boniferous and to *Schwagerina* and related forms in the Early Permian.

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Eastern Gas Shales Project (EGSP) Data System: Useful Exploration and Research Tool

The U.S. Department of Energy in Morgantown, West Virginia, and the U.S. Geological Survey and Petroleum Information Corp. in Denver, Colorado, have created two large data files for the Eastern Gas Shales Project (EGSP). All computer-compatible well, outcrop, and sample data generated by EGSP contractors from Devonian shales throughout the Appalachian basin are being edited, converted to a data base, and accessed by Department of Energy contractors to produce digital printouts, charts, and maps.

The EGSP Well Data File was developed as an extension of the Petroleum Information Well History Control System (WHCS) and contains geologic, engineering, and production test data for more than 6,000 wells. The EGSP Sample Data File contains geochemical, lithologic, and physical characterization data on more than 50,000 samples from 17 EGSP cored wells, and 140 additional wells and outcrops.

Well and sample data can be retrieved to produce (1) production test summaries by formation and location; (2) contoured isopach, structure, and trend surface maps of Devonian shale units; (3) sample summary reports by location, well, contractor, and sample number; (4) cross sections displaying digitized log traces and geochemical and lithologic data by depth for wells; and (5) frequency distributions and bivariate plots.

EGSP Data System products are being used by EGSP contractors to help solve Devonian shale exploration and research problems in the Appalachian basin. Although part of the EGSP Well Date File is proprietary, and distribution of complete well histories is prohibited by contract, maps and aggregated well data listings can be made available to the public through published reports.

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Overview of Seals for Hydrocarbons

Seals for hydrocarbons need to be analyzed and described at two differing scales. A micro view of the rock matrix, pore structure, and fluid content of the seal surface provides quantitative information about the capacity of the seal to impede hydrocarbon movement at a specific measured point. Such micro information often can be accurately measured, but can rarely be extrapolated to describe the overall (mega) sealing capacity of a large hydrocarbon trap.

Efforts have been made over the years to describe the lateral variability of seals for hydrocarbon accumulations. One of the best features of the simple anticlinal structure is that it generally provides sequential sealing surfaces. Top-seal surfaces may be expected to have relatively little lateral variability (at least on the scale of an individual anticline). Faulted structures, in contrast, require not only a top seal, stable in lithology over the trap area, but require juxtaposition of the hydrocarbon-bearing interval against a sealing lithology at the fault plane surface. Large hydrocarbon columns become almost impossible to seal if the trapping configuration requires multiple faults with throws that vary along the individual faults.

Stratigraphic traps for hydrocarbons typically require a top seal, bottom seal, and an updip lateral seal. In addition, the transition from reservoir to seal must be very rapid or the hydrocarbon accumulation will largely occupy a "waste-zone"—not quite a reservoir, hardly a seal.

Regionally, it can be shown that hydrocarbons are preferentially distributed under major roofing seals. These major sealing units are characterized by broad extent, by laterally stable character, and commonly by ductile lithologies. Where these regional seals are above significant source rocks and reservoirs, they largely control the emplacement of hydrocarbon accumulations.

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Morphology of Continental Shelf-Slope Break

The continental shelf-slope break has been defined as the point of first change in gradient at the outermost edge of the continental shelf, fundamental boundary of the earth's crust. Through the projection of its strike must pass all materials carried from the continents to the ocean basins. Although morphology of the shelf-slope break commonly depends on the crustal change between continents and ocean basins, it is a reflection of tectonics and structure, lithology, age of the margin, sea level, deposition, erosion, reworking, and diagenesis. Many details of specific physical factors and processes influencing morphology of the break remain to be discovered. Therefore, analysis of the resultant of all these factors, the morphology of the break itself, will be useful in understanding the components which formed it. As many of the factors which affect the transition from shelf to slope are dynamic, continental shelf-slope break morphology is not static but changes through time. Changes in morphology must commonly interact in a feedback loop to alter the processes contributing to that morphology. If the elements of formation were to remain constant, the shelf-slope break would go through a regular morphologic evolution as it ages. Variation in the processes involved, such as sea-level state, most commonly interrupt the cycle.

Because the shelf-slope break represents the upper boundary of the continental slope, it is convenient to discuss the interplay of the various factors involved as extensions of the 6 types of continental slopes. The resulting framework for shelf-slope breaks is: folded or faulted, stepped breaks; progradational transitions; pull-apart transitions; sharp, steep shelf-slope breaks resulting from crustal convergence; breaks associated with reefal dams; and breaks associated with diapir dams. A shelf-break classification emphasizing shelf-to-slope morphology, based on comparison of different world margins, is proposed.

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Data Enhancement from 500-Channel Streamer

Seismic reflection data obtained with a 500-channel, digital streamer cable can be processed by array-forming techniques that include optimal weighting and time-shifting of individual channels. Such processing can improve the vertical resolution of horizons at early and intermediate times as well as enhance the continuity and clarity of later reflections. In addition to the recording of individual channels, a separate recording can be made aboard ship with the individual channels array formed to simulate data obtainable with any of a wide variety of conven-