

Assessment of the Petroleum Potential on the Bucșani Structure

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Abstract

The paper presents an evaluation of petroleum potential estimated with a new method based on Rock-Eval analyses. With this program can be obtained different diagrams that are useful for quantitative evaluations.

Keywords: *Rock-Eval, petroleum potential.*

Structure geology

The Bucșani structure is situated in the mio-pliocene area of the Pericarpathian Depression on the most southern alignment for salt appearance, the so called alignment of the crypto-diapir folds.

From the stratigraphical point of view, in the drillings performed up to 5000m, there were found mio-pliocene deposits. The tectonic assably of the structure was created in the Stiric and Wallachian phases.

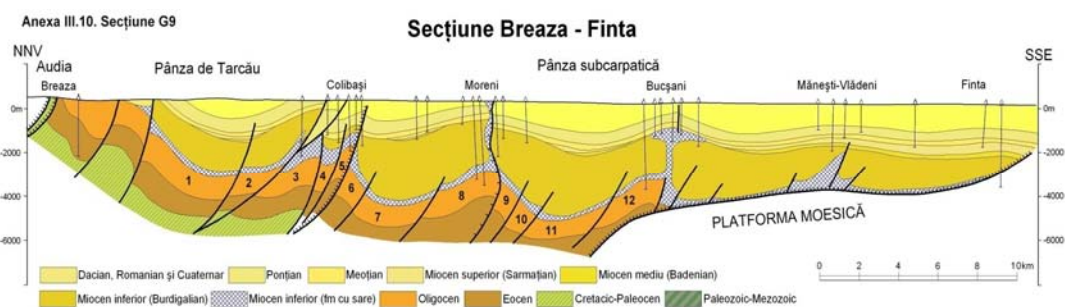


Fig. 1. Geological cross-section through the diapir folds area including the Bucșani structure.

Estimations regarding the source rocks

The result of the geochemical analyses performed on some pelitic samples, of the Oligocene and Eocene age, taken from Panza de Tarcău, showed the source rock character of these pelitics; this reconfirms the hypothesis that the Oligocene and the Eocene pelitics represent the sources of the hydrocarbons identified in the accumulations in the bending area of the Eastern Carpathians.

The total organic carbon measured in these samples has values between 2 – 4 %g for the Oligocene and between 1 – 3,5%g for the Eocene. These concentrations of organic matter in the rocks grants them a generation potential that is considered from good to very good. [2]

The rock extractable organic matter contents (MOE, bitumen) was situated within a values range between 1120 and 3930 ppm and the hydrocarbons in the bitumen between 258 and 1100 ppm. These quantities are also specific to the source rocks with generation potential from good to very good.

The organic matter type (kerogen) present in these rocks is a marine one (II type kerogen). The organic matter was deposited in an anoxic – high anoxic environment (the values of the Pristan/Fitan biomarkers reports being around one).

The petroleum window starts as from a depth over 3800m, when the rock generates liquid hydrocarbons at a vitrinite reflecting value of 1%. It results from here that the generation and expulsion phenomena began about 16 Ma ago when the rate of kerogen transformation exceeded 15%.

The moment when the phenomena of kerogen transformation into hydrocarbons started is in direct relation with the tectonic phenomena generated by the Alpine Orogenesis stage that took place during the medium-inferior Miocene.

The hydrocarbons' migration paths were provided by the fault systems generated by the orogenesis processes, by the intraformational limits and the lithology unconformities. The hydrocarbons' migration took place mainly in vertical direction.

Determination of the generated hydrocarbons' quantities

The decisions made at the level of the big petroleum companies are much based on the geochemical data. As an exploration campaign involves very high costs, it must develop some successive economic scenarios, with increasing investments, depending on the result of each stage. Generally, the petroleum companies have three major exploration stages.

In the first stage, when there are available only general geological data, possibly some seismic data, when well data may be available or not, the geochemical information are few and general. The methods elaborated now are a way to test the different hypotheses regarding the existence of the petroleum generation conditions.

In the second stage, when there are wells driven, one of the previous hypotheses must be completed and calibrated on the data provided by these wells.

In the final stage there are used, if there is considered a mature exploration area, all the geochemical methods and the analyses performed on the petroleum and on the source rocks for correlating the data.

The process for simulating the generative capacity, used in this documentation, provides the information necessary for the first stage, for testing the hypotheses regarding the existence of the petroleum generation conditions.

We must specify that for a good assessment of the petroleum potential there are necessary some Rock-Eval analyses, that allow the determination both of the initial generating capacity (I.G.C.) and of the residual generating capacity (R.G.C.), of the appraisal of the generated hydrocarbons capacity (T.G.H.C.) and also the volumetric appraisal of the migrated hydrocarbons quantities (M.H.C.).

The assessment of the petroleum potential was made by taking into consideration only the Oligocene-Miocene inferior rocks and only on delimited areas as perspective zones.

For determining the thickness of the source rock, there were amended the thicknesses of the pelitic possibly source rocks as proportionally to the thicknesses determined in the coring of the well considered.

This lead to the consideration, in the geochemical modelling, of some source rocks piles with minimum thicknesses.

The organic carbon quantity was considered (2,5% T.O.C.) in the same manner, meaning that there were used the residual carbon information existing in the rocks considered to be source rocks. Only a part of the diagrams used are presented below.

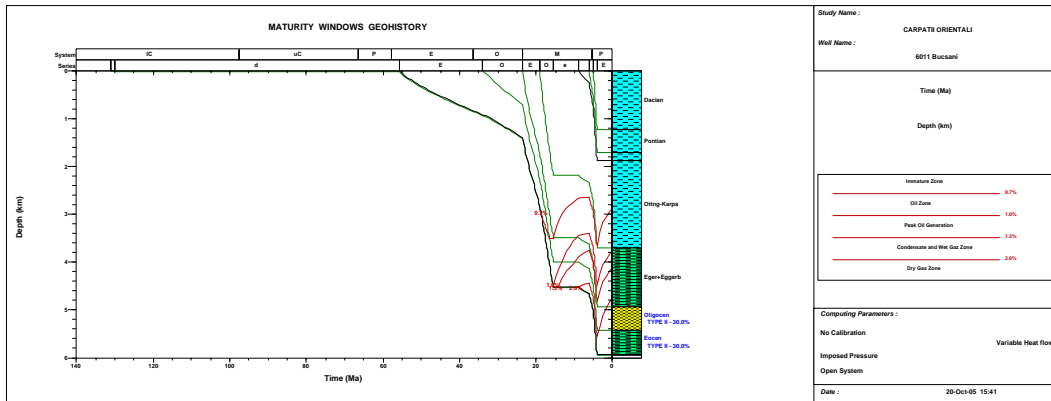


Fig. 2. Maturity history curves

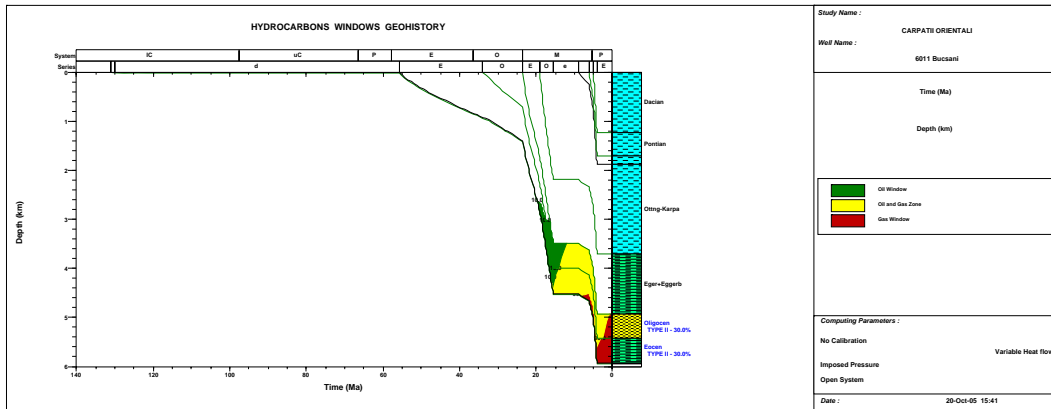


Fig. 3. Petroleum windows history curves

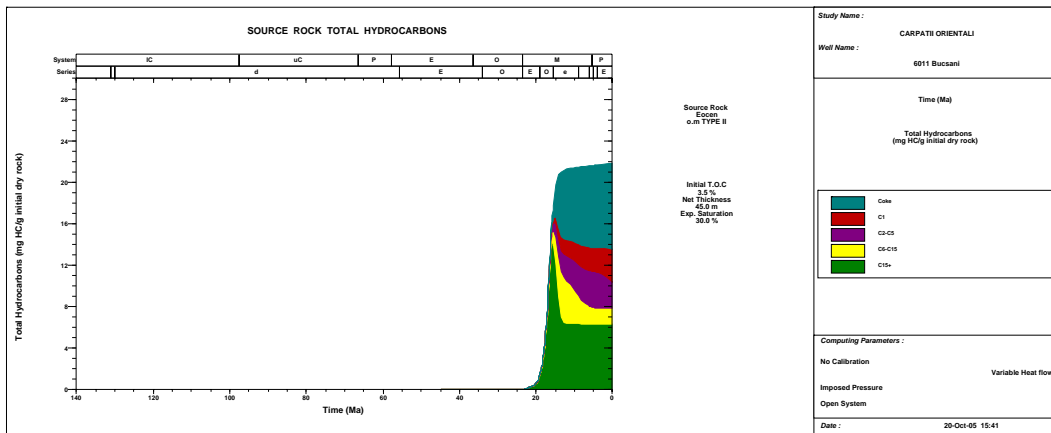


Fig. 4. Total generated hydrocarbons quantity

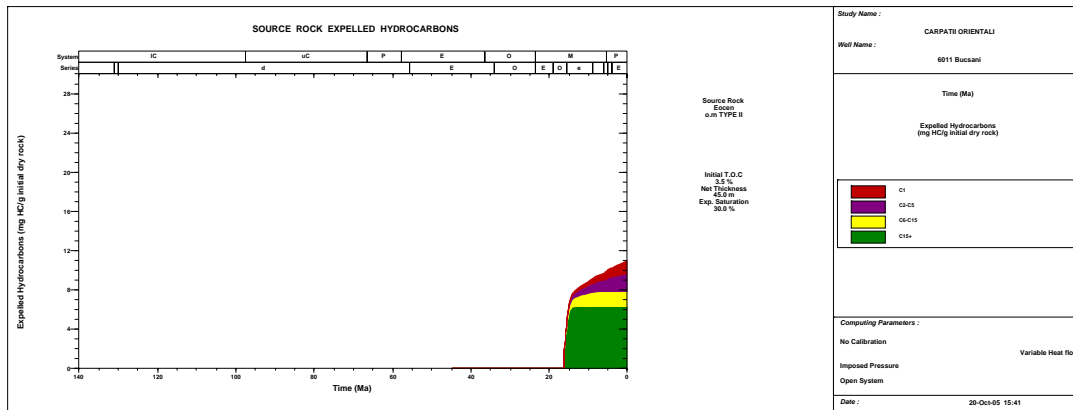


Fig. 5. Total quantity of the hydrocarbons expelled.

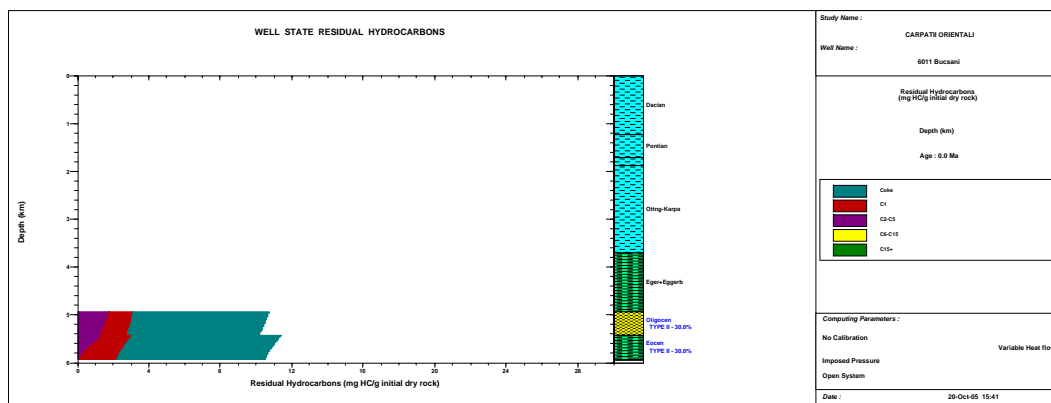


Fig. 6. Total quantity of residual hydrocarbons

From the interpretation of the 37 diagrams obtained there were calculated the following hydrocarbons quantities.

Total generated hydrocarbons quantity

$$T.G.H.C. = 1,37 \times 10^7 \text{ tHc/km}^2$$

Residual generative capacity

$$R.G.C. = 2,93 \times 10^7 \text{ tHc/km}^2$$

The above values show that at the Oligocene and Eocene level there are still being generated hydrocarbons, which justifies the exploration activity in the area. By correlating the data of the present estimation with the explored hydrocarbons quantities, we can say that there are still unexplored hydrocarbons. Also, by means of the works corresponding to the present estimation, there were presented the accumulation possibilities for the generated hydrocarbons and there were indicated the research directions that must be followed for the deceleration of new deposits.

References

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Evaluarea potențialului petroligen de pe structura Bucșani

Rezumat

Evaluarea potențialului se face prin modelarea complexă a datelor furnizate de sonda 6011 Bucșani, prin reinterprețarea analizelor T.O.C.