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AUTHIGENIC DOLOMITES FROM RED SEA

Deep-Sea Drilling Project Sites 225 and 227 were located in the main trough of the Red Sea, 10 and 3 mi, respectively, east of the axial trough in the vicinity of the Atlantis II Deep. Coring was continuous. The sedimentary section included 3 units. Unit 1 (0-175 m) is carbonate and nannofossil ooze and chalk, with minor variable detrital admixture. It is of early Pliocene to Holocene age. Unit 2 (175-195 m) is claystone, rich in dolomite and pyrite, and is earliest Pliocene. Unit 3 (195-? m) is layered anhydrite and halite, with interbeds of black shale. Dolomite is present in the shale and between anhydrite nodules. Unit 3 is of late Miocene age.

Scanning electron micrographs show the dolomites in Units 2 and 3 to have euhedral planar crystal faces and to show penetration twinning, indicating them to be authigenic. The overall percentage of dolomite increases from less than 10% at the top of Unit 2 to, locally, more than 80% within the evaporite.

Geochemical signatures differ between the dolomites of Units 2 and 3. The dolomites in Unit 2 contain excess calcium. The dolomites of Unit 3, generally of finer crystal size, achieve stoichiometric composition and show better ordering. Both types of dolomite are interpreted as early diagenetic, with the calcium-magnesium ratios being indicative of paleosalinity conditions, analogous to the dolomites of the Zechstein and the Triassic Keuper Formation.

Stable carbon and oxygen isotope data show the environments of deposition of dolomite of both units to have been restricted, but to differing degrees. The situation is directly analogous to the dolomites of the Mediterranean basin.

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DEPOSITIONAL ENVIRONMENT OF OIL SHALE IN THE GREEN RIVER FORMATION, WYOMING

Oil shale in the Green River Formation of Wyoming was deposited in shallow water. The sandstones and siltstones spatially associated with oil shale are characterized by mudcracks, ripple marks with flattened crests, ripple marks with mudcracks in the troughs, many burrows and root casts, thinly bedded units with current laminations, and fluvial channel deposits. The sandstones and siltstones lack graded bedding and other sedimentary structures diagnostic of turbidite sequences.

The assemblage of carbonate rocks associated with oil shale includes dolomitic with mudcracks, crystal casts, and plant debris; flat-pebble conglomerates; coquinas containing pulmonate gastropods; ooliths and pisoliths; algal bioherms; and mudcracked ostracodal limestones.

Disrupted bedding and a lack of continuous lamination are distinctive of the oil shale in the Green River basin. At some locations oil shale contains abundant ostracodes and insect larvae. The oil shale is closely associated with trona beds in the Wilkins Peak Member of the Green River Formation.

The sedimentological evidence is overwhelmingly in favor of a shallow-water origin for the oil shale in the Green River Formation of Wyoming. This genetic interpretation is consistent with the playa-lake (continental sabkha) model recently proposed by Eugster and Surdam.

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GAUSS-BRUNHES DISCONFORMITY IN SOUTHEASTERN INDIAN OCEAN—PALEOMAGNETIC AND BIOSTRATIGRAPHIC ANALYSIS

Previous work in antarctic regions south of Australia and New Zealand described an erosional disconformity, centered in the southern Tasman basin, that formed when bottom currents

removed sediments as old as late Miocene (Gilbert). Detailed analyses of cores from *Eltanin* cruise 39 indicate, however, that the extent of the disconformity is considerably greater than previously reported, especially on the west, along the Southeast Indian Ridge. Sediments just below the erosional surface have a remarkably constant late Gauss age (2.6 m.y.b.p.), but no specific areal trends could be determined from observed age variations. Locally, some Brunhes-age sediments have accumulated during the last 0.3 m.y., and range in thickness from thin veneers to 2 m or more.

Late Gauss and late Brunhes sedimentary hiatuses, as observed in the present area, are easily overlooked in routine core studies. The magnetic polarity is the same, and biostratigraphic definition of the late Brunhes in these latitudes is difficult. An excellent illustration of this problem is given by core E39-40. Th²³⁰ measurements, visual inspection, evaluation of radiolarian and foraminiferal indices, and polarity changes demonstrate that sediments in the top 60-70 cm are of Brunhes age (less than 0.3 m.y.B.P.), that sediments contain certain reworked Gauss elements, and that the hiatus is marked by a layer of distinctly stained (ferromanganese coatings?) foraminifers. A Gauss-Gilbert sedimentary sequence follows in the remainder of the core.

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FORTIES FIELD, NORTH SEA

The Forties field was discovered in 1970 in the northern part of the British sector of the North Sea, about 110 mi east-northeast of Aberdeen, in a water depth of 350-450 ft. The reservoir is a Paleocene sandstone at a depth of about 7,000 ft, at the base of a thick Cenozoic section consisting primarily of mudstone. The Paleocene is a sandstone-mudstone sequence and is underlain by Danian and Maestrichtian chalk. The trap is a broad, low-relief, anticlinal feature with a closed area of 35 sq mi (22,000 acres). Maximum gross oil column is 510 ft, the structure being full to spill point.

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SEDIMENTARY STRUCTURES AND DISCRIMINANT ANALYSIS OF TEXTURAL CHARACTERISTICS OF RECENT AND ANCIENT POINT BARS

Point-bar deposits of the Raton-Vermejo (Cretaceous) Sandstone are analogous to recent point-bar deposits of the Brazos River of Texas. Sedimentary structures in the two bars are similar; both contain abundant trough (festoos) crossbedding and climbing ripples. Avalanche foreset bedding is prominent at the maximum curvature of the meander in the Brazos River; reverse climbing ripples formed at the toe of the foresets. The upper and lower surfaces of the bars, measured perpendicular to flow direction at the maximum curvature of the meander, converge shoreward in both the Brazos and the Raton-Vermejo bars.

Grain-size analyses of the Brazos River and Raton-Vermejo point bars are similar. In comparison with known suites of eolian, fluvial, and beach sands, all of 33 samples of Brazos River sands are classified as fluvial sands by multiple-group discriminant analysis. Ten of the initial 50 variables calculated for each sample were removed to decrease provenance effects. Classifications were performed from the remaining 40 by using the 16 most discriminating variables.

Individual sedimentary structures in both the recent and ancient bars have similar grain-size distributions. Discriminant analysis indicates that grain-size variables alone are sufficient to separate the samples into 5 different sedimentary-structure groups (trough crossbedding, avalanche foresets, climbing ripples, reverse-climbing ripples, and horizontal laminations).

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