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Classification of Hydrocarbon Deposits in the South-Eastern Part of The Bukhara-Khiva Region

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Abstract: *When conducting geological exploration, calculating hydrocarbon reserves, drawing up project documents for field development, planning measures to intensify production and increase the component recovery of productive formations, it is necessary to use the experience of working on similar fields. For productive deposits with different geological and physical conditions, the effectiveness of geological and technical measures varies, and this circumstance should be taken into account when conducting geological exploration and developing hydrocarbon deposits.*

Keywords: Oil, gas, deflection, tectonics, structure, fields, seismic exploration, location of wells, carbonate formation, reef, biogerm, swimming pool.

Introduction

In this regard, there is a need to classify deposits, that is, to distinguish groups with relatively homogeneous objects by a set of geological and physical parameters[1].

To date, numerous classifications of hydrocarbon deposits have been proposed, depending on the tasks to be solved in the study of the geological structure of deposits and development. In this case, the main features are used: genetic by the conditions of formation of hydrocarbon deposits; type of fluids, gas, gas condensate, oil and gas condensate; type of reservoirs; morphological – by the conditions of occurrence of hydrocarbon deposits; industrial value of deposits [2].

In historical terms, it should be noted that for the first time the classification of hydrocarbon deposits was proposed by KLAPP, this classification was supplemented by Gubkin I. M. (1932). subsequently, the General classification scheme for oil and gas fields was proposed by Hain V. E. (1954), Mirchinkov M. F. (1955), Brod I. O.(1941) and eromenko N. A. (1957), Bakirov A. A. (1968), and others [3; p. 198]. However, to date, the classification of oil and gas fields that meet various geological and physical conditions has not been developed, and research continues.

All activities carried out in the process of prospecting and exploration, development of hydrocarbon deposits are aimed at rational exploitation of deposits and maximum extraction of oil and gas from productive reservoirs.

The above-analyzed classifications of hydrocarbon deposits mainly use one or two parameters. Therefore, there is a need to clarify the validity of the parameters accepted in the classification based on the use of a complex of geological and physical factors.

Currently, various geological, technological and mathematical methods of classification of hydrocarbon deposits are proposed [2: 147-150], [3: 288], [4: 43], [5:112], [6: 79-84], [7; c. 36-40].

Most of these methods allow you to select homogeneous objects only by quality characteristics[8].

Since three-dimensional methods of geological and hydrodynamic modeling are widely used in Geology, including oil and gas Geology, there is a need to Express the similarity of objects quantitatively. One of the ways to solve this problem is the widely used method of constructing dendrograms [3: 161-168].

The essence of the method of constructing dendrograms according to [3: 161-168] is as follows.

Let there be a class of objects A_1i8=1, 2, …., n, characterized by a set of geological and commercial features a_{ip}, p-1, 2, … , k..

The main idea of the method is to build a hierarchical system that combines groups of similar objects. In this case, the correlation coefficient is given a geometric meaning, interpreting it as the cosine of the angle between two vectors in multidimensional Euclidean space. The Arccos of the correlation coefficient is considered as a measure of the distance between

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vectors, and therefore as a measure of similarity between objects. The correlation coefficient is calculated using the formula [3: 161]:

$$\sqrt{A_i, A_j} = \frac{\sum_{p=1}^{k}(a_{ip}-\overline{a_i})*(a_{jp}-\overline{a_j})}{\sqrt{\sum_{p=1}^{k}(a_{ip}-\overline{a_i})^2*\sum_{p=1}^{k}(a_{jp}-\overline{a_j})^2}} \quad 1$$

where AI is the arithmetic mean calculated from the set of values aip and AJP. It should be borne in mind that the signs may have a completely different nature and characteristic interval of change. Therefore, you must first normalize them in some way, for example, by bringing them to a single change interval. The basis for applying any method of grouping objects into mutually related groups is a symmetric matrix S1 - whose elements Sj are the distances between objects Ai, Aj

$$S_{ij} = arccos\sqrt{A_i A_j} \quad (2)$$

where AI is the arithmetic mean calculated from the set of values aip and AJP. It should be borne in mind that the signs may have a completely different nature and characteristic interval of change. Therefore, you must first normalize them in some way, for example, by bringing them to a single change interval[10]. The basis for applying any method of grouping objects into mutually related groups is a symmetric matrix S1 - whose elements Sj are the distances between objects Ai, Aj.

At each subsequent stage, you must again select the two closest objects, combine them, and remember the value of the hierarchical level of the formed group. Obviously, with the initial number of elements equal to n, the entire procedure ends at the (n-1) th step[11].

When combining two objects containing several elements, the arithmetic mean of the distances between the elements of the combined groups can be taken as a measure of group similarity[12].

To perform calculations based on the classification of hydrocarbon deposits, parameters were selected that are reliably justified when objects exit geological exploration [13]. Which the tables compiled by the author characterize the geological and physical parameters:

- conditions of occurrence of hydrocarbon deposits (depth of water-oil and gas-water contacts, reservoir temperature, reservoir pressure);
- the size of hydrocarbon deposits (the area of gas and oil content, the total thickness of the productive horizon, the oil and gas – rich thickness of the productive horizon);
- filtration and fatigue properties of reservoirs (porosity, oil and gas saturation);
- properties of gas and reservoir fluids (density of oil, gas, water, potential condensate content) [14].

The hydrocarbon deposits in the South-Eastern part of the BHR are more uniform in the following parameters: the level of gas – water and water-oil contacts, reservoir temperature, porosity, oil and gas saturation, density of oil, gas and water. At the same time, they differ greatly in the area of oil and gas content, the total and effective thickness of productive horizons, reservoir pressure, and potential condensate content in the gas[15].

According to the results of calculations by formulas (1) and (2) constructed a dendrogram of the classification fields in the Southeast part BHR (Fig.1), from which it is evident that the hierarchical level of 0.64 there are four groups of fields differing in fasova as hydrocarbon gas, gas condensate, gas condensate and oil[16]. At a lower hierarchical level, 0.2 of these groups are distinguished by the type of deposits: massive, reservoir-arched, reservoir-massive, which in some cases are complicated by lithological substitutions and shielded by tectonic disturbances.

The results of the classification of deposits in the South-Eastern part of the BHR show that it combines two qualifications, in which the criteria are the phase state of hydrocarbons and the geological structure of deposits[17].

Thus, it is shown that to date, depending on the problems of Geology and development of hydrocarbon deposits, numerous classifications have been proposed[18]. As a criterion, the complexity of the geological structure and the phase state are accepted

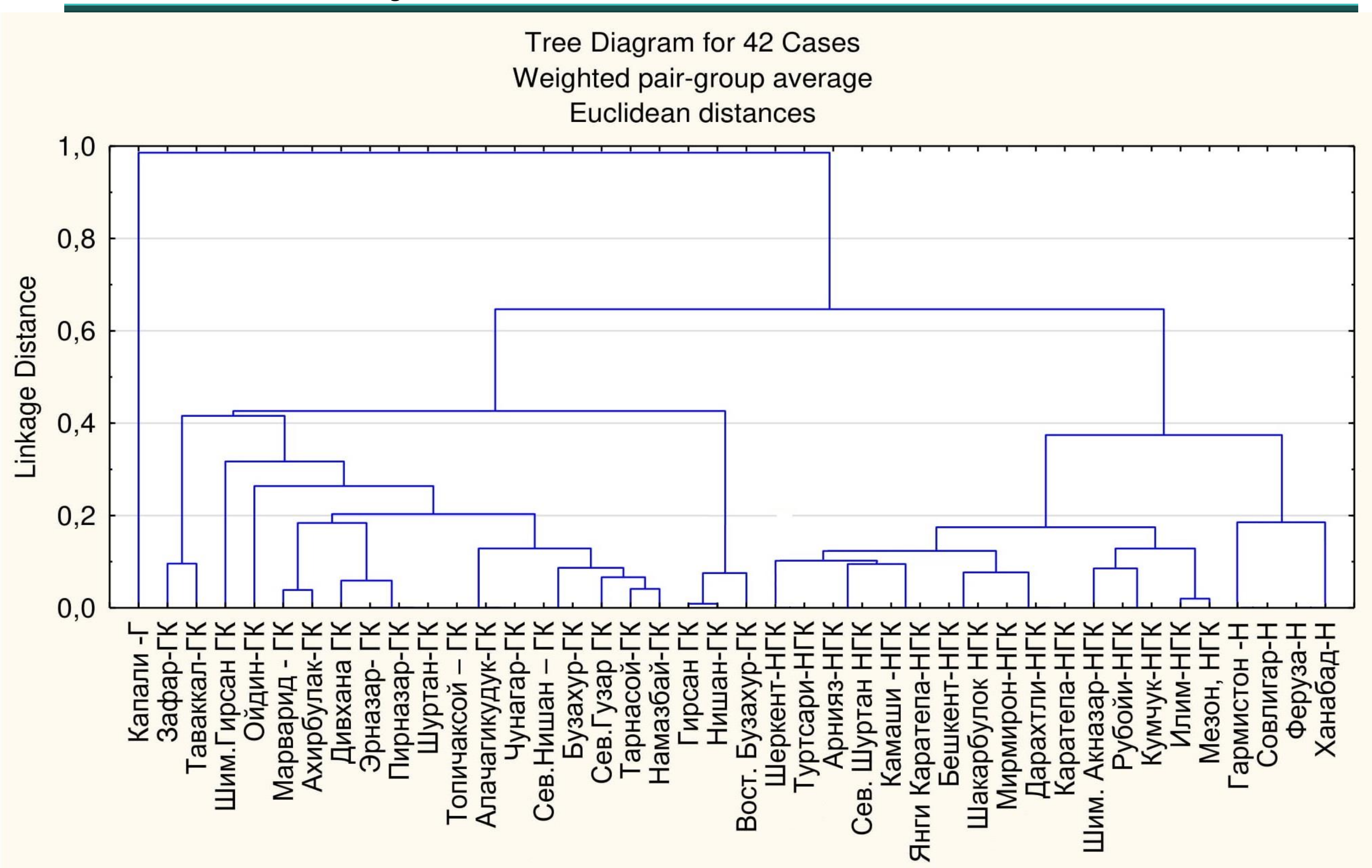

Fig.1. Dendrogram of classification of deposits in the South-Eastern part of the BHR.

hydrocarbon, the initial reservoir pressure, the potential contents of the condensate in gas well flow rates, etc. [19].

To classify hydrocarbon deposits in the South-Eastern part of the BHR by a set of geological and physical parameters, the method of constructing dendrograms was used. Used a set of geological and physical parameters characterizes the conditions of occurrence of hydrocarbon deposits, sizes of deposits, the porosity and permeability reservoirs, gas properties and reservoir fluids and geological and physical parameters are relatively homogeneous along the depth of the gas-water and oil-water contacts, reservoir temperature, porosity, oil and gas saturation of reservoirs, density of oil, gas and condensate. At the same time, they differ greatly in the area of oil and gas content, the total and effective thickness of productive horizons, reservoir pressure, and potential condensate content in the gas.

The results of the classification of hydrocarbon deposits in the South-Eastern part of the BHR are recommended for use in:

-justification of the choice of analog objects;

- use of experience in the development of long-term deposits in the preparation of projects for new objects of the same type;
- justification of the effectiveness of geological and technical measures and new technologies;
- solving various geological and technological problems.

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