

GEOPHYSICS AND STRATIGRAPHIC PROBLEMSG. H. WESTBY¹

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The era of structure finding for the location of oil fields in the United States is waning. The era of geological and geophysical search for stratigraphic trap oil fields has barely begun. Vast oil reserves in stratigraphic traps are surely available if suitable means can be developed to find them.

Geophysical methods in the past and as applied up to the present have had some small success in solving stratigraphic problems and locating stratigraphic traps. The magnetic method has determined the depth of basement rocks and, thereby, the section of sedimentary beds available. The gravity method has, of course, located many salt domes, but these are not considered in this discussion. It has, as the sole method employed, been very successful in the location of shallow reefs, shallow productive areas of porosity in limestone or dolomite reservoirs, and may even, in favorable cases, locate shallow sand bars.

The seismic reflection method, through proper identification of important reflecting horizons, their presence and absence, plus the use of time intervals between reflections, has provided some stratigraphic data of value. The time interval or isochron maps were used in Oklahoma in the Golden Trend to project areas of stratigraphic accumulation of oil. The disappearance of certain reflections has been used to map edges of stratigraphic traps such as the West Edmond field in Oklahoma.

New methods available to the seismic industry include the continuous velocity log and its derived reflection coefficient log and synthetic reflection record, the Siran, an electronic simulator of the entire seismic process, magnetic recording and reproducing, corrected normal and variable-density cross-sections derived from the magnetic data and a device, one type called a Seisverter, to rerun old paper seismic records and give them modern cross-section or magnetic tape treatment.

Of these new developments, the continuous velocity log and the synthetic reflection record, whether derived from the CVL or through the Siran, are important. Reflection complexes can be unscrambled and much more stratigraphic data revealed. Theoretical studies with synthetic reflection records indicate a reasonable possibility of determining from seismic data the presence or absence of certain important sandstones which produce under stratigraphic-trap conditions.

The presentation of seismic data on corrected record sections, particularly the variable density type, reveals more data of low-amplitude reflections and greatly improves stratigraphic study.

The Seisverter enables the geophysicist to apply these new techniques to old seismic records shot by conventional means.

These new methods promise much greater success in the revelation of stratigraphic problems by the seismic method if properly studied and applied.

It is the purpose of this paper to acquaint geologists with these new techniques, so that cooperation with geophysicists in the study of stratigraphic problems can be improved and intensified.

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