation.

Tabular microstructures defined by hematite particles and probably representing outlines of sheaths of oscillatoriacean cyanophytes in calcareous stromatolites of the Snowslip Formation (ca. 1,100 m.y.) in Glacier National Park represent one of the few occurrences of Proterozoic microfossils preserved within wholly calcareous rocks. Microfossils also occur in association with syngenetic sulfides in shales of the Appekunny Argillite (ca. 1,300 m.y.) in Glacier National Park.

Macroscopic carbonaceous compressions occur in shales of the Newland Limestone (ca. 1,400 m.y.) in the Little Belt Mountains and probably represent macroscopic, and possibly eukaryotic, algae.

Stromatolites are particularly abundant, diverse, and well exposed in strata ranging from 1,400 to 1,100 m.y. old in Glacier National Park. In addition to having paleoenvironmental significance, inclined conical stromatolites provide paleocurrent information useful in basin analysis, and branched columnar forms are potentially useful time-stratigraphic indicators.

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Pool Depletion and Geochemical Signal Decay

No abstract available.

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Effect of Depletion on Near-Surface Hydrocarbon Anomalies

Early in the history of geochemical prospecting, it was recognized that more intense soil-hydrocarbon anomalies occur in the near-surface soil over newly discovered petroleum accumulations than over those that are depleted or nearing depletion. The first convincing confirmation of this effect was obtained in 1968 after resurveying the Hastings oil field, Brazoria County, Texas, which previously was sampled in 1946. The outstanding soil hydrocarbon anomaly of the earlier survey did not reappear in the 1968 study.

Surveys conducted in 1970-71 over new and old oil and gas producing areas in Jackson County, Texas, furnished additional support to the thesis that removal of hydrocarbons from subsurface reservoirs affects near-surface soil hydrocarbon anomalies.

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Sedimentary Structures of "High-Energy" Beach-to-Offshore Sequence, Ventura–Port Hueneme Area, California