Abstract

"LOCAL UNCONFORMITIES ASSOCIATED WITH SALT STRUCTURES"

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Geology can progress as a science only when newly discovered contradictory data are explained clearly or former postulations are modified to fit the new criteria.

The present geological concept of the Gulf Coast Salt Dome Basin is based on three main postulations:

1. Sharp lithological changes occurring at very short distances in sediments younger than Oligocene.
2. Upsurge of salt due to its buoyancy.
3. Tectonic quiescence of the area.

Deep drilling has revealed factors which partially contradict all three of the above postulations. These factors are:

1. In at least one instance, very detailed electrical log correlations are possible over distances of up to 45 miles. This would indicate a blanket deposition of sediments, and therefore lithological changes are obviously very gradual, with the exception of those changes occurring along flexures. Thus, the so-called "facies changes" in our area are actually misnamed and are a result of a forced correlation either from the top or the bottom of the log. The failure to realize that each well located on a salt structure has "missing intervals" within the sedimentary column due to erosion or nondeposition results in regional miscorrelation. These missing intervals are of variable thickness on each structure, since the rate of growth of each structure is not the same. "Missing intervals " within the sedimentary column are the clues for differentiation of individual cycles of deposition. Eleven such depositional cycles can be recognized in the Miocene.

2. An upsurge of salt due to its buoyancy alone can explain only the existence of salt pinnacles and domes with vertical slopes on the salt mass. However, the majority of salt structures are elongated at depth and have slopes as low as 35 degrees. Such structures can be created only by corrugation of salt resulting from a release of compressive stresses in the basement rocks.

3. If the Sigsbee Fault and the fault west of Florida, both of which are suspected of being slip faults, were rejuvenated once every 1½ million years, (the approximate duration of each Miocene sedimentary cycle), the existence of tangential stress in the area might be conceived. Release of this tangential stress will rejuvenate corrugation of the salt periodically.

Where the depth of the sea is less than 75 feet, submarine erosion in the shelf area will not permit salt structure to protrude above the flat bottom of the sea and will create local low angle unconformities at the end of each cycle. Where the sea depth is greater than 75 feet, structures will protrude above the sea floor; and the deposition of new sediments will occur only on the flanks of these structures. This will create typical overlapping.

There can be as many local unconformities as there are cycles. The majority of those unconformities are only low angle discordances and are of little importance. However, those which were created under conditions of dormancy of the salt movement during one cycle followed by vigorous salt movement during the next younger cycle - are of paramount importance. The beds below these unconformities are strongly truncated and constitute potential traps for oil and gas accumulation on distant flanks of the structure.

By comparing the sedimentary column of one structure to that of others around it, the differing rate of growth of the structure during various cycles can be established at an early stage of exploration. The recognition of a different cycle within a given sedimentary interval will indicate the presence of potential traps below certain shale breaks.