Three boreholes in New York State were investigated, all of which had porosity, sonic velocity, and electrical resistivity well-log data available. Thermal conductivities of drilling chips were measured on a needle probe apparatus. These data were correlated with the geophysical well-log data using multiple linear regression statistics.

An empirical relation for eastern New York State is $K = -42.5\ \phi + 0.31 \times 10^{-1}\ \Delta t + 0.12 \times 10^{-3}\ \alpha + 3.24$ where K is thermal conductivity in watts/m°C, ϕ is porosity in percent, Δt is the interval transit time in μsec/ft, and α is electrical resistivity in ohms m^2/m. A goodness of fit of 0.885 and a multiple correlation coefficient of 0.941 indicate that the technique can be used for analysis of the variation in temperatures in the subsurface.

The data fell into two groups: (1) clastics with thermal conductivities ranging from 3.39 w/m°C to 3.92 w/m°C; and (2) nonclastics with thermal conductivities ranging from 3.04 w/m°C to 4.89 w/m°C.

The evaluation of temperatures in sedimentary basins can be greatly enhanced if empirical relationships are established for particular areas.

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Diagenesis of Sandstone/Shale Package, GCO/DOE No. 1 Well, Brazoria County, Texas

Petrographic analysis of closely spaced sandstone samples (GCO/DOE No. 1 well) of a sandstone/shale package from the Frio Formation (Oligocene) indicates that sandstone reservoir quality was influenced by shale diagenesis. Three alteration zones at increasing distance from the sandstone/shale contact are observed. This zonation may be explained as follows.

Organic and inorganic maturation processes modified shale fluids which, upon expulsion into the sand, resulted in the precipitation of thin, isopachous chlorite grain coatings in the contact sand. Late in the chloritization process and thereafter, unstable framework grain silicates began to dissolve within the sand. We believe that aluminum from framework grains was removed from the contact zone by mobile organic complexes. Silica released from grain dissolution reprecipitated as quartz cement. This contact zone is about 1-ft (0.3 m) thick.

As fluids passed into the second zone (about 1-ft (0.3 m) thick) the sandstone framework grain leaching continued but to a lesser degree. Kaolinite was produced from internal mass sources and from aluminum imported from the first zone. The net addition of alumina from the contact zone prevented development of quartz overgrowths in this zone and the third zone.

In the third zone, dissolution of framework grain silicates was least thorough because of greater distance from the shale and alteration appears to have been aluminum conservative.

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Dolomitization of Pleistocene Reef Sediments by Magnesium Leaching Out of Overlapping Volcanics, Mauritius Island, Indian Ocean

A hole drilled through basaltic rocks on the west coast of Mauritius Island encountered 3 m thick, partly dolomitized reefal deposits of middle Pleistocene age, 120 m below mean sea level. Above this carbonate bed is a sequence, about 50 m thick, of strongly weathered basalts and paleosoils.

The degree of dolomitization increases toward the overlying basalt. Low-magnesian calcite and dolomite are distributed along the core as follows: (1) entirely dolomite 0.5 m downward from the volcanic rock, (2) from 0.5 to 2 m below the base of the basalt, both calcite and dolomite, and (3) below 2 m only calcite. High calcium/magnesium ratios (1.2 to 1.4) indicate that protodolomite has replaced micrites (as 0.5 to 3 μm crystals) or sparites (as 10 to 30 μm, subhedral to euhedral crystals) and fills pores created by the dissolution of calcite, demonstrating the near contemporaneity of calcite solution and dolomite precipitation. The isotopic composition of the dolomite ($\delta O^{18} = +0.1$ to $+3.6‰$, $\delta C^{13} = -1.7$ to $+2.00‰$) and its relatively high strontium content (>500 ppm) suggest the system initially must have been partly closed in order to retain the O^{18}, C^{13}, and strontium of reef carbonates during dolomitization.

The calcium/magnesium ratio of the volcanic rocks decreases from the upper to the lower part of the series (0.66 to 0.075), confirming that higher magnesium contents present in the uppermost reef layers are derived from weathered basalts.

The chemistry of the dolomite and associated volcanic rocks strongly suggests that dolomitization was probably caused by leaching of magnesium out of the volcanic rocks and redistribution within carbonate sediments by descending waters.

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Depositional Environments and Processes of Calico Bluff Formation (Carboniferous), East-Central Alaska

The Calico Bluff Formation (Carboniferous) is an interbedded limestone and shale unit which is exposed along the Yukon River in east-central Alaska. A prograding submarine-fan model explains the observed lithofacies succession and sedimentary structures.

The rocks of the Calico Bluff Formation are subdivided into five lithofacies: (1) coarse-grained bioclastic limestone, (2) fine-grained bioclastic limestone, (3) platy micritic limestone, (4) calcareous shale, and (5) siliceous shale. Shallow-water fauna in the bioclastic limestones contrast with deep-water goniatites, straight cephalopods, and brachiopods found in the platy micritic limestone and calcareous shale. Sedimentary structures include graded bedding, sole marks, Bouma sequences, and soft-sediment deformation.

Depositional processes of the Calico Bluff Formation range from basinal pelagic sedimentation to sediment gravity flows. Both proximal and distal turbidites are recognized. Distal turbidites represent deposition in a lower-fan environment, whereas proximal turbidites are deposited in a mid-fan environment. Several thickening and coarsening upward cycles are recognized in outcrop. Individual cycles may represent shifting suprafan depositional lobes. Paleocurrent measurements indicate direction of transport to the south-southeast.

Micritic beds are probably calcareous pelagic oozes that have been transported downslope by turbidity currents and deposited in the basin. Calico Bluff Formation shales were deposited by suspension and weak suspension currents.

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Use of Computer Enhanced Landsat Imagery as Planning Tool for Resource Exploration

Computer-processed NASA Landsat data were used as an exploration planning tool in four potential hydrocarbon-bearing areas in the United States and Israel. The project areas are located in Montana, Washington, west Texas, and the Dead Sea (Israel).