

# **EXPLORATION APPLICATIONS OF PHOTOGEOLOGY AND LANDSAT IN TEXAS**

**By:**

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The Austin Chalk is undergoing an exploration play for which photogeology and imagery analysis can play a useful role.

In most areas of the world a careful and knowledgeable assessment of the surface geology provides much information about the subsurface. In fold belts the mapped surface structure generally relates to structure at depth, and it has been known for many years that an experienced analysis of the surface in complex thrust belts can provide valuable clues to help solve the subsurface structure and identify prospects. Similarly, surface data derived from the interpretation of aerial photography in low relief, plains-type areas with little or subdued outcrop can provide many indications of subsurface structure.

Drainage patterns have long been recognized to reflect the surface on which they have developed. Streams cut back along lines of weakness caused by faults or fractures. They react to subtle dip changes, different lithologies, and may outline structure not immediately obvious to the eye or hammer. The most likely causes for the surface expression of a buried structure, other than the simple continuation upward in the strata, are compaction and ground water processes. It is often possible to detect such structures by assessing the drainage, landforms, faults, fractures, lineations and tones for "deviations from the norm," or anomalies as they are called.

A thorough stereoscopic analysis of aerial photography combined with field control from published geological and topographic maps makes possible a detailed analysis of the surface. A positive structural interpretation of the data visible on the surface can be of immense use in oil and gas exploration programs. Such mapping is an essential part of the regional coverage that is so often omitted.

Since the 1950's there has been written a wealth of literature regarding photogeology, photogeomorphology, linears, fracture analysis, lineament analysis and satellite imagery interpretation. Despite much bias, this information has done nothing to change the fact that when a buried structure, feature or trend has surface expression such as a drainage anomaly, linears or haloes, then it must have been propagated upward during geological time. The analysis of linears, particularly from imagery, without an exact definition of their origins, ground characteristics and relation to lithology, is of questionable meaning. Similarly, it is unlikely that vague haloes and fracture patterns correlate with boundaries of oil and gas fields, or dry holes with the upward propagation of water levels, facies changes and porosity and permeability differences.

Illustrations from photogeological studies and imagery analysis in Texas show what these investigations can accomplish to aid the explorationist. In the case of the Austin Chalk the surface faults and fractures should be of particular interest.

In the course of these studies it was clearly demonstrated that far more relevant and reliable data can be obtained from the interpretation of vertical aerial photography or photogeology than from imagery analysis.

The use of photography in prospecting requires remarkably small expenditures compared with other exploration methods. Skilled interpretation can often bring to

light previously unrealized local and regional geological features of considerable significance to the geologist and geophysicist. Consequently, photogeology should be included in almost all exploration programs.