

THE DENSITY FEATURES OF THE FERGANA BASIN

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ABSTRACT

The Fergana basin deep section has a well-seen block-layered structure. We can distinguish there three parts: sedimentary cover, Paleozoic sequences and crystalline basement. Each of these parts has its own density features: 2.25 to 2.55 g/cm³ for sedimentary cover, 2.67-2.75 g/cm³ for pre-Mesozoic sequences and 2.85 to 3.0 g/cm³ for crystalline basement.

INTRODUCTION

The Fergana basin is the oldest oil and gas province of Uzbekistan. For more than 100 years of its studying, the huge number of information about its geology has been collected. However, there is still no clear understanding of its deep structure (Akramkhodzhaev and Saydaliyeva, 1971, Babadzhonov *et al.*, 1986).

MATERIALS AND METHODS

To bring a light to a deep geological structure of the Fergana basin we have constructed 10 models showing the distribution of density within the blocks of the basin's earth crust. These models were reconstructed according to the data of drilling, seismic, gravimetric and magnetometric surveys.

RESULTS

According to created models, we divide the section of the earth crust of the basin for several parts (fig. 1). The first part is a sedimentary cover. Though underlying layers overall, presented by sedimentary rocks, upper part of the section consists of the friable and very low-density rocks. The average density of a sedimentary cover is within the interval from 2.25 to 2.55 g/cm³. Increasing of density appears eastward. In our opinion, it connects to the direction of the main tectonic pressure, which is sharing to the east part of the Fergana basin.

Besides, when we constructed our models, the variations of density in upper part of a section exerted the greatest influence on theoretical gravitational field. Such effect can be explained, first, to the extent of a sedimentary cover - it covers practically each line from the beginning to the end.

Under a sedimentary cover, we distinguished the Mesozoic sequences. They appears at all sections, only their thickness changes. Average density is higher and makes about 2.6-2.65 g/cm³. However, in some lines, an increasing of density to 2.67 g/cm³ was noted. In general, thicknesses of the Mesozoic rather well sustained on density on all the lines. Lithologically, such densities correspond to the terrigenous sedimentary rocks.

Under the Mesozoic, appears the roof of the pre-Mesozoic sequences. Its average depth is about 5-7 km, decreasing to onboard parts and increasing eastwards.

Pre-Mesozoic rocks density varies in 2.67-2.75 g/cm³ interval, which shows us the sedimentary character of their foundation. Most likely, it is represented by sandy-argillaceous consequences of different genesis. This range well sustained practically on all lines. Besides, the low-dense objects with density of 2.5 – 2.56 g/cm³ exist on the pre-Mesozoic surface. Sometimes, their density reaches 2.48 and 2.6 g/cm³. These indicators of density, according to pre-Mesozoic formation, characterize an acid rocks. Such dispersion, in our opinion, comes from the minor change of acidity of rocks. Most of these objects are concentrated in the western part of a basin. It can be connected to the processes caused by northward subduction of the Turkestan Ocean at the end of the Paleozoic or the processes connected to the closing of the Tetis Ocean (Heubeck, 2001, Filippova, 2001, Gekker *et al.*, 1962.). It should be noted that both of these tectonic processes are interconnected.

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There are also several intrusives at the western part of a basin. Their density, according to the modeling, is 2.7-2.72 g/cm³.

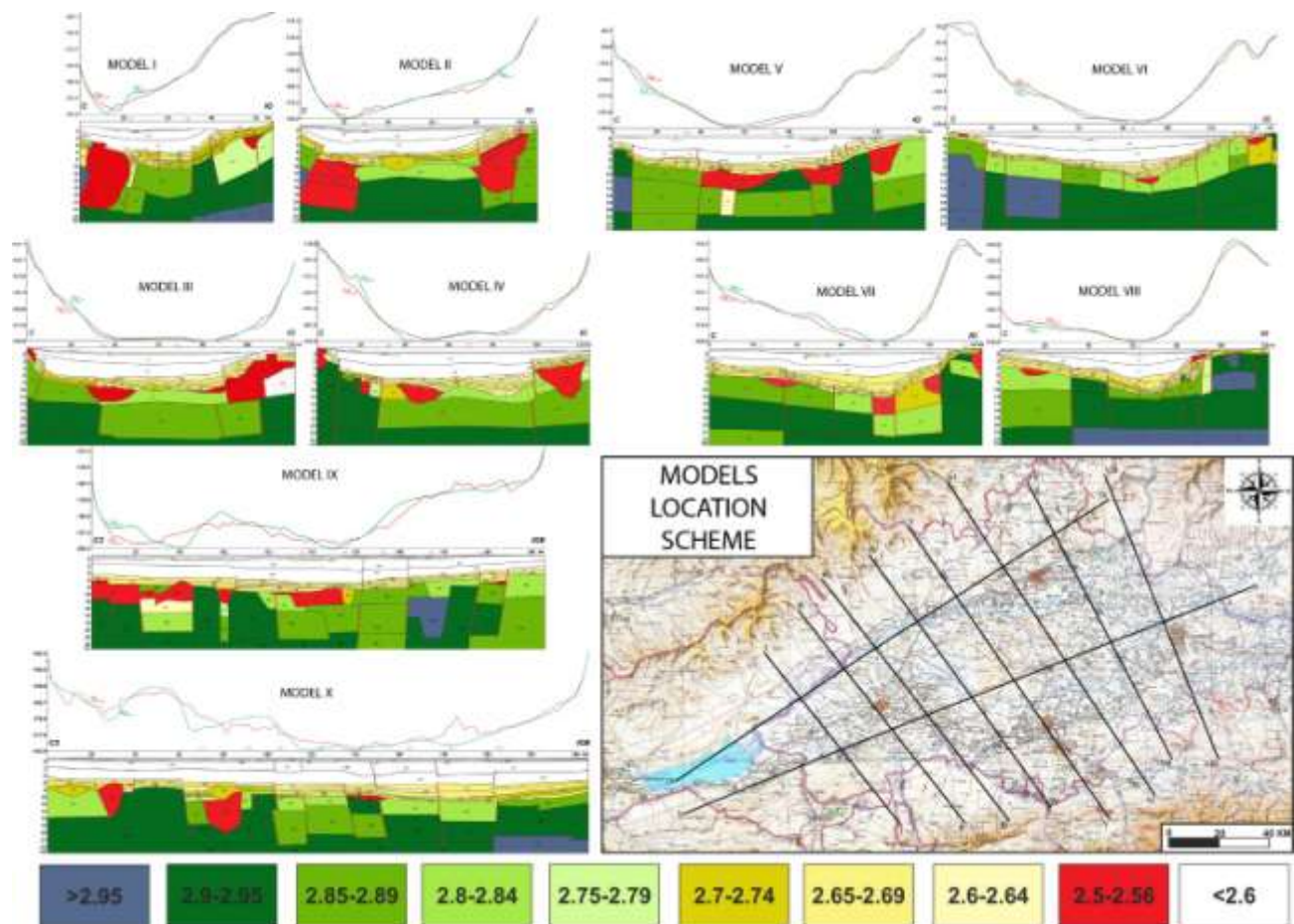


Figure 1: Density models of deep geological structure of the Fergana basin, used for researches (Mordvintsev, 2018 [6]).

The density of the crystalline basement varies from 2.85 to 3.0 g/cm³. These values of density correspond to the basic and ultra-basic rocks. At the same time, the crystalline basement of the southern part of the Fergana basin is denser, than in the northern part. It is well visible on the lines IX-IX and X-X.

Eastward increase in density was also observed. In the western part of the line basement blocks have densities from 2.85 to 2.9 g/cm³, while moving in east direction the density range is displaced towards 2.9 – 2.95 g/cm³. Nevertheless, in some places blocks with the densities of 2.85-2.87 g/cm³ are still fixed.

The low-density objects, which we mentioned above, are also located within the crystalline basement. They are concentrated in the western part of the Fergana basin.

Thus, it is possible to make a conclusion that according to the distribution of densities, Fergana basin subdivided into the western and northern low-dense zones and on southern and eastern – dense zones. Most likely, this consolidation connected to the distribution of tension in the earth crust because of the geological tectonic processes, which led to formation of the basin. (Gekker *et al.*, 1962, Mordvintsev *et al.*, 2017, Glorie *et al.*, 2011, Biske *et al.*, 2013, Biske and Seltmann, 2010, Brookfield, 2000, Burtman, 2011).

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