



beds have scoured bases and become finer grained upward, suggesting traction-load deposition. Sand-transport directions are normal to the paleoshoreline. Outside the graben, chenier plain and interdistributary sequences were deposited. Likewise, hummocky stratification is more common and sand transport parallels the paleoshoreline, suggesting wave and longshore transport of sand material.

RIGGI, SALVADOR A., JR., Wright State Univ., Dayton, OH

Solute Transport Model for Pollutant Flux in Vicinity of a Landfill, Dayton, Ohio

Toxic waste disposal and ground-water contamination is a problem which the entire nation faces. The Dayton area in Ohio is presently facing the threat of having its underground water supply contaminated by toxic wastes disposed of in various sites. It is now realized that these toxic substances are leaching out from both existing and abandoned dumpsites and posing a serious problem for an already endangered resource. The study area is located in Moraine, Ohio, which lies south of Dayton. The goal of this thesis was to develop a two-dimensional model showing the transport and dispersion of solutes through the Dayton aquifer, using the USGS program for a computer model of two-dimensional solute transport and dispersion in ground water. The model will show the results for varying water-table conditions, concentration of solutes relative to some distance from landfill, plume direction, time of plume migration, and potential hazards. This model shows results for a two-dimensional, vertical and horizontal model.

ROBERTS, W. H., III, Gulf Research & Development Co., Houston, TX

Hydrothermal Approach to Petroleum Exploration

In sedimentary basins, the accumulation of raw materials to form oil and gas deposits is in many ways similar to the accumulation of materials to form mineral (ore) deposits. Logic suggests that the job can hardly be done without an active water system functioning as both solvent and vehicle for the raw materials. Members of the mining community have no problem with this concept. However, a majority of people in the petroleum industry (especially in the Western Hemisphere) seem to have a chronic aversion to water.

Mining and petroleum people both work with the same environment of water-wet sedimentary material. It can be shown that some similarities of petroleum and mineral accumulations are not just coincidence. They are essential functions common to both systems.

An important similarity of petroleum and mineral accumulations—and the main topic of this paper—is the hydrothermal regime. In both systems, hydrothermal conditions are supported by field and laboratory evidence. Such evidence has been used effectively in mineral exploration for many years and there is good reason to believe it can be used in petroleum exploration. If moving waters carry raw materials for oil and gas deposits, and temperatures can be used to track those waters, then the temperatures may also point toward possible oil and gas deposits. As with mineral deposits, places of interest could be where depressuring and cooling associated with upward movements of enriched waters are likely to cause hydrocarbon fall-out.

ROBERTSON, J. D., and H. H. NOGAMI, ARCO Oil and Gas Co., Dallas, TX

Thin Bed Stratigraphy from Complex Trace Attributes

Both model seismic data and broad-band field data acquired to delineate complicated stratigraphy have been converted to displays of the instantaneous attributes of the complex seismic trace. Attribute sections enhance the interpretation of conventional sections not only by qualitatively highlighting specific properties of conventional displays, but also by quantitatively defining wavelet characteristics like dominant frequency, and stratigraphic variables like formation thickness. An example of the quantitative use of complex attributes in wavelet definition is the phenomenon that the maximum instantaneous frequency of a zero-phase Ricker wavelet is synchronous with the central peak of the wavelet and exactly equal to the frequency corresponding to the center of gravity of the wavelet's amplitude spectrum. Peak instantaneous frequency thus is a physical meaningful measure of the spectral content of a zero-phase Ricker wavelet. If the signal in a seismic section can be approximated by zero-phase Ricker wavelets, and if the geophysicist can identify occasional wavelet peaks in the sections which are uncontaminated by noise or interference, instantaneous frequencies at these samples are direct estimates of a significant and absolute spectral characteristic of the signal.

An example of the quantitative use of attribute sections in seismic stratigraphy is their application to estimation of the thickness of thin, porous sands. Pods of porous sand which are encased in high-velocity material and whose thicknesses are of the order of half the peak-to-peak period of the dominant seismic energy show up as anomalously high amplitude zones on instantaneous amplitude displays. These anomalies result from the well-known amplitude tuning effect which occurs when reflection coefficients of opposite polarity a half-period apart are convolved with a seismic wavelet. As sand members thin to a quarter-period of the dominant seismic energy, the thinning is revealed by an anomalous increase in instantaneous frequency. This behavior results from the less well-known but equally important phenomenon of frequency tuning by thinning beds. Frequency tuning reaches a maximum when sand thickness is about a quarter-period and remains evident as the sand continues to thin. The instantaneous frequency section thus can be a sensitive analytical tool for investigating stratigraphic sequences composed of very thin layers. Frequency and amplitude tunings are accompanied by changes in the character of the complex of interfering reflections from various impedance boundaries in a formation of thin beds, and these changes are highlighted by the instantaneous phase display.