Brazil, consists of coarse-grained turbidite sand bodies enclosed by pelitic deposits. The turbidite sands represent a major oil reservoir in the Brazilian offshore. On the basis of core analysis, E-log correlation patterns, and seismic data, these sand bodies are interpreted as original deep-sea fan sediments that were extensively winnowed by bottom currents. Indirect evidence for such an interpretation is given by the complete absence of thin-bedded and fine-grained turbidite sediments. Direct evidence is the highly burrowed, fine-grained, and irregularly stratified bottom-current deposits. This complex depositional system was formed on a passive continental margin setting, concurrently with an overall seaward progradation of clastics. The correct understanding of such depositional models seems to be of primary importance for the oil exploration of the Atlantic margins.

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Utility of Computerized Data Bases of Drill-Stem Test Information in Hydrogeologic Studies

The Palo Duro basin, a subbasin of the Permian basin, is being investigated by the Bureau of Economic Geology at The University of Texas at Austin as a potential site for the location of a nuclear waste repository. As the program changes from a regional to a site-specific investigation, it becomes necessary to optimize the expenditure of funds for drilling and testing. Hydrogeologic information is of critical importance in evaluating the long-term stability of a potential repository; consequently, deep multipurpose wells should be drilled in locations that maximize the opportunity to obtain both hydraulic and geochemical data.

Prior to our own borehole testing, the only hydrogeologic data available came from petroleum exploration activities, namely, drill-stem test (DST) pressure measurements and brine samples collected with the test. Computer data files of DST information were purchased from commercial sources or obtained directly from operators who had worked in the basin, and the data were merged into a master file. Approximately one thousand tests have been sorted according to geologic formation and lithology. The DST data were then screened and ranked according to their level of confidence based on shut-in pressure characteristics, fluid recoveries, and flowing times.

Automatic computer contouring of the selected data produced an unsatisfactory map because of the varied quality of the tests. An objective geostatistical method was subsequently employed to map the regional pressure or hydraulic head distribution in the basin. Geostatistical analysis of the data revealed that a spatial dependency existed which could be modeled by a two-dimensional spherical variogram. The method of kriging was then applied to the data to estimate the regional hydraulic head surface.

A chemical equilibrium computer program was used to determine the reaction state of the deep basin flow system, using as input data the chemical composition of the brines collected during drill-stem testing. The program then incrementally added the CO_2 lost during collection back into the initial brine composition until it reached the calcite phase boundary. This mass transfer approach results in the computation of the most likely mineral constraints on the brine at measured formation temperatures, pressures, and computed pH conditions.

The results of these studies provide interpretations of the regional hydrogeologic processes. Consequently, exploration decisions can be made concerning the location of future test wells to further define the geologic, hydrologic, and geochemical characteristics in this sedimentary basin.

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An Alternative to Reservoir Simulation Using Critical Parameter Analysis of Reservoir Data Bases

Conventional methods of statistical analysis often break down in the study of reservoirs because exclusionary processes reduce the number of elements studied until they are statistically meaningless.

Using an Enhanced Oil Recovery (EOR) Field Test Data Base which was developed for 187 field tests, methods of multivariate analysis, particularly cluster techniques, were used to look for similarities and differences in the data. Each field test was treated as a key element with the following nine reservoir parameters considered as independent variables: porosity, permeability, oil saturation, API gravity, initial water saturation, age, depth, net pay, and viscosity.

A 187 × 12 unweighted data matrix was constructed. Then a 187 × 187 diagonal matrix of similarity coefficients was calculated using a moment based equation. The similarity matrix was ordered and plotted in the form of a dendrogram using a pair-wise grouping technique.

Clustering effects were found correlated to the five different enhanced oil recovery processes used in the field tests. The processes involved are in situ-combustion, carbon dioxide injection, improved waterflood, surfactant-polymer injection, and steam flooding.

The application of these methods to critical parameter analysis of a field test data base for enhanced oil recovery are discussed and illustrated by an assortment of computer and display techniques. The methodology appears to have significant potential in evaluations involving selection and application of reservoir screening criteria, the identification of minimum data requirements for decision making, audit methods for the examination of data bases, and comparative analysis of large numbers of reservoirs simultaneously.

An exploratory approach to prediction of performance of EOR Field Tests using an interactive stochastic model will also be described.

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Mississippian Conodonts from Well Cores, Crossfield, Alberta

Cores from three wells drilled into the Elkton Member of the Turner Valley Formation at Crossfield, Alberta, yielded numerous conodonts. These conodonts permit interregional and intraregional correlation to other sections in western Canada, to strata in the upper Mississippian Valley region, and to sections in Europe. This material came from 300 to 500 g samples taken at 5 ft (1.52 m) intervals from 0.5 in (1.26 cm) slabs of well cores.

Eotaphrus burlingtonensis and *Polygnathus mehli* are common and allow recognition of the *Eotaphrus* Subzone of the *Eotaphrus-Bactrognathus* Zone. This subzone can be recognized within the Turner Valley Formation at Cadomin and Moose Mountain and the lower Livingstone Formation in Bow Valley sections. This subzone also occurs in the upper part of the Burlington Formation within the type region of the Mississippian System and in the upper Tournaisian (Tn3c) of Belgium, Britain, and Germany.

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