POROSITY AND PERMEABILITY IN SILURIAN CARBONATE ROCKS OF ANADARKO BASIN, OKLAHOMA

Ninety Hunton cores have been studied, from which 37 Silurian samples from 21 wells were tested for porosity and permeability. Each sample was examined in thin section and was analyzed chemically for $CaCO_3$, $MgCO_3$, and HCl insolubles. The specimens range from limestones and calcareous mudstones having less than 1% $MgCO_3$ to crystalline dolomites with more than 43% $MgCO_3$. Porosity ranges up to 21%, and permeability to 305 md. Rocks with appreciable porosity and permeability have a circumscribed range in texture and composition: specimens with more than 5% porosity are confined to crystalline dolomites with more than 35% $MgCO_3$ (65% dolomite), and those with more than 10% porosity to dolomites with more than 37% $MgCO_3$ (80% dolomite). Much of the pore space is in the form of fossil molds and vacuities in the matrix surrounding oolites. The fossil molds were formed by leaching, and the porous oolites probably result from a primary porosity increased by dissolution. Not all dolomites have high porosity, and several specimens with more than 35% $MgCO_3$ have less than 1% porosity; the latter condition appears to result from preservation of the fossils by calcspar and dolospar rather than as molds. Leaching of fossils and preservation by spar are confined to crystalline dolomite, thus indicating a genetic relation to dolomitization. A suggested sequence of events in the development of porosity is dolomitization and leaching, followed by some secondary cementation of pore space by spar.

Present information indicates a geographic concentration of these porous Silurian dolomites in the north-central and western parts of the Anadarko basin (data on the deeper parts of this basin are lacking).

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TECTONICS AND DEPOSITIONAL HISTORY OF ROCKY MOUNTAIN INTERMONTANE BASIN

In the Uinta basin of northeastern Utah, the Uinta and Duchesne River Formations are composed of extremely diverse fluvial sedimentary rocks. The rock units overlie extensive lacustrine deposits of Lake Uinta and provide a sensitive record of late Laramide (latest Eocene) tectonic events in this part of the Rocky Mountains. The fluvial deposits are dominantly heterogeneous, laterally discontinuous sandstone lenses and varied amounts of conglomerate and poorly stratified, fine-grained rocks.

Uplift of the Uinta Mountains changed geographic conditions and drainage patterns in the Uinta basin and strongly influenced the characteristics of contemporaneous sedimentary deposits. Important features of the stratigraphic sequence are (1) the oldest major body of sediment (early Duchesnean) produced during uplift of the Uinta Mountains is considerably younger than the youngest preserved deposits of Lake Uinta (middle Uintan); (2) lower (early Duchesnean) and upper (late Duchesnean) conglomeratic rock units record two major episodes of uplift, each composed of several smaller events; and (3) thick volcanic ash deposits, now altered, accumulated during the quiescent period (middle Duchesnean) between major uplifts. This sequence of events imposes some constraints on inferred geomorphic development of the region. The deposits also demonstrate that the latest Eocene (about 40 m.y. ago) was a time of major differential movement of the Uinta Mountains and the Uinta basin, and was not a time of tectonic quiescence in northeastern Utah.

Because of the great distance of the Rocky Mountains from the North American continental margins, detailed knowledge of local tectonic timing affords the best opportunity for plausible speculations relating plate tectonic mechanisms to Laramide events and to early development of the Colorado Plateau and the Basin-Range province.

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SUBTLE SURFACE MAPPING KELSH PLOTTER TECHNIQUES

Studies indicate that the Kelsh stereoplotter is capable of locating subtle surface anomalies using high-altitude photos and ground control.

Petroleum explorationists in the early 1950s used the Kelsh plotter to map in detail known geologic surface structures in order to determine the amount of structural closure and fault throws. In the early 1960s, with the advent of high-altitude photographic coverage over much of the United States, a new role developed for the plotter. The large, 40-sq-mi/print, lateral stereoscopic coverage allows a much wider look at large areas, and thus a new system of geologic reconnaissance mapping with extremely accurate results. Tip and tilt, inherent in all aerial photographs, can be removed. An enlargement factor of 5, together with vertical ground controls for each stereo pair, makes possible dip-magnitude readings of 1/2 degree and accurate structural elevation work. Using the Kelsh plotter to evaluate larger geologic provinces, many previously undiscovered subtle nosings, faulted noses, and independent surface closures become apparent. Cross-section work and measurement of the thickness of formations also may be accomplished. A newly developed system of polarized light makes possible the use of color aerial photographs with the same accuracy as conventional black and white prints.

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OXYGEN ISOTOPE COMPOSITION OF RECRYSTALLIZED CARBONATES ASSOCIATED WITH SUBMARINE VOLCANIC ROCKS

Recrystallized carbonates from the contact zone between sediments and apparently intrusive basalt, and from calcareous xenoliths in eruptive flows in several Deep-Sea Drilling Project cores, are depleted in O^{18} by not more than a few per mil relative to the estimated isotope composition of the original sediment. If this depletion were the result of isotope exchange to equilibrium with seawater in a closed-pore water-sediment system, then the upper limit of the temperature of recrystallization was 100°C, and probably less for most of the samples analyzed. If isotope exchange occurred in an open system, where seawater could readily circulate through the recrystallizing carbonate, the upper temperature limit would be even lower. The possibility that retrogressive isotope exchange or kinetic isotope effects were responsible for the observed isotope fractionations is considered unlikely. The fact that bulk carbonates from the deepest parts of long Deep-Sea Drilling Project cores show only minor effects of diagenesis and apparently have retained their original oxygen-isotope composition suggests that burial and a concomitant moderate temperature increase are not the only factors involved in carbonate remobilization in the deep sea. It is concluded tentatively that chemical changes in the pore water-sediment system resulting from the interaction of seawater with volcanic material may play an important role in the alteration and lithification of carbonates associated with deep-sea basalts and pyroclastic material.

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CHEMICAL COEFFICIENTS FOR IRON, MANGANESE, LEAD, ZINC, AND COPPER IN RIVER WATER AND SUSPENDED LOAD, AND MINERALOGIC COMPOSITION OF SUSPENDED LOAD OF SELECTED KANSAS RIVER SYSTEMS