

CORRELATION BETWEEN THE OIL AND GAS FIELDS LOCATION AND ELEMENTS OF A DEEP GEOLOGICAL STRUCTURE OF THE FERGANA BASIN

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ABSTRACT

Very often, oil and gas fields are correlated to the zones of big faults and other tectonic breaks. Also, there is a bond between an arrangement of fields and contact zones between blocks of earth crust with the contrast petrophysical features. In this article we have determined anomalous high and low dense blocks of the earth crust of the Fergana basin and created the schematic map of their location. Then we have analyze the location of the hydrocarbon fields, according to the created scheme. And most of them are situated in the contact zones between blocks with different features.

INTRODUCTION

The Fergana basin is one of the leading oil-and-gas provinces of Uzbekistan. The main hydrocarbon bearing formations are the Neogene and the Paleogene sequences. The oil and gas seeps also exist also in the esozoic and Paleozoic rocks (Akramkhodzhaev and Saydalieva, 1971, Babadzhanov *et al.*, 1986).

The most part of hydrocarbon fields is concentrated within the southern part of the Fergana basin.

First, it corresponds to the good quality of researches in this area. Besides, in this part of basin hydrocarbon fields are situated at depths, available for drilling. In addition, some set of structures was revealed and prepared for input in drilling in the Central graben, and on the Northern step, however most of them remained in prepared fund.

Nevertheless, the method of oil and gas researches are based only on criterions such as available depth for drilling and an arrangement of fields in the "traditional" hydrocarbon bearing horizons in the Mesozoic and Cenozoic, in our opinion, already sputtered out. Because the opening of the large (not huge) fields, practically do not happen. It connects to the considerable exhaustion of the "traditional" horizons during their longtime exploration. Therefore, it is interesting to direct the researches to the more deep-laying areas, and to use the information about the deep geological structure as the search criterion.

For this purpose, it is necessary to consider an appearance of oil and gas from the inorganic or mixed hypotheses of oil and gas creation. In that case studying for a deep geological structure and its interrelation to distribution of hydrocarbon fields will be a logical step.

Very often, oil and gas fields correlate to the zones of big faults and other tectonic breaks. There is a bond between an arrangement of fields and contact zones between blocks of earth crust with the contrast petrophysical features (Mordvintsev, 2010, Babadzhanov *et al.*, 1986, Babadzhanov *et al.*, 2009). For the Fergana basin, it is also fair.

Having compared the position of the deep faults distinguished by the modeling (fig. 1) with the scheme of an arrangement of hydrocarbons fields, it is easy to notice that a lot of fields are laying in the zones of tectonic breaks. In this case, these breaks are some kind of bringing channels where the hydrocarbon fluids rises from the depths of the earth crust, while they reach conditions, suitable for their accumulation. Before beginning their way upward, hydrocarbons have to be formed somewhere. In our opinion, contact zones between the blocks of earth crust, which have different, often – contrast, physical features could be serving as the place of formation of hydrocarbon fluids. One of these features is density. Really, if to compare the location scheme of oil and gas fields to the scheme of blocks with contrast density characteristics, it is easy to see that practically all fields, more or less, locate in the contact zones between these blocks. The first researches of this problem in the Fergana basin took place in 2009 (Mordvintsev, 2010). As a result, 1:500 000-scaled schemes displaying the location of blocks with the contrast features

concerning the scheme of an arrangement of oil and gas fields of the Fergana basin was constructed (fig. 2).

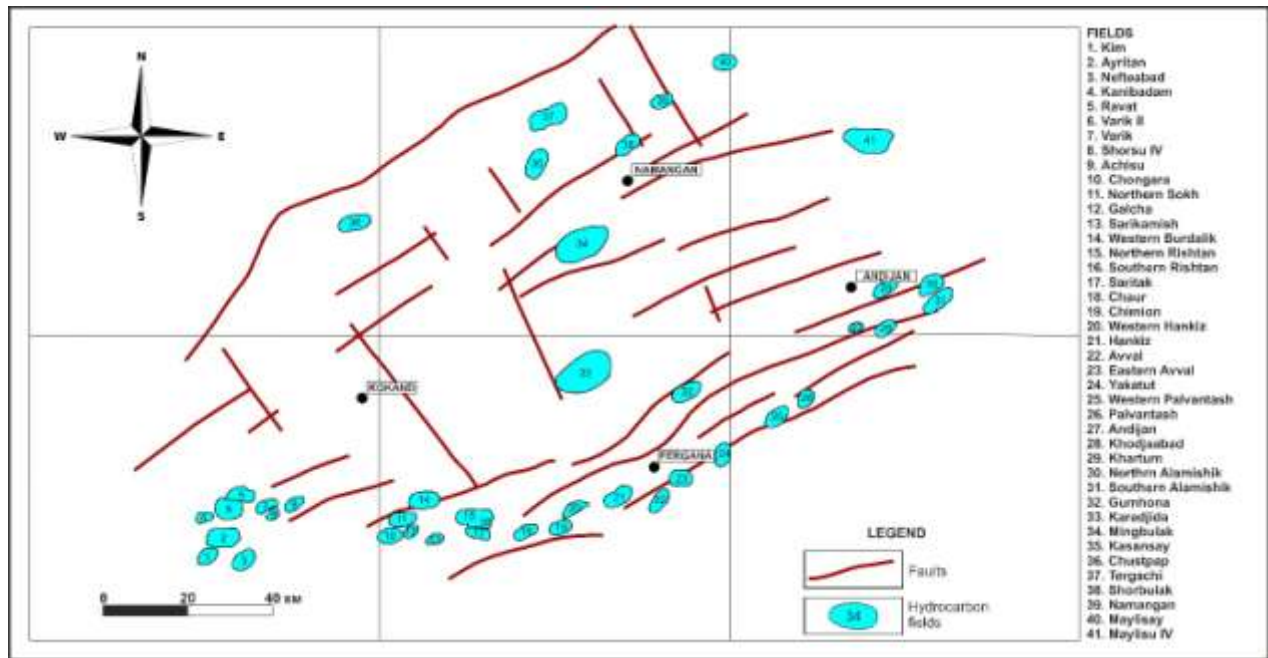


Figure 1: Correlation between faults and hydrocarbon fields location (Mordvintsev, 2018).

There it was clearly visible that the most part of these fields belong to contact zones between high and low dense (for their depths) blocks. However, this map was too schematical, and the distinguished blocks were too large. Therefore, we decided to continue these researches and to reconstruct the available scheme, but based on 1:200 000-scaled models (Mordvintsev *et al.*, 2017, Mordvintsev and Radzhabov, 2018).

MATERIALS AND METHODS

For the determination of the faults positions and petrophysical features of the Fergana basin deep geological section, we have used the complex of geological and geophysical data, such as drilling data and data of seismic, gravimetric and magnetometric surveys. According to all these data we have created the set of models of the deep geological structure of the Fergana basin. Then, using these models, we have determined the principal faults and blocks (fig. 3).

RESULTS AND DISCUSSION

According to the analysis of constructed models, the set of blocks with abnormal petrophysical features (fig. 4) for their depths was determined. As the lower limit exerting impact on overlying thicknesses depth in 15 km was chosen. On that how exactly up to this depth with a big share of confidence it is possible to allocate and divide geological objects on density. As an upper limit served the day surface (in those places where the allocated blocks outcrop).

The key abnormal parameter for crustal blocks division and allocation was density of rocks. For the low-density blocks the limit was 2.5-2.56 g/cm³, for abnormally dense it was 2.85 – 2.99 g/cm³.

As a result, 15 high-density and 11 low-density blocks were determined. All of them more or less evenly distributed on the area of the Fergana basin. Nevertheless, it

is easy to note that "lightweight" blocks concerned within the border zones of a basin while "heavy" fill all space of it. Having compared the scheme of an arrangement of oil and gas fields with the turned-out

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scheme, received confirmation of the declared pattern that all fields belong to zones of contacts between blocks with contrast parameters. Moreover, there shall not be directly side-by-side contact. From the scheme, it is visible that boundaries of the low-density blocks located in the limits of abnormally dense objects. In addition, the majority of fields connects to these zones of overlappings. It is also possible to note a zone of contact between two "dense", on our classification, blocks in the north of a basin, west of Namangan. It is easy to see that one of blocks whose density range is less, is the light for another block, which is denser (fig. 5). That also promotes a creation of oil and gas fields over the zone of their contact. It suggests an idea that existence of pronounced contrast in petrophysical features of rocks composing earth crust is optional to accumulation of hydrocarbons over such contact. Nevertheless, there are many fields, which belong to zones with a big difference in density of the blocks composing them. It appears, generally within the Southern step. Besides, it is also possible to connect existence of big accumulation of fields here to the Southern Fergana deep fault, which is a part of a Turkestan ocean suture. As it was already mentioned above, fields of hydrocarbons very often bond to zones of large tectonic breaks which are some kind of bringing channels for raising of fluids from depths and the subsequent their accumulation.

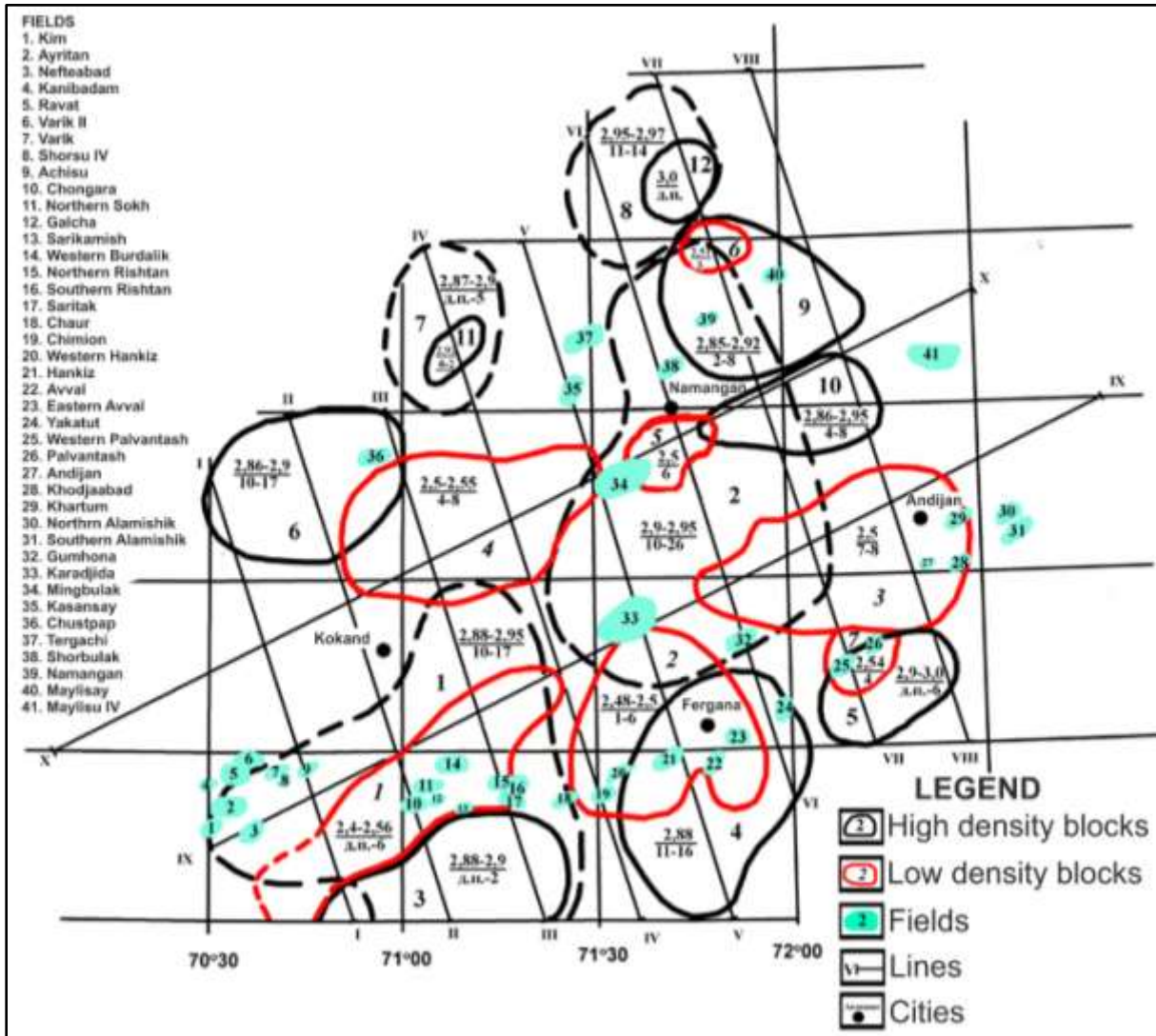


Figure 2: Correlation between petrophysical features and hydrocarbon fields location (Mordvintsev, 2010).

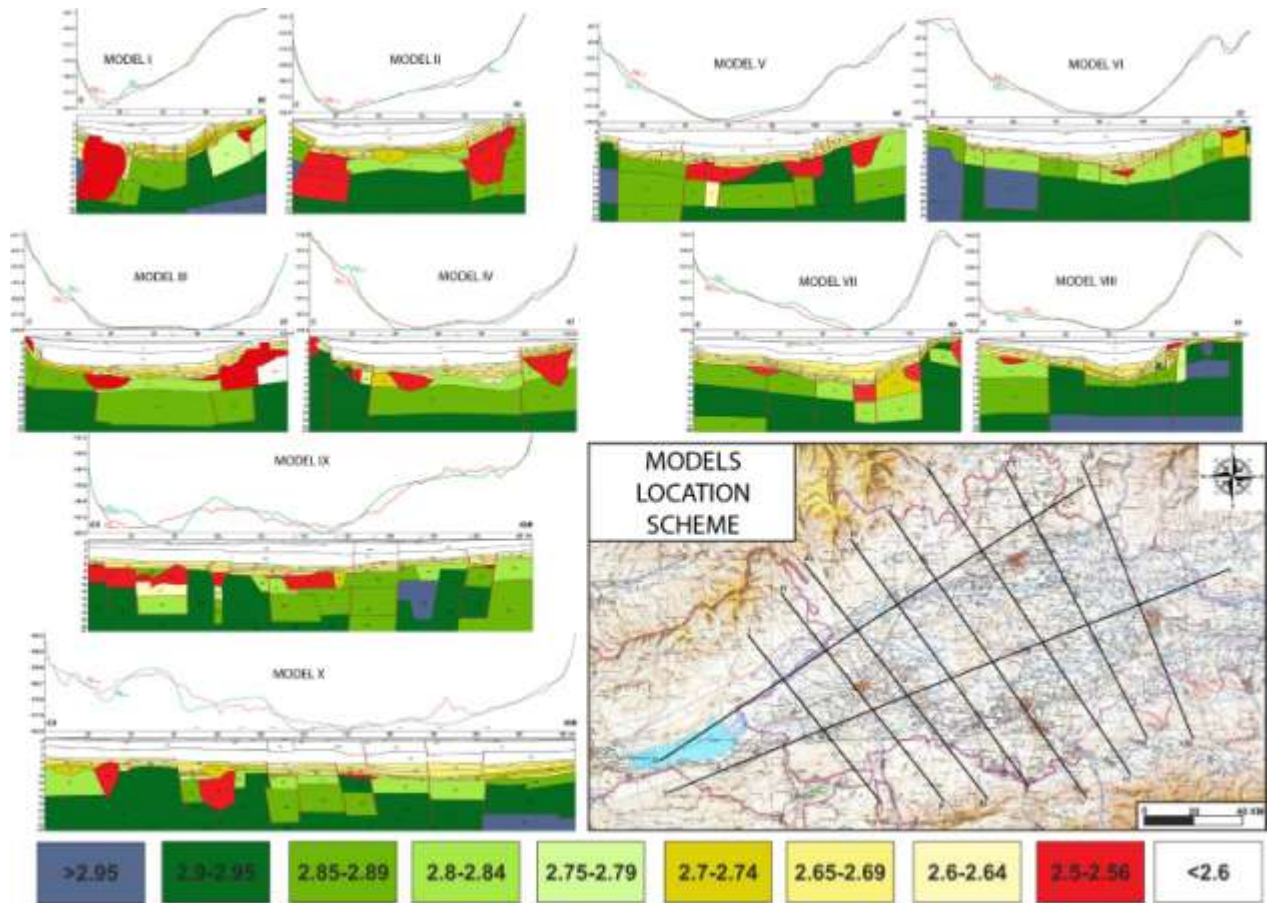


Figure 3: Density models of deep geological structure of the Fergana basin, used for researches (Mordvintsev *et al.*, 2017).

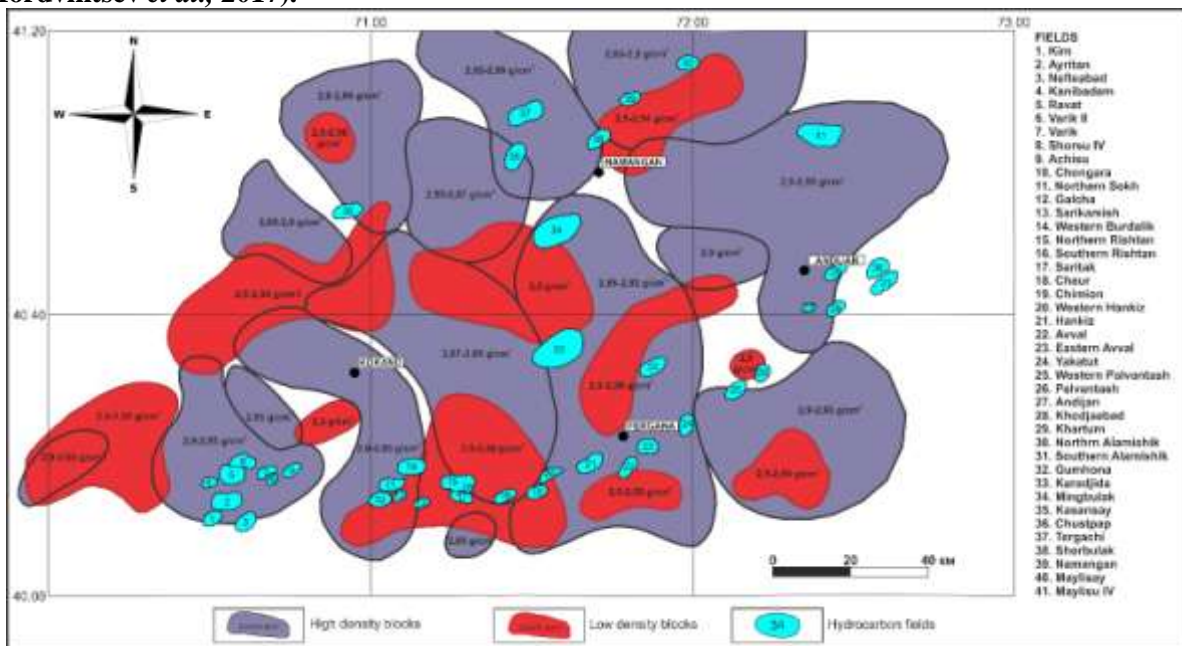


Figure 5: Correlation scheme of blocks with anomalous densities and hydrocarbon fields location for the Fergana basin (Mordvintsev and Radzhabov, 2018).

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