

over 250 nL/L of methane, whereas the reported open-ocean concentrations show a majority of the samples contained less than 50 nL/L.

Generally, on the continental shelf a local contribution is more common for methane than for propane.

The seawater hydrocarbon concentrations have been compared with the U.S. Geological Survey estimates of undiscovered oil and gas resources in each of the offshore geologic provinces where data were collected.

PLAFKER, GEORGE, G. R. WINKLER, P. R. CARLSON, T. R. BRUNS, U.S. Geol. Survey, Menlo Park, Calif., and GEORGE CLAYPOOL, U.S. Geol. Survey, Denver, Colo.

#### Petroleum Potential of Eastern Gulf of Alaska Shelf Based on Dredge Samples from Adjacent Continental Slope

Bedrock dredging in water depths between 4,060 and 550 m along the continental slope in the eastern Gulf of Alaska has revealed the existence of a previously unknown Eocene sequence that locally includes potential source and reservoir rocks. Argillaceous rocks in the sequence are soft to moderately indurated dark-brown shales and commonly glauconitic, pyritic, and in part concretionary or laminated siltstones. They locally contain extremely abundant microfossils, large fish scales, and carbonized plant fragments. Associated with the argillaceous rocks are relatively clean quartzofeldspathic sandstones that are in part carbonaceous and calcareous, sandstone matrix cobble-boulder conglomerate, and palagonitized basaltic tuff. The rocks range in age from late early Eocene to late Eocene and were deposited in relatively warm water at depths ranging from shallow to bathyal.

Source-rock analyses indicate that argillaceous rocks from six of the dredge hauls located between Yakutat Seavally and Alsek Canyon contained more than 1% and as much as 1.6% organic carbon; the rocks are thermally mature to slightly immature and one sample contained extractable saturated hydrocarbons. Sandstone porosities are generally moderate and permeabilities are very low. However, recovery of one friable sandstone with 23.8% porosity and 35.9 md permeability suggests the presence of possible reservoirs in the sequence.

Seismic reflection data indicate that the Eocene sequence with the most favorable source potential dips northward from the slope beneath the adjacent Yakutat shelf where it could be a possible petroleum source and exploratory target.

RICE, G. W., and B. M. BRANDT, Continental Oil Co., Ponca City, Okla.

#### Wave-Form Factor Analysis—Quantitative Approach to Seismic Stratigraphy

Stratigraphic prospecting methods have made extensive use of seismic reflection data during recent years. Although many of these qualitative concepts have helped geoscientists define lithologic patterns and their characteristics with improved accuracy, quantification of the methodologies has been difficult. Multivariate statistical methods are useful in delineating and charac-

terizing wave-form patterns from a multiplicity of seismic reflection lines. Recursive factor-analysis methods are used first to identify the number of wave-form patterns that exist in a particular zone of seismic data and then to assign each seismic trace to a particular wave-form group (or seismic facies).

This analysis yields two products: average and end-member wave forms for each of the various groups and a distribution map of the classified wave forms. Resulting average and end-member wave forms can be used in conjunction with well information and/or seismic models to infer a lithologic meaning for the seismic facies. The map of classified wave forms can effectively augment other geologic data and concepts in establishing environments of deposition and other distributional information. Further quantification of the wave-form patterns can be established through discriminant-analysis procedures. These resulting classification functions are useful when new data are integrated into the analysis and when correlating well information with the wave-form data.

ROBINSON, J. E., W. A. BURROUGHS, P. D. WILLETTE, and D. F. MERRIAM, Syracuse Univ., Syracuse, N.Y.

#### Quantitative Comparison of Geologic Maps to Petroleum Prospects

The problem of deciding on the best geologic parameter and mapping procedure for prospect location can be simplified by the use of similarity maps and comparison functions. Structural or other geologic data are contoured by digital computer, filtered to extract and enhance specific features, then tested against areas of known production. Tests include the application of similarity maps that can be used to locate the specific areas that are most similar to those that are known to have production. Statistical comparison functions help to minimize personal bias in choosing the best mapping procedure.

SAVIN, SAMUEL M., Case Western Reserve Univ., Cleveland, Ohio, and ROBERT G. DOUGLAS, Univ. Southern California, Los Angeles, Calif.

#### Tertiary and Cretaceous Ocean Temperatures

Oxygen-isotope paleotemperature studies of marine microfossils, primarily from DSDP cores at several laboratories, have in the past few years yielded a great deal of information about the three-dimensional temperature structure of the oceans and its evolution during the past 100 m.y. As expected, because of problems of sample preservation, climatic information is progressively less detailed for successively older times.

The general trend of ocean temperatures since middle Cretaceous time has been downward. However, the downward trend has not been uniform, but has been punctuated by frequent intervals of rising temperatures. Temperatures fell and then rose again near the time of transition from Tertiary to Cretaceous, but the magnitude of the temperature decline was much smaller than other temperature declines observed in the marine isotopic record of the past 100 m.y. Two striking features