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CALCIFICATION AT FANNING ATOLL

Alkalinity, pH, and salinity measurements were made during the summer of 1972, in the lagoon of Fanning Atoll, Line Islands. These measurements were used to estimate water residence time and the rate of various CO_2 flux processes, particularly calcification.

Residence time of water in the lagoon is about 1 month, and the calcification rate is about 1,000 g $CaCO_3$ m^{-2} yr^{-1}. This rate is less than a third of what might have been anticipated on the basis of coral standing crop there. The lagoon water is supersaturated with respect to $CaCO_3$, but is significantly less so than is the adjacent open-ocean water. Possibly the metabolic process of calcification is limited by this lowered saturation state.

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CITY AND STATE REGULATIONS AFFECTING OIL INDUSTRY

No abstract available.

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METAMORPHISM OF SEDIMENTARY ORGANIC MATTER

Organic constituents both in fine-grained rocks and reservoirs undergo chemical and physical changes in both the diagenetic and metamorphic realms. Four factors affect the final products—the original kind of organic material and its diagenetic state, heat due to geothermal gradient and metamorphism, time, and subsequent alteration in the reservoir.

In the diagenetic realm, algal debris is readily convertible to potentially hydrocarbon-rich, amorphous debris (floccules) through the action of organisms and suitable water chemistry. Phytoclasts, such as cuticle and spores, are more resistant, but also can be converted. High-carbon-structured fusinite is relatively inert to diagenesis or low-grade metamorphism.

Three facies of organic metamorphism with increasing temperature/time are recognized. The immature facies has abundant methane, trace quantities of C_2-C_{14} hydrocarbons, and a C_{15+} fraction containing abundant NSO compounds. The mature facies exhibits a complete spectrum of hydrocarbons; its start marks the onset of oil generation. The metamorphic facies, characterized by abundant methane, only traces of heavier hydrocarbons, and practically no NSO material in the C_{15+} fraction, signifies the thermal destruction of preexisting oil pools. These facies, which can be mapped very early in the exploration of new-venture areas, can be recognized by combined cuttings-gas and organic-matter study. Chemical changes are paralleled by measurable physical changes in the solid-organic components. A correlation of coal rank, vitrinite reflectance, and thermal alteration numbers, based on color of organic debris, is presented.

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PLIOCENE TO HOLOCENE SEDIMENTS IN MEDITERRANEAN AREA AND THEIR TECTONIC SETTING

Today's plate-tectonic boundaries in the Mediterranean area are delineated on the basis of earthquake hypocenters, faults, ophiolites, intermediate volcanic rocks, paleomagnetic data, linear gravity anomalies, and magnetic anomalies. These plate boundaries are subdivided into subduction zones, zones of oceanic crust formation, and transform or strike-slip faults.

The thickness and facies of Pliocene to Holocene sediments, both onshore and offshore, have been compiled from many sources, which include measured surface sections, well data, offshore sparker and other seismic surveys, and cores from JOIDES Leg XIII drilling sites. A prominent, subbottom, acoustic reflector is present on almost all marine-seismic sections. This reflector was proved to be the top of an upper Miocene evaporite sequence in cores from JOIDES site 134, where late Miocene Foraminifera are present in marine shales intercalated with halite. Evaporites from the same reflecting horizon were cored at 5 other JOIDES sites. On this evidence the prominent acoustic reflector has been identified as marking the Miocene-Pliocene boundary. The subsea Pliocene to Holocene sediments correlate with post-Messinian onshore sediments.

A comparison of the postulated Mediterranean geometry with the Pliocene to Holocene sediment distribution shows the following correlations.

1. Thick, linear accumulations may occur along subduction zones, as in Italy, the eastern Carpathians, and the southern Caspian Sea-Caucasus area, but may also be thin or virtually absent, as offshore south of Crete and north of Algeria.

2. Sediment fans occur at the mouths of larger rivers as the Nile, Rhone, and Ebro; and where sea currents emerge from a constriction as south of the Strait of Messina. Some fans are related to plate-rift margins.

3. Thin sediment sheets or patches characterize the interior areas of both continental and oceanic plates.

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MECHANISM FOR LARGE-SCALE DEFORMATION IN EOLIAN DUNES

Large-scale deformation of laminae in ancient sandstone of supposed eolian origin has perplexed geologists for many years. Other workers have described several types of deformation related to lee-side avalanching, but none at the scale observed in some ancient eolian sandstone. Our observations on the surface and in trenches of a transverse dune in the Killpecker dune field in southwestern Wyoming suggest that incorporation of snow into dunes may provide such a mechanism.

During periods of snowfall, large snow cornices form on the crests of dunes. In the spring the cornices are covered by blown dry sand which is remobilized after most other snow has melted. Subsequent warming causes the sand-covered cornices to melt, become unstable, and slide at least part way down the slipface. Both folding and brecciation take place in the sand covering the snow during melting and sliding. Folding of laminae in sand under the snow also occurs. Further burial of this deformed mass of snow and sand results in its incorporation into the internal structure of the dune. Collapse breccia is formed where climatic conditions and depth of burial permit the continued melting of incorporated snow. In some cases, however, the covering sand provides sufficient insulation to prevent further melting and the snow becomes a permanent or semipermanent part of the dune.

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PALEOGEOGRAPHY, PALEOBATHYMETRY, AND PALEOTECTONISM OF MID-TERTIARY JAMAICA

Two biologically and lithologically distinct realms of carbonate deposition characterized mid-Tertiary Jamaica. After a latest Cretaceous to Paleocene orogenic episode, complete submergence of insular paleo-Jamaica accompanied the strike-slip or extensional faulting associated with the formation of the Cayman Trench on the north. Differential subsidence along a series of peripheral subsea escarpments (Duanvale-Wagwater escarpment) produced relief of more than 2,000 m by the middle Eocene. The slowly subsiding Cornwall-Middlesex platform was covered by shoal-water limestones which ended the supply of clastics to sea-bottoms north and east of the escarpment,