Deep Structure and Metallogeny of the Earth's Crust

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Abstract

Considerable experience with integrated geological and geophysical studies has enabled definition of deep crustal structures and, within limits, composition and processes within the deep crust, and to determine their association with metallogeny in the USSR.

By means of seismic experiments, stratification of the Earth's crust and the upper mantle to a depth of about 100 km has been revealed. Numerous heat flow data have been compiled. Magneto-telluric soundings made it possible to determine the position of conductive strata in the crust and upper mantle for a number of areas. Gravity surveys coupled with the results of seismic profiling enabled the finding of a number of empirical laws that are useful for investigation into the deep crust. Magnetic data analysis has enabled evaluation of the magnetic layering of the deep crust. Kimberlite and ore provinces can be considered examples of these concepts.

For more detailed studies of deep crustal structure the territory of the USSR is the subject of a system of regional investigation of the deep crust and upper mantle. This system is based principally upon a network of interconnected regional profiles (geotraverses) tied to deep and superdeep boreholes. The system includes predicted geophysical observations to control investigation of the geophysical field data. The geotraverse network is the basis for detailed studies within the bounds of petroleum and ore provinces.

The most accurate data obtained allows the formation of a crustal model and reveals empirical relationships with metallogeny.

Based on the deep crustal structure data a regional ore-genesis prediction map has been made. The endogenous mineralization prediction was based on special features of the upper layering of the crust and on data relating to deep crustal permeability zones.

Geophysical Methods of Oil and Gas Exploration in Cambrian and Precambrian Sedimentary Rocks of the Siberian Platform

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Abstract

The Siberian Platform is the largest hydrocarbon-bearing sedimentary basin in the USSR. The conditions encountered in geophysical exploration in this basin are uniquely difficult. This very old sedimentary complex is characterised by abrupt changes in physical properties reflecting the presence of dolerites and tuffs, changes in salt thickness, and complex structure.

Petroleum traps are controlled by low amplitude structures in the salt complex, although reservoir properties are variable, so that most traps are stratigraphic. This leads to the use of frequency content of seismic data to identify traps and electrical and time domain EM techniques to confirm the presence of the traps.