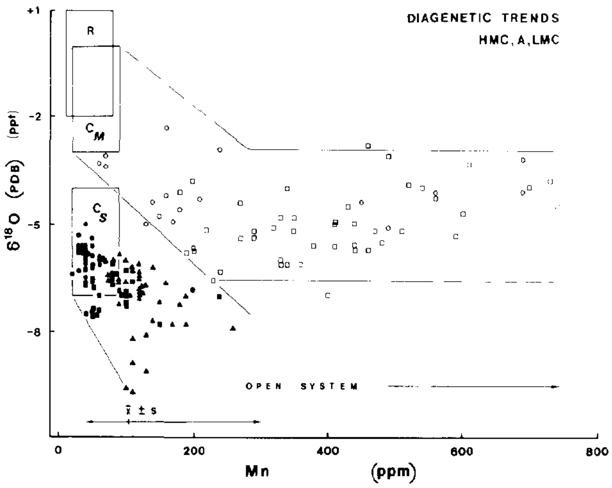

diagenetic system, is about −1 ppt for the originally low −Mg calcite components and about −2 ppt for the originally high −Mg calcite and aragonite components. Conversely, for the Burlington Limestone components, which stabilized in an open diagenetic system, the average diagenetic shift in $\delta^{18}O$ is about −3 ppt for the originally low −Mg calcite components and about −4 ppt for the originally high −Mg calcite components.

The $\delta^{13}C$ values of the components are bimodally distributed. This distribution is independent of geologic age, inferred original mineralogy of the component, degree of diagenetic alteration, and the type of diagenetic system, with components from both formations contributing to the light (+0.5 ± 0.4 ppt) and heavy (+3.1 ± 0.7 ppt) ^{13}C groups. Both groups also show a decrease in ^{13}C of about 1 ppt with stabilization of the carbonates in the diagenetic system.

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Thermal History by Fission-Track Dating, Tejon Oil Field Area, California

Data that have been obtained from deep drill holes in several areas where the approximate duration of heating events is known suggest that fission tracks in apatite and zircon are totally annealed when the grains are heated at temperatures of 135 to 105°C and 200 to 175°C, respectively, over periods of 10^6 to 10^8 years. Annealing can pose problems for determining the primary ages of samples, but if offers a powerful method for studies of their thermal and tectonic history. This paper explores the application of this method to determining the thermal history of sedimentary basins using detrital grains separated from drill-hole samples.

Detrital apatite and zircon have been separated from Eocene to Miocene sandstone recovered from deep drill holes in the southern San Joaquin Valley of California (Tejon oil field area). The Tejon area is divided by the seismically active White Wolf fault. Fission-track data show that apatite in the downthrown block immediately northwest of the fault is totally annealed at a maximum paleotemperature (reconstructed from laumontite geothermometry) of 135 to 140°C, suggesting heating of 10^6 years' duration. The higher paleotemperature ($>$ 150°C) indicated for total annealing of apatite in the upthrown block shows that these samples could have been at the suggested maximum paleotemperatures for no more than 10^5 years. The relative short duration of heating over the whole Tejon area is supported by the lack of annealing in zircon, even at paleotemperatures as high as 179°C. These conclusions are consistent with the thermal history suggested by laumontite crystallization viewed with stratigraphic and structural evidence.

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Spatial Variations in Sand-Wave Size and Migration Rate: Implications for Shoal Dynamics

Spatial patterns of sand-wave size and migration rate were carefully monitored using side-scan sonar and narrow-beam echo sounding on Southwest Middle Ground Shoal in Vineyard Sound, Massachusetts, from March 22 to November 16, 1978. Navigation was provided by an acoustic-transponder system with a positioning accuracy of 3 m.

Sand waves migrate obliquely upshoal from depths greater than 19 m to depths less than 11 m. Erosion at depths less than 16 m is caused by a downcurrent increase in the sediment-transport rate, represented by a twofold increase in bed-form height that more than offsets a small decrease in migration rate. Deposition farther downcurrent, above 16 m, is caused by a downcurrent decrease in sediment-transport rate, manifested by downcurrent decreases in both bed-form height and migration rate. These bed-form-size trends are consistent with a kinematic control on bed-form size that causes bed forms to grow or shrink while they acquire or lose sediment owing to erosion or deposition.

The observed pattern of erosion on the shoal's lower flanks, and of deposition on the upper flanks and crest (a constructional phase of shoal dynamics), may be seasonal because the period of our study did not include the more energetic winter months. Alternatively, this constructional pattern may occur during all seasons, and only be balanced by such major storm events as hurricanes, which would transfer sediment from the shoal crest to its lower flanks.

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Statvik Field of Norwegian North Sea—Exploration Study of Unconformity Trap

The Statvik field is situated in block 34/10 in the Norwegian sector of the North Sea approximately 20 km east of the Statfjord field. The main reservoir is the Middle Jurassic Brent sandstone which is truncated by the late Kimmerian unconformity. the unconformity is overlain by Upper Cretaceous shales. The delta structure is one of the biggest structures at the late Kimmerian unconformity level in this part of the North Sea.

In the early exploration phase the crucial question was whether the Jurassic reservoir rocks had been eroded during the late Kimmerian orogenic event. Early generation seismic showed no reflectors below the unconformity. A square km seismic reflection survey was shot in 1974 and interpretation of this data gave indications of a thick Jurassic sequence below the unconformity.

The first well was drilled during the summer of 1978. It showed a 165-m thick hydrocarbon column in sandstones of Middle Jurassic age. The predrilling interpretation was largely correct. An active period with continuous drilling followed; by August 1979, 8 wells had been drilled on the structure. During