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TREND ANALYSIS OF PETRO-PHYSICAL PROPERTIES OF RESERVOIRS IN OUED MYA BASIN (SAHARA ALGERIAN)

Abstract

The geological model of development and the introduction of new concepts are needed for petroleum exploration using mathematical methods (trend of analysis) for the study of the change of the reservoir petrophysical properties.

It is the location of positive and negative anomalies of these parameters and their regional trend.

This method is to search for trends for the whole of a given population and extract subsets with certain special characters in the case of two dimensional variables.

Used equation will be: Z(x,_y) = a X + b Y + c

The coefficients a, b and c are such that the surface of the plan passes, otherwise by at least the most possible meadows of the known points located in the vicinity of the point (x, y).

Each of these known points is a deviation between the observed value and the computed value oblast. The most simple smoothing is to pass through the cloud of data plan equation:

Z`(x, y) = aX + bY + c

The coefficients of this surface are obtained by minimizing the sum of the squares of the deviations or residues between the calculated values Z' and observed Z.

The essential conditions are: Alternate Z'(x, y) by its value, will be:

$$S = \sum_{i=1}^{n} (Z_i - aX_i - bY_i - c)^2 = \text{minimum}$$

Then, $\partial S / \partial a = -2\sum_{i=1}^{n} (Z_i - aX_i - bY_i - c) \cdot X_i = 0$, $\partial S / \partial b = -2\sum_{i=1}^{n} (Z_i - aX_i - bY_i - c) \cdot Y_i = 0$

$\partial S / \partial c = -2\sum_{i=1}^{n} (Z_i - aX_i - bY_i - c) = 0$ $\sum_{i=1}^{n} (Z_i - aX_i - bY_i - c) \cdot X_i = 0$ ....(1)

$\sum_{i=1}^{n} (Z_i - aX_i - bY_i - c) \cdot Y_i = 0$ ....(2) $\sum_{i=1}^{n} (Z_i - aX_i - bY_i - c) = 0$ ....(3)

To solve this system of equation (1), it uses the method of matrices: To find the determinant Δ, one must first have all the values of the members of the matrix. To do this, we must establish calculation tables where the latter are included. Once Δ is calculated, it can determine a, b and c.

This method of trend of Petrophysical parameters, namely the thickness, porosity and permeability, is applicable to TAG - A and TAG – B resrvoirs in Ait Kheir area, where it has led to the following conclusions: Productive reservoirs "A" and "B" have thickness and different reservoir qualities. The sandstone "A" have a relatively

constant thickness across the area. The Petrophysical characteristics present a certain homogeneity. Sandstones "B" have a larger thickness, almost double that of the sandstone «A» and a good Petrophysical characteristics. TAG - A zonation is characterized by a high heterogeneity. Interesting areas determined from the superposition of different local positive anomalies and their analysis, we has found that the best qualities of the TAG – A and TAG-B reservoir Petrophysical is localized into two areas (1and 2): 1st area: encompassing wells ATK (2, 4, 24, 19 and 15).
2nd area: encompassing the TKN-1 well.
Keywords: Mathematical methods. Trend analysis. TAG - A and B reservoirs. Ait Kheir. Algerian Sahara.

Résumé :

L'élaboration de modèles géologiques et l'introduction de nouveaux concepts sont nécessaires pour l'exploration pétrolière en utilisant les méthodes mathématiques (trend d'analyse) pour l'étude des variations des propriétés pétrophysiques des réservoirs. C'est la localisation des anomalies positives et négatives de ces paramètres et leur tendance régionale.
Cette méthode consiste à rechercher des tendances pour l'ensemble d'une population donnée et à extraire des sous-ensembles ayant certains caractères particuliers dans le cas des variables à deux dimensions. L'équation utilisée sera :
Z(x, y)=a X +b Y + c
Les coefficients a, b et c sont tel que la surface du plan passe, sinon par au moins le plus prés possibles des points connus situés au voisinage du point (x, y). A chacun de ces points connus correspond un écart type б entre la valeur observée et la valeur calculée.
Le lissage le plus simple consiste à faire passer à travers le nuage des données un plan d'équation : **Z`(x, y) = aX + bY + c.**
Les coefficients de cette surface sont obtenus en minimisant la somme des carrés des écarts ou résidus entre les valeurs calculées **Z`** et observées **Z**.
Les conditions essentielles sont : $S = \sum_{i=1}^{n} (Z_i - Z'_i)^2 =$ minimum. Remplaçant Z`(x, y) par sa valeur, on aura : $S = \sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c)^2 = \text{minimum}$

Donc, $\partial S / \partial a = -2\sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c) \cdot X_i = 0$, $\partial S / \partial b = -2\sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c) \cdot Y_i = 0$

$\partial S / \partial c = -2\sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c) = 0$

$$\sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c) \cdot X_i = 0 \quad \text{........ (1)}$$

$$\sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c) \cdot Y_i = 0 \quad \text{......(2)}$$

$$\sum_{i=1}^{n} (Z_i - \mathrm{aX_i} - bY_i - c) = 0 \quad \text{........... (3)}$$

Pour résoudre ce système d'équation (1), on utilise la méthode des matrices :
Pour trouver le déterminant Δ, il faut avoir tout d'abord toutes les valeurs des membres de la matrice. Pour cela, il nous faut établir des tableaux de calcul où figurent ces derniers.
Une fois que Δ est calculé, on peut déterminer a, b et c. Cette méthode de tendance des paramètres pétrophysiques, à savoir l'épaisseur, la porosité et la perméabilité, est applicable aux réservoirs TAG-A et TAG-B de la région de Ait Kheir, où on a abouti aux conclusions suivantes : Les réservoirs productifs "A" et "B" ont des

épaisseurs et des qualités de réservoirs différentes. Les grès "A" s'étendent sur l'ensemble de la région avec une épaisseur relativement constante. Les caractéristiques pétrophysiques présentent une certaine homogénéité. Les grès "B" possèdent une épaisseur plus importante presque le double de celle du grès «A» ainsi que de bonnes caractéristiques pétrophysiques. La zonation de TAG-A est caractérisée par une grande hétérogénéité. Les zones intéressantes déterminées d'après la superposition des différentes anomalies locales positives, et leur analyse, nous a permis de constater que les meilleures qualités pétrophysiques des réservoirs TAG-A et TAG- B se localisent en deux zones (1et 2) :
1ère zone : englobant les puits ATK (2, 4, 24, 19 et 15). 2ème zone : englobant le puits ATK-1.

Mots clés : Méthodes mathématiques. Trend Analyse. Réservoirs TAG- A et B. Ait Kheir. Sahara Algérien.

Introduction

The Oilfield of Ait Kheir was discovered by the ATK-1 well at a depth of 2750m. The results of tests conducted at ATK - 1, revealed a gas saturation in condensate in the Triassic clay-sandstone level (A) and (B).
Triassic clay-sandstone is the main oil objective of Oued Mya basin, however most recent made drilling proved negative because of the heterogeneity of Petrophysical parameters (reservoir thickness, porosity, permeability and oil saturation).
The development of geological models and the introduction of new concepts are needed to confront this new stage of oil exploration this, uses the method of trend analysis for the study of variations in the Petrophysical properties. It is the location of positive and negative anomalies of these parameters and their regionally trend.

I. Geological and Geographical setting:

The oilfield Ait Kheir, which is the objective of our study, is located in the region of Wadi Noumer, in basin of Oued Mya, it's located at mid distance between the City of Laghouat and Ouargla, about 82 km Southeast of Hassi R'Mel field, and 116 km Northwest of Haoud Berkaoui field, in the Western position from Hassi Messaoud (Fig. 1).
The region of Wadi Noumer include three fields, where the field of AIT KHEIR is the objective of our study, it is oriented North - South in Oued Mya basin.
Geologically, is located between Hassi R'Mel domes and Hassi Messaoud on the reassembled to Hassi R'mel of the Oued Mya Basin. The structure of Ait Kheir presents as a regular form anticline North West and South, is limited by a normal fault North South up to more than 100 m of rejection, there is an area of 60 km2, with a 60 to 80 m structural closure.

II. Petroleum Aspect:

Analysis of geochemical data reflects only the clay sediments of the Gothlandien and the Ordovician can only be the principal source rock.
The Major reservoirs identified in our study area, include the fluvial sandstone from the Triassic.

Two major reservoirs can be distinguished; the T2 or the sandstones "A", and the T1 or the "B" sandstones and equivalents (Fig. 2).
The sandstones Triassic Produce a condensate and light oil. The formation of Azzel Middle Ordovician Shales and sandstones of Ouargla constitute the caprock of the quartzites of Hamra.
Slices of Triassic and Jurassic evaporations provide excellent coverage for the Triassic reservoirs.

III. Stratigraphy of the region:

The sedimentary cover of area study is represented by Paleozoic and Mesozoic deposits. Its average thickness is approximately 5000m.
A - Paleozoic: based on the granitic basement, it thins in a progressive manner (phenomenon of hercynian erosion) to the East and West from the centre of the basin (bloc438). It consists of the Cambrian, Ordovician, Silurian and Devonian.
B - The Mesozoic: its average thickness is 3700m. It is divided into three major series: Triassic, Jurassic and Cretaceous.
C - Cenozoic: this floor consists of sand and sandstones of the Mio-Pliocene. A few polls in half Northern basin met with gypsum, anhydrites, dolomites, clays and marls of the lower Eocene.

IV. Tectonic Aspect:

The current architecture is a result of a long evolution, as the result of slow deformation which continued in a manner more or less continued throughout the history of the basin.
The main phases of deformation influencing the sedimentation and the structuring of the basin (beef, 1971); (Boudjemaa, 1987) are the hercynian phase and the Austrian phase.
Hercyniens movements correspond to a direction N 120 compression, the most significant deformation is located along the NE-SW accidents.
One of the most important features of this training concerns the fate of main source rocks (Silurian).
They are preserved in depressions Berkine and Oued Maya and will feed into hydrocarbon structural and stratigraphic traps which will later form (Boudjemaa, 1987).
During the Austrian movements (terminal Aptian), there is a compressive phase East-West, which is replayed in reverse subméridiens accident North-South of the Oued Mya.
This compression would be responsible for the individualization of structural traps.

V. Local context:

Structure of Ait- Kheir: contours to the roof of the S4 (Triassic) from seismic data and their interpretation map through a peak irregular structure to-2240m between ATK-1, 2.7 and 6, a secondary culmination against fault always-2240m is situated at the North of TKN - 5.

With direction NW – SE, Anticline structure has a length of 15 km and a width of at least 7 km with a closure of about 60 m (Fig. 3).
It is limited to the East by a fault of N-S direction up to 120 m of rejection. The dip is low (2°- 3° approximately).

Given the technology evaluation, recording methods, calculation, statistical corrections, treatment and preparation of sections are different according to the studies, they follow all of the profile is very heterogeneous, which was a precision of interpretation, however on the map established from the well (well log) data, the structure is regular, direction NW – SE limited by faults in the four (4) directions.
These faults appear not to be barriers, only that which is located to the East (of rejection of 120 m).

VI. VI. Trends study:

1. Methodology:

The method used to give an idea on the variation of the Petrophysical properties is the method of trend analysis.
It is the search for trends in regional variations of a parameter to study.

2. Object of the study of trend:

The smoothing of the raw values with trend analysis is directed to seek a general trend of evolution of a phenomenon and explore positive residues linked to the anomaly in favour the good qualities of production of the tank.
The superimposition of maps of total sandstone, the porosity and permeability positive residues, leads us to delineate areas of good, averages and bad characteristics Petrophysical and petrographic of the reservoir.

3. Surfaces of trends:

The method of trends is only a generalization of smoothing techniques. It is to look for trends for the whole of a given population and extract subsets with certain special characters in the case of variables in two dimensions.
All of the observed values of the variable allows to draw a more or less regular broken line or better yet subtract a line or a curve simple (second or third degree).
In our case where the data correspond to a surface in three dimensions, the local irregularities may obscure the regional distribution.
Conversely if one deletes the regional variations, it reveals much better local anomalies.
So, the trend surface is one that will best represent the distribution of the parameter in a given region. The used equation will be: **$Z(x,\_y) = a X + b Y + c$**
The coefficients **a, b and c** are such that the surface of the plan passes, otherwise by at least the most possible meadows of the known points located in the vicinity of the point **(x, y).**
Each of these known points is a deviation б between the observed value and the computed value oblast.

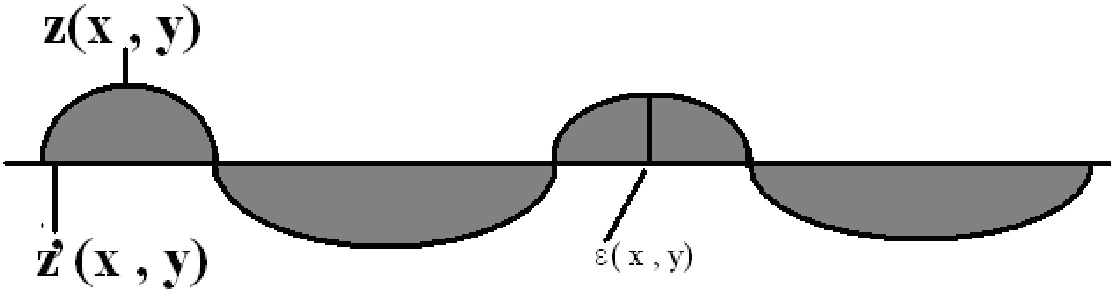
4. Smoothing by least squares method: Either Z(x,_y) the variable studied (in two dimensions). The most simple smoothing is to pass through the cloud of data plan equation:

$Z`(x, y) = aX + bY + c$

The coefficients of this surface are obtained by minimizing the sum of the squares of the deviations or residues between the calculated values **Z' and Z.**
The equation of the trend in our study, will be: **$Z`(x, y) = aX + bY + c$**

5. The formulas for the calculation:

In General: Z(x, y) = Z`(x, y) +ε(x, y). Where: Z'(x,_y): the equation of the regional dip (trend). ε(x, y): is the coefficient that describes intervals.



The essential conditions are: $S=\sum_{i=1}^{n}\left(Z_i - Z'_i\right)^2 =$ minimum.

We are: Z`(x, y) = aX + bY + c

Alternate Z'(x,_y) by its value, will be:

$$S=\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)^2 = \text{minimum} \qquad \delta S/\delta a=-2\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)\cdot X_i=0$$

$$\delta S/\delta b=-2\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)\cdot Y_i=0 \qquad \delta S/\delta c=-2\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)=0$$

$\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)\cdot X_i=0$ ..... (1) $\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)\cdot Y_i=0$ ..... (2)

$\sum_{i=1}^{n}\left(Z_i-\mathrm{aX_i}-bY_i-c\right)=0$ .... (3) $\mathrm{a}\sum_{i=1}^{n}X_i^2+b\sum_{i=1}^{n}Y_i\cdot X_i+c\sum_{i=1}^{n}X_i=\sum_{i=1}^{n}Z_i\cdot X_i$ .. (4)

$\mathrm{a}\sum_{i=1}^{n}Y_i\cdot X_i+b\sum_{i=1}^{n}Y_i^2+c\sum_{i=1}^{n}Y_i=\sum_{i=1}^{n}Z_i\cdot Y_i$ (5) $\mathrm{a}\sum_{i=1}^{n}X_i+b\sum_{i=1}^{n}Y_i+c\cdot n=\sum_{i=1}^{n}Z_i$ .. (6)

To solve this system of equation (1), it uses the method of matrices

$$\Delta \begin{vmatrix} \sum_{i=1}^{n} Xi^2 & \sum_{i=1}^{n} Xi\cdot Yi & \sum_{i=1}^{n} Xi \\ \sum_{i=1}^{n} Xi\cdot Yi & \sum_{i=1}^{n} Yi^2 & \sum_{i=1}^{n} Yi \\ \sum_{i=1}^{n} Xi & \sum_{i=1}^{n} Yi & n \end{vmatrix}$$

To find the determinant Δ, it must first have all the values of the members of the matrix.

To do this, we need calculation tables containing the latter. Once Δ is calculated, can be determined: a, b and c; where:

$$a = \Delta a / \Delta \qquad b = \Delta b / \Delta \qquad c = \Delta c / \Delta$$

With :

$$\Delta a = \begin{vmatrix} \sum_{i=1}^{N} X_i \cdot Z_i & \sum_{i=1}^{n} X_i \cdot Y_i & \sum_{i=1}^{n} X_i \\ \sum_{i=1}^{n} Y_i \cdot Z_i & \sum_{i=1}^{n} Y_i^2 & \sum_{i=1}^{n} Y_i \\ \sum_{i=1}^{n} Z_i & \sum_{i=1}^{n} Y_i & n \end{vmatrix}$$

$$\Delta b = \begin{vmatrix} \sum_{i=1}^{n} X_i^2 & \sum_{i=1}^{n} X_i \cdot Z_i & \sum_{i=1}^{n} X_i \\ \sum_{i=1}^{n} X_i \cdot Y_i & \sum_{i=1}^{n} Y_i \cdot Z_i & \sum_{i=1}^{n} Y_i \\ \sum_{i=1}^{n} X_i & \sum_{i=1}^{n} Z_i & n \end{vmatrix}$$

$$\Delta c = \begin{vmatrix} \sum_{i=1}^{n} X_i^2 & \sum_{i=1}^{n} X_i \cdot Y_i & \sum_{i=1}^{n} X_i \cdot Z_i \\ \sum_{i=1}^{n} X_i \cdot Y_i & \sum_{i=1}^{n} Y_i^2 & \sum_{i=1}^{n} Y_i \cdot Z_i \\ \sum_{i=1}^{n} X_i & \sum_{i=1}^{n} Y_i & \sum_{i=1}^{n} Z_i \end{vmatrix}$$

The final result of the array will be the determination of the value of the trend: $Z'(x,\_y) = aX + bY + c$.
Calculation of the coefficients a, b and c for each training:
Equations of the trends, it was: $Z'(x,\_y) = aX + bY + c$
obtained equations are represented in the table below:

Tab. 1 : Table of équations

	TAG-A			**TAG-B**		
	a	**b**	**c**	**a**	**b**	**c**
Thickness useful (Hu)	**0.47**	**1.10**	**-65**	**-0.74**	**-1.54**	**133.69**
porosity (Ø)	**-0.52**	**-0.98**	**82.85**	**0.54**	**0.26**	**-1.40**

permeability (K)	**-101.10**	**-66.27**	**4962.52**	**94.14**	**-11.20**	**1472.01**
Saturation (%)	**1.30**	**0.83**	**-37.90**	**6.01**	**6.78**	**-462.29**

	TAG-A	**TAG-B**
Thickness useful (Hu)	**Z`=0.47x+1.1y-65**	**Z'=-0.74x-1.54y+133.69**
porosity (Ø)	**Z`=-0.52x-0.10y+82.85**	**Z`=0.54x+0.26y-1.4**
permeability (K)	**Z`=-101.10x-66.27y+4962.52**	**Z`=94.14x-11.20y-+1472.01**
Saturation (%)	**Z'=1.30x+0.82y-37.87**	**Z'=6.01x+6.78y-462.29**

VII. The Petrophysical characteristics:

It is characterized by a mean lower porosity, approximately 16%. A low average permeability and a high heterogeneity, due to the presence of faults and the complexity of the reservoir.

1. Reservoir TAG--A :

The average parameters that characterize the reservoir TAG "A" are as follows: the average porosity is: 12.9%. The average water saturation is: 22.4%. The average permeability is: 139 md. The average thickness: 14.6 m. the average depth is: 2670 m. (Fig. 4,5,6,7).

Tab.2: Summary table of TAG- A

Well	**depths (m)**	**ratings absolute (m)**	**Thickness (m)**		**K(mD)**	**Ø(%)**	**So(%)**
			Overall	**useful**			
ATK-1	2550	-2247.5	17	15	54.1	13.5	26.6
ATK-2	2592	-2246.5	20	15.25	25	11.6	29.3
ATK-3	2605	-2280.5	14.5	11.50	10.3	10.2	33.3
ATK-4	2584	-2263.0	13	09	82.2	8.1	21.4
ATK-5	2635.5	-2275.5	18	18	78.6	10.6	21.8
ATK-6	2548.5	-2249.0	18	14.25	200.2	14.1	13.3
ATK-15	2659.5	-2248.5	16	15	96.1	15.3	20.7
ATK-17	2687	-2267.0	5	2.75	76.2	9.4	20.4
ATK-18	2716.5	-2296.0	22	9.75	138	15.1	23.2
ATK-19	2668	-2250.0	19.5	19.25	79.4	16.6	16.6
ATK-20	2699.5	-2265.5	7.5	7.25	207.4	11.4	13.6
ATK-21	2547.5	-2246.5	13.5	13.50	79.4	15.6	41.7
ATK-22	2689	-2276.0	5	3.75	96.7	9.8	21.8
ATK-23	2681	-2283.0	17	16.75	514.9	18.1	16
ATK-24	2662	-2265.0	13.5	11.25	354	15.2	16.6

2. Reservoir TAG--B :

The average parameters that characterize the TAG "B" tank are as follows: the average porosity is: 18%. The average water saturation is: 23.10%. The average permeability is: 875-md. The average thickness is: 50 m. the average depth is: 2710 m (Fig.12,13,14,15)

Tab.3 : Summary table of TAG -B

Well	depths (m)	ratings absolute (m)	Thickness (m)		K(mD)	Ø(%)	So(%)
			Overall	useful			
ATK-1	2684.5	-2277.5	45	35	1065	21,5	26,5
ATK-2	2720	-2280.5	47.5	35,5	1186	19,8	20,8
ATK-3	2734	-2304.5	49.5	15,5	544	17,9	29,1
ATK-4	2712	-2291	45.5	29,75	896	18,6	20,3
ATK-5	2763	-2307.5	-	4,75	440	18	61,5
ATK-6	2686	-2282	39.5	35,75	1069	19,2	13,4
ATK-15	2688	-2277	45	38,5	957	18,5	10
ATK-17	2717.5	-2297.5	34	21,75	836	18,2	19,4
ATK-18	2742	-2321.5	37	1,5	831	17,3	38,9
ATK-19	2696.5	-2278.5	47	37	1309	19,1	7,7
ATK-20	2739.5	-2305.5	43	12,75	603	15,6	31,2
ATK-21	2686.5	-2283	37.5	32,5	843	17,2	18,7
ATK-22	2710.5	-2297.5	49	21,75	842	16,7	16,5
ATK-23	2707	-2309	44	13,5	313	16,2	20,3
ATK-24	2692	-2295	46	24	1242	17,2	12,3

VIII. Interpretation of results:

1. The TAG - A resrvoir:

A. The summation of positive anomalies:

Overlay of positive anomaly maps, allows to define separate areas and classify the Petrophysical parameters. (Fig.8,9,10,11), (Tab.4)

Tab.4- The summation of positive anomalies:

Category of zones	Perméability (mD)	Porosity(%)	Thickness useful (m)	Saturation (%)
1st. category	+	+	+	+
2sd. Catégorie	+	+	+	-
3th. category	+	+	-	+
4 th. category	+	-	+	+
5 th. category	-	+	+	+
6 th. category	+	+	-	-
7 th. category	+	-	+	-
8 th.category	-	+	+	-

9 th. category	+	-	-	+
10 th.category	-	+	-	+
11 th. category	-	-	+	+
12 th. category	+	-	-	-
13 th. category	-	+	-	-
14 th. category	-	-	+	-
15 th.category	-	-	-	+
16 th.category	-	-	-	-

B. the zonation:
There are the five following areas: (Fig. 20)
Tab.5- Zonation

Category	Zones	Legend	Quality
1st category	1st zone	1	**Very good**
2sd -3 th -4 th -5 th	2sd zone	2	**Good**
6 th -7 th -8 th -9 th -10 th -11 th	3th zone	3	**Average**
12 th -13 th -14 th -15 th	4thzone	4	**Low**
16 th	5th zone	5	**Poor**

Conclusion:

According the zonation of TAG - A map it is concluded that:
1. The TAG - A formation is characterized by a high heterogeneity of the Petrophysical parameters.
2. Zones 1 and 2, may be the subject of a future operations because these areas Petrophysical characteristics are very good and good
3. Zones 3 and 4, may be a future production development since these areas Petrophysical characteristics are low and medium-sized.
4. Wells which are at the level of the 5th area can be transfotmés in injectors
5. Zone 2 is characterized by a large extension of the Petrophysical parameters.
6. We can add some development and future production wells in the North-East zone that corresponds to the zone 2 (good).

2- Reservoir TAG-B :

The zonation: TAG - B shows five areas: (Fig. 16,17,18,19)

Tab.6- Zonation (Fig. 21)

Category	Zones	Legend	Quality

1^{st} category	1^{st} zone	1	**Very good**
2^{sd} -3^{th} -4^{th} -5^{th}	2^{sd} zone	2	**Good**
6^{th} -7^{th} -8^{th} -9^{th} -10^{th} -11^{th}	3^{th} zone	3	**Average**
12^{th} -13^{th} -14^{th} -15^{th}	4^{th}zone	4	**Low**
16^{th}	5^{th} zone	5	**Poor**

Conclusion :

On the map of zonation of TAG - B it is concluded that:
1. The TAG - B formation is characterized by concentric zones, a large extension of the first (very good) zone.
2. The presence of zones 3 and 4, may be subject to a development of future production, since these areas Petrophysical characteristics are low and medium zones.
3. The wells that are at the level of the 5th area can be transformed in injectors.

General conclusion

After the geological study of the TAG - A and TAG - B reservoirs in the region of Ait Kheir were led to the following conclusions:
Productive reservoirs "A" and "B" have different thickness and qualities of resrvoirs.
The sandstone "A" span across the region with a relatively constant thickness. The Petrophysical characteristics present a certain homogeneity.
Sandstone "B" have a thickness greater almost double that of sandstone "A" and good Petrophysical characteristics.
Zonation of TAG - A is characterized by a high heterogeneity.
Interesting areas determined by the superposition of the various positive local anomalies and their analysis, has allowed us to see that the best qualities of the TAG - A reservoir Petrophysical localized into two areas (1 and 2):
1st area: encompassing wells ATK (2, 4, 24, 19 and 15).
2nd area: encompassing the TKN-1 well.
From the results obtained, it is recommended that:
The implementation of the production wells in areas best petrogazéiferes of positive anomalies.
The implementation of the research to the direction of the trend well.

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Fig.1: ALGERIAN STRUCTURAL ELEMENTS

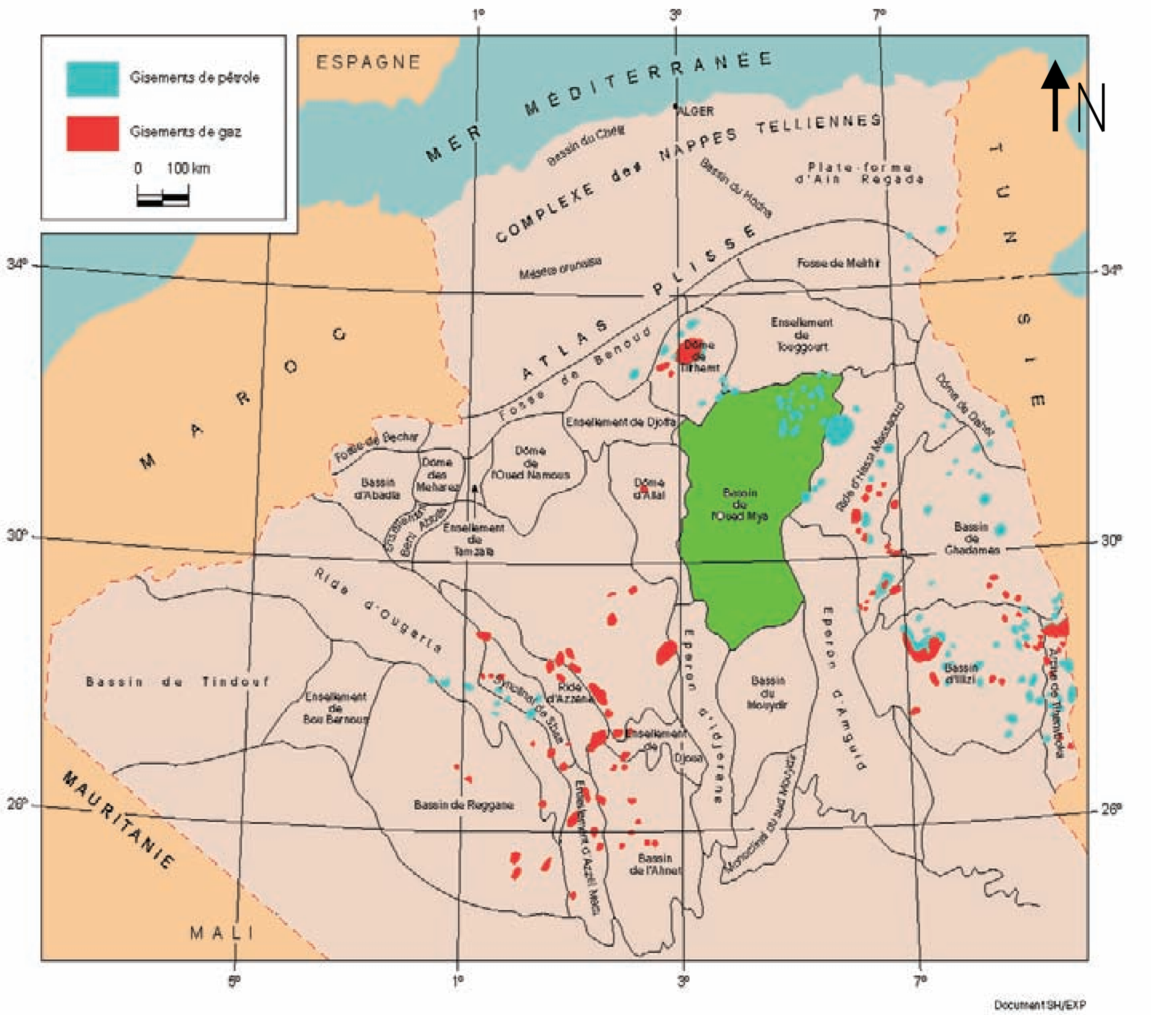
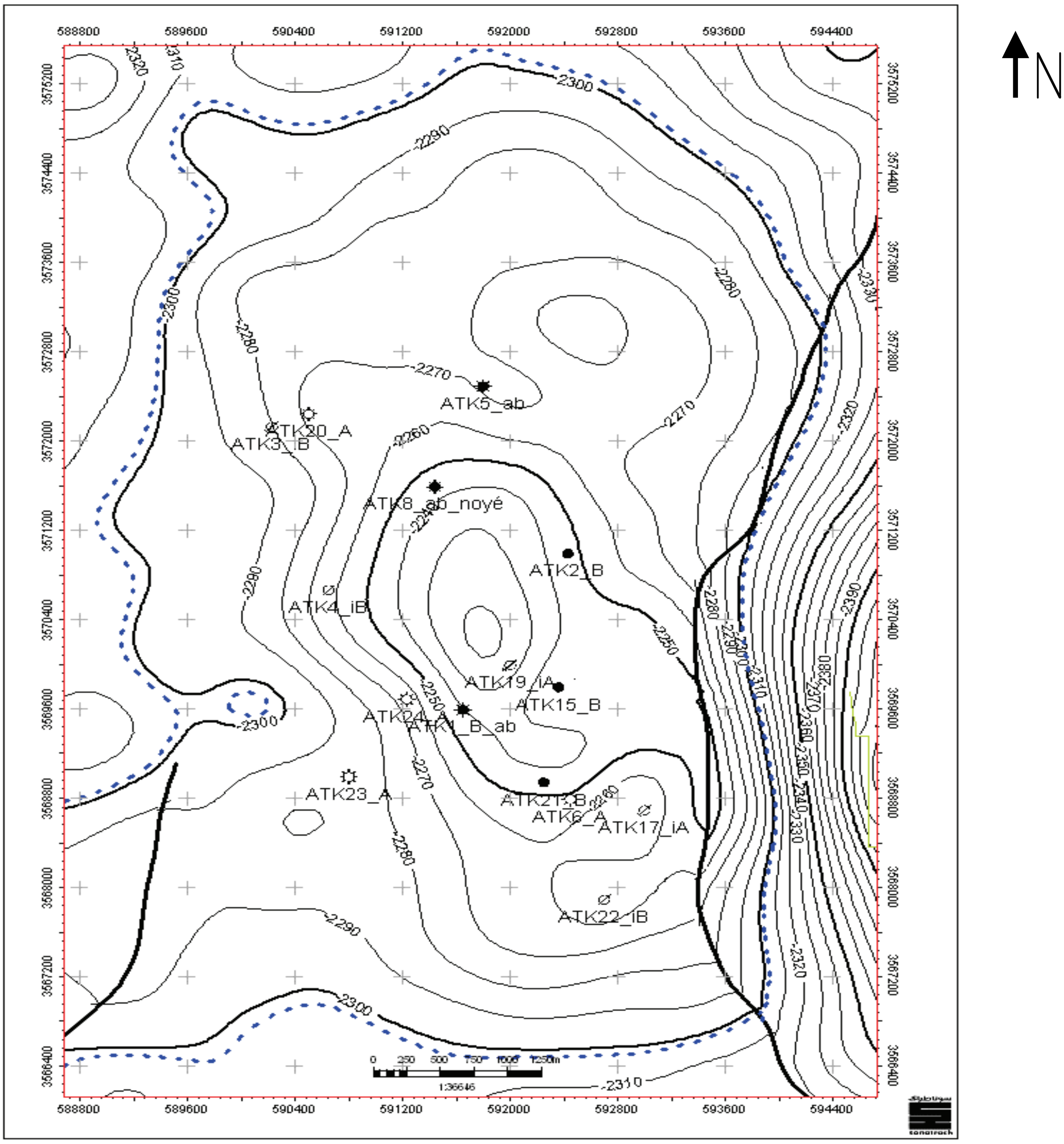


Fig. 2: Stratigraphic section of Triassic sandstone clay

Age	Etages	Strati.	Lithologie	Epaisseur
TRIAS ARGILO GRESEUX	T-2		Altern.d'argile silteuse et de silts,passées de grés beige à cim.argilo-dolomitique	20 à25m
	T-1		Alternance d'argile et de silts passées de grés beige ciment argilo siliceux fine altercal.de grés gris-blanc.	25 à 30 m
	ERUPTIF		Andésite brun-rouge à brun sombre altérée en général au sommet. Présence de nodules de carbonates.Fines intercala-tions de joints d'argile ferrugineuse.	0 à 75 m
	SERIE INFERIEURE		Grés gris beige fin,moy à grossier.Ciment carbonaté à siliceux.Passées de films d'argile verdatre .Presence de pyr et nodules d'argile verte ou ferrugineuse.	15 à 60 m
	GOTHLANDIEN		Argile noire feuilletée pyriteuse, silt.	300 à 900m

Fig.3 : Structural map at the top of the TAG - A.
Ait -Kheir Field.



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3571200
3570400
3569600
3568800
3568000
3567200
3566400
ATK5_ab
ATK20_A
ATK3_iB
ATK8_ab_noyé
ATK2_B
ATK4_iB
ATK19_iA
ATK15_B
ATK24_A
ATK1_B_ab
ATK23_A
ATK6_A
ATK17_iA
ATK22_iB
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-2270
-2280
-2290
-2300
-2310
-2320
-2330
-2380
-2390
1:36646
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Fig. 4: Trend and map of Thickness useful of TAG- A

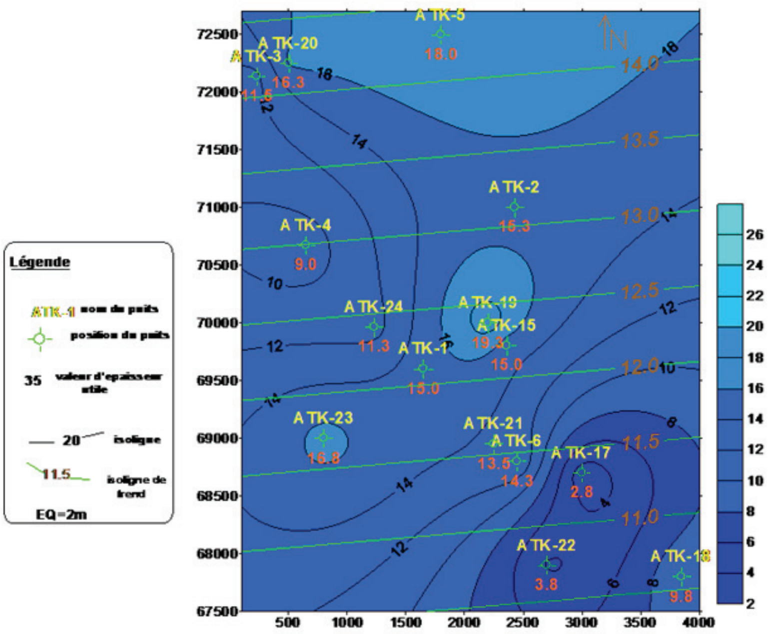

Fig. 5: Trend and map of Porosity of TAG- A

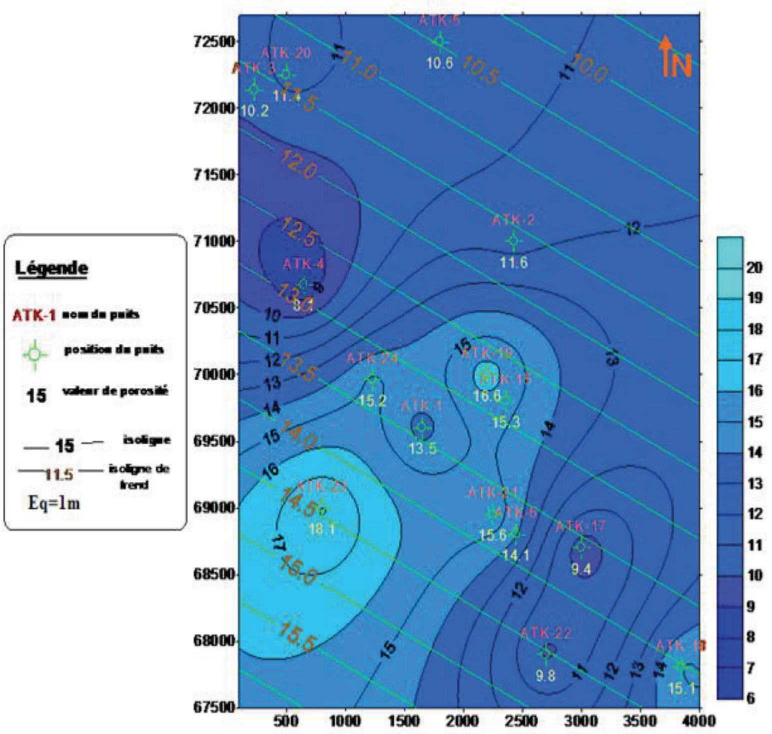

Fig. 6: Trend and map of Permeability of TAG- A

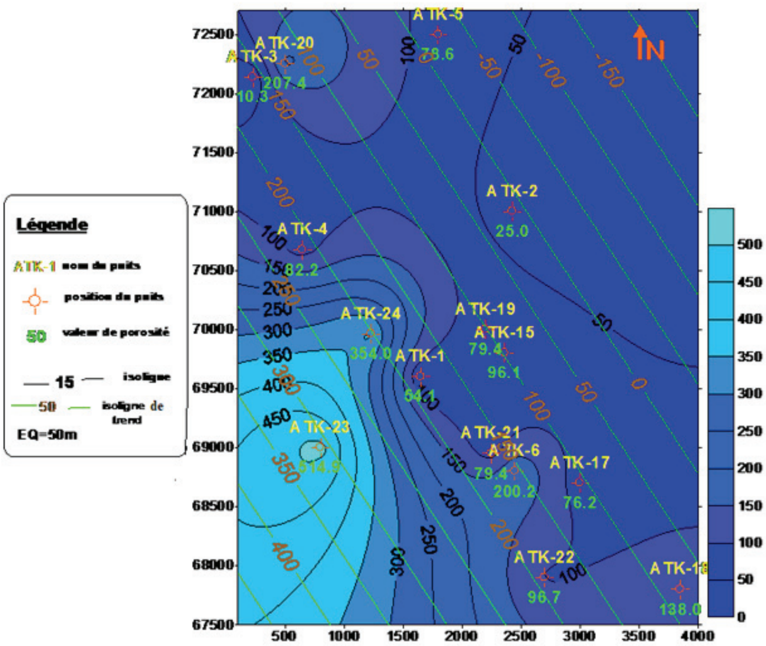

Fig. 7: Trend and map of Saturation of TAG- A

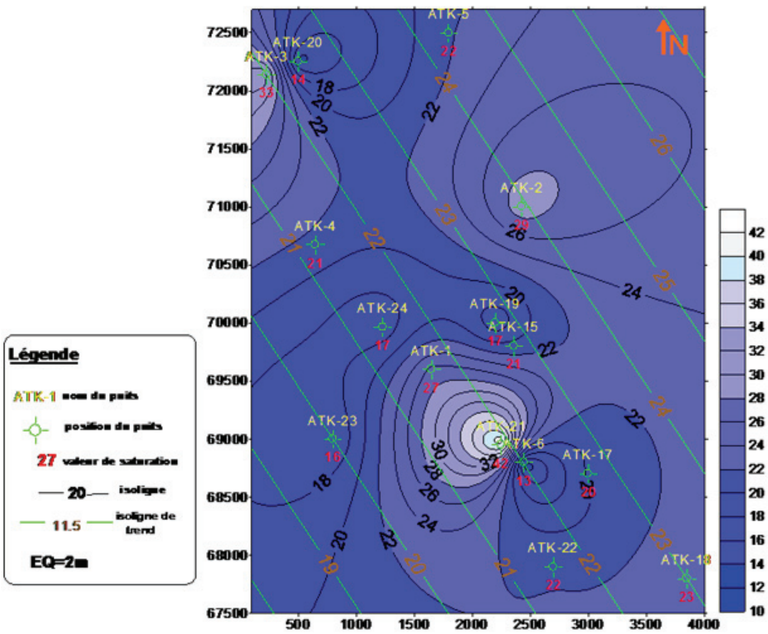

Fig. 8: Map of Thickness anomalies of TAG- A

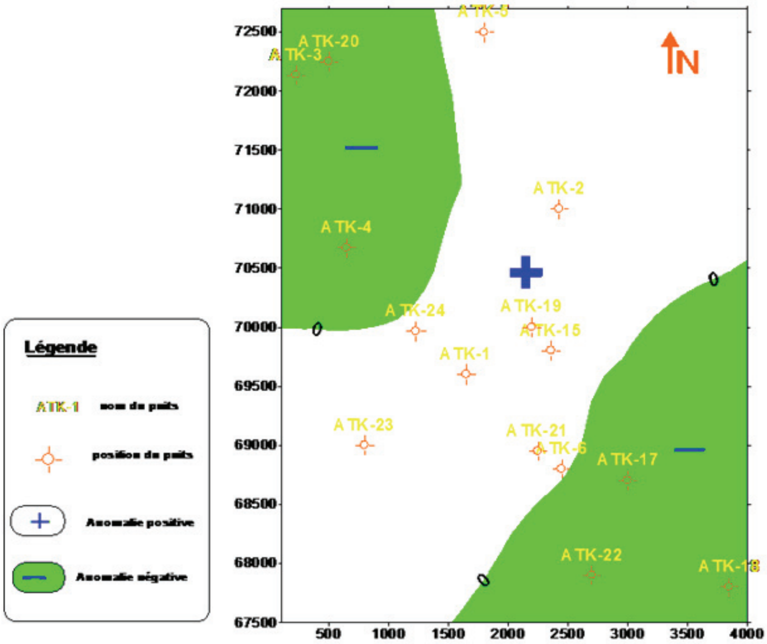

Fig. 9: Map of Porosity anomalies of TAG- A

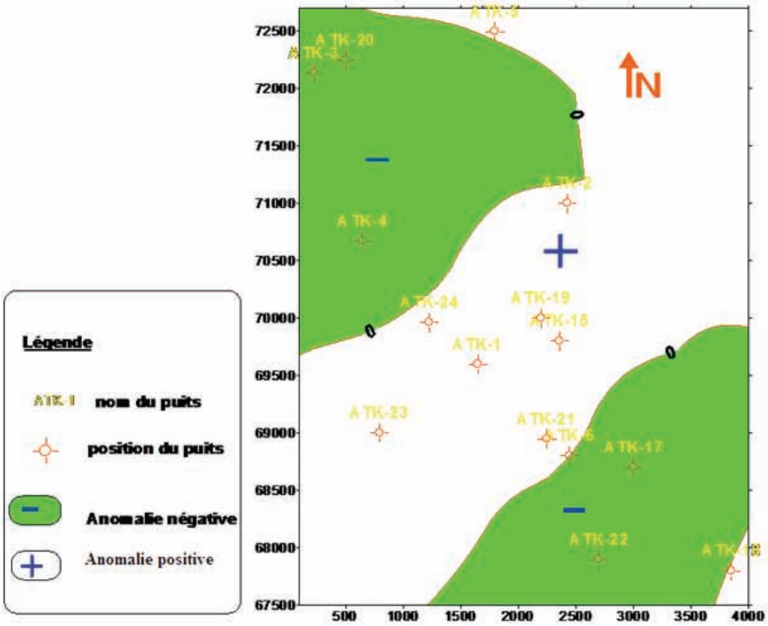

Fig. 10: Map of Permeability anomalies of TAG- A

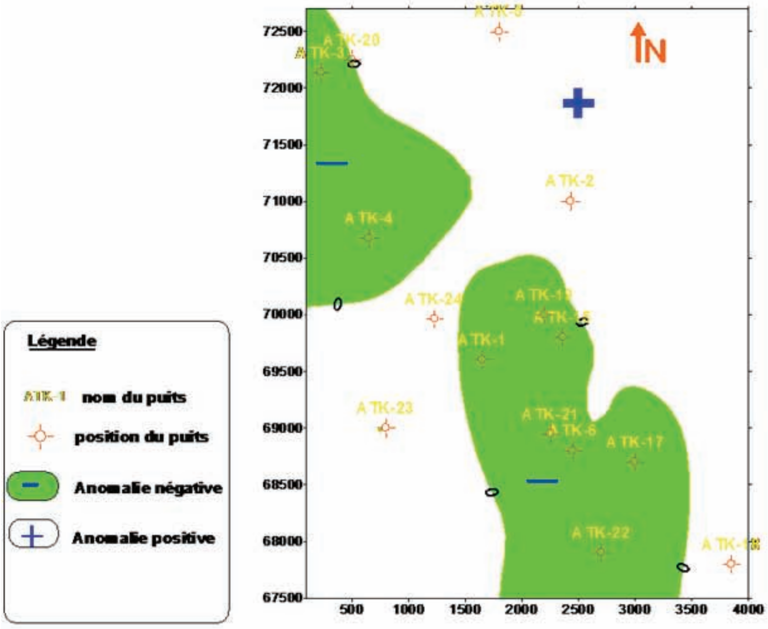

Fig. 11: Map of Saturation anomalies of TAG- A

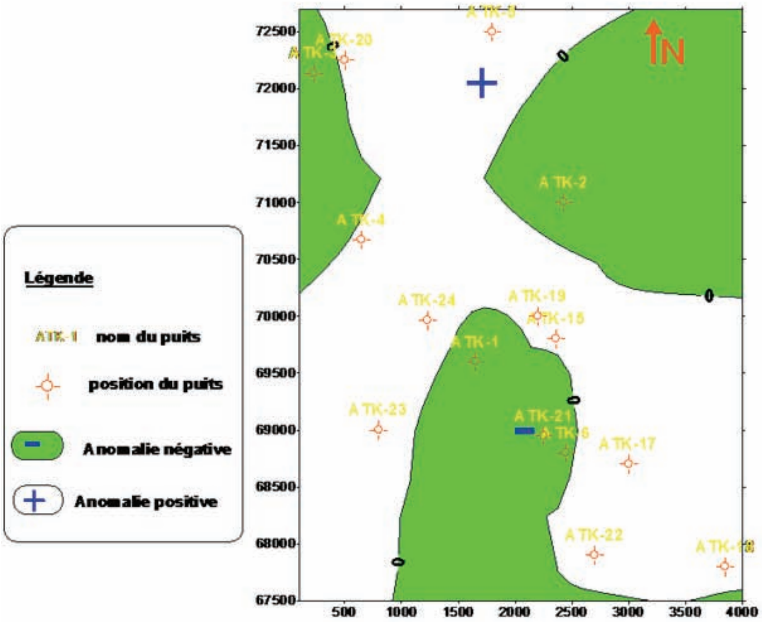

Fig. 12: Trend and map of Thickness useful of TAG- B

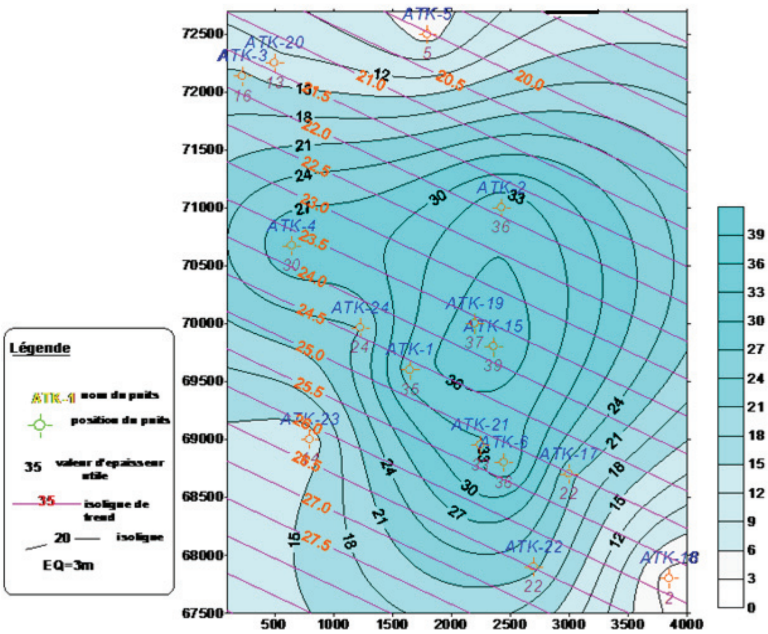

Fig. 13: Trend and map of Porosity of TAG- B

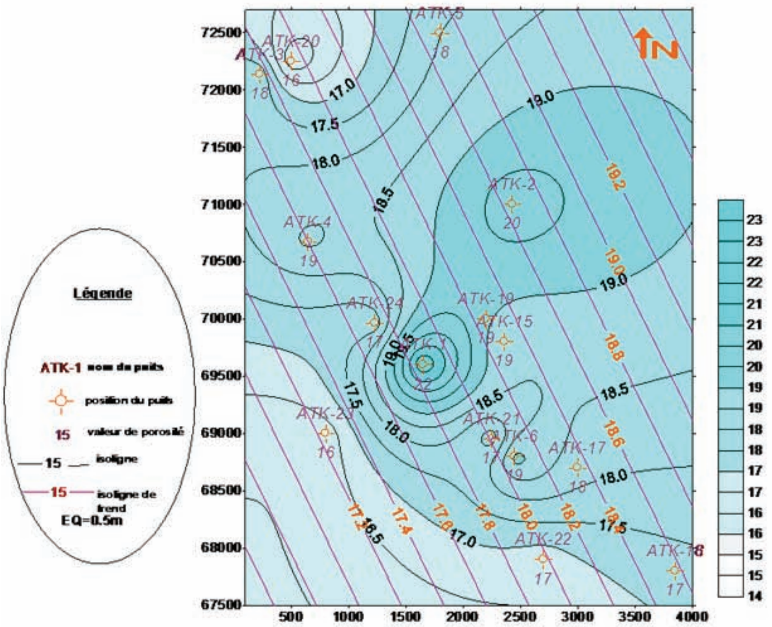

Fig. 14: Trend and map of Permeability of TAG- B

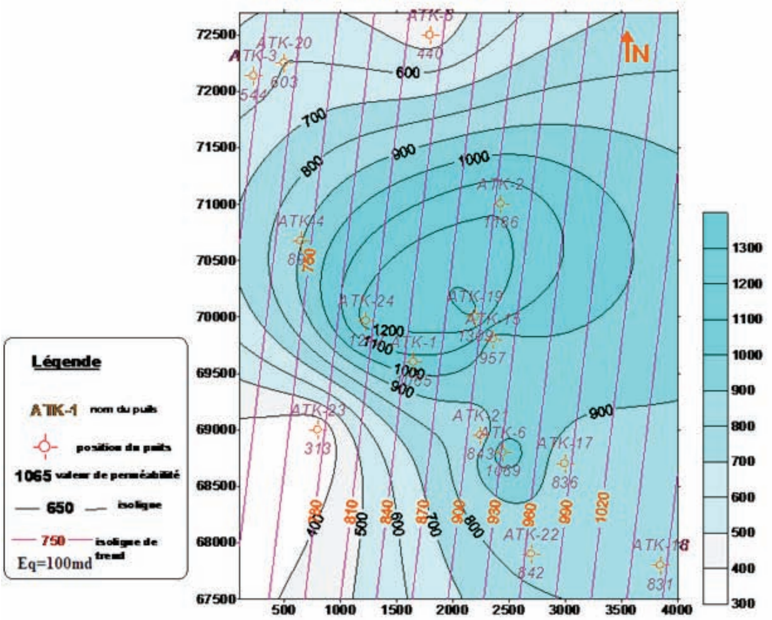

Fig. 15: Trend and map of Saturation of TAG- B

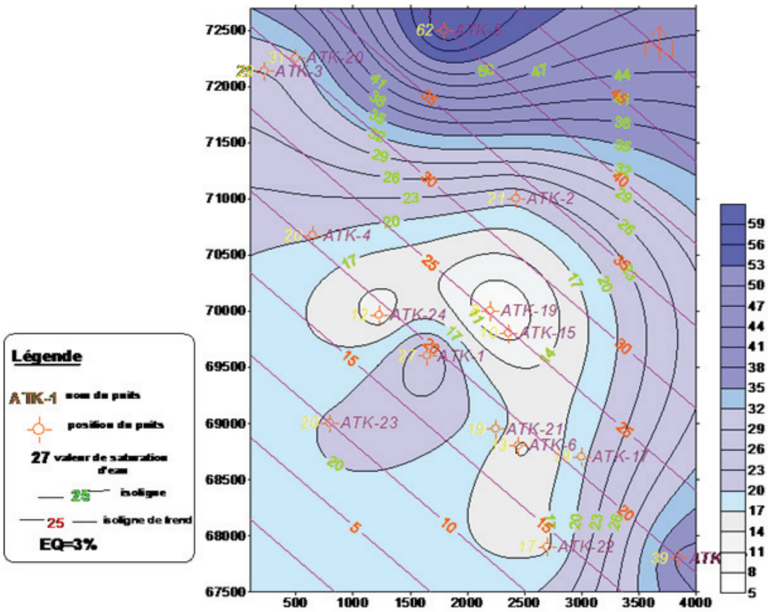

Fig. 16: Map of Thickness anomlies of TAG- B

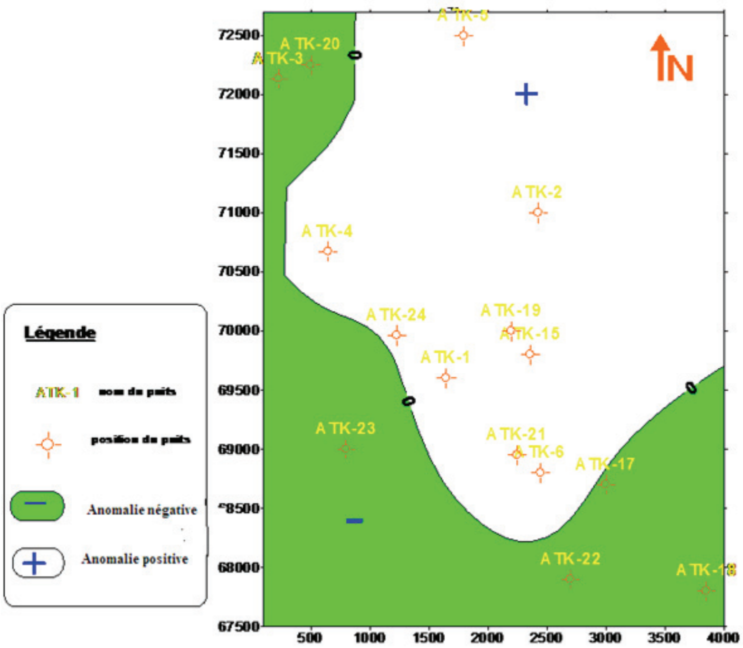

Fig. 17: Map of Porosity anomalies of TAG- B

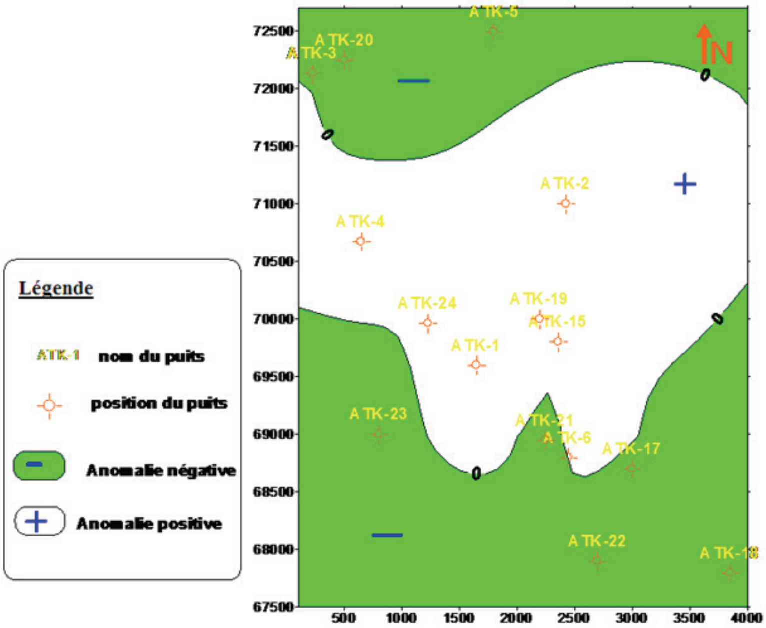

Fig. 18: Map of Permeability anomalies of TAG- B

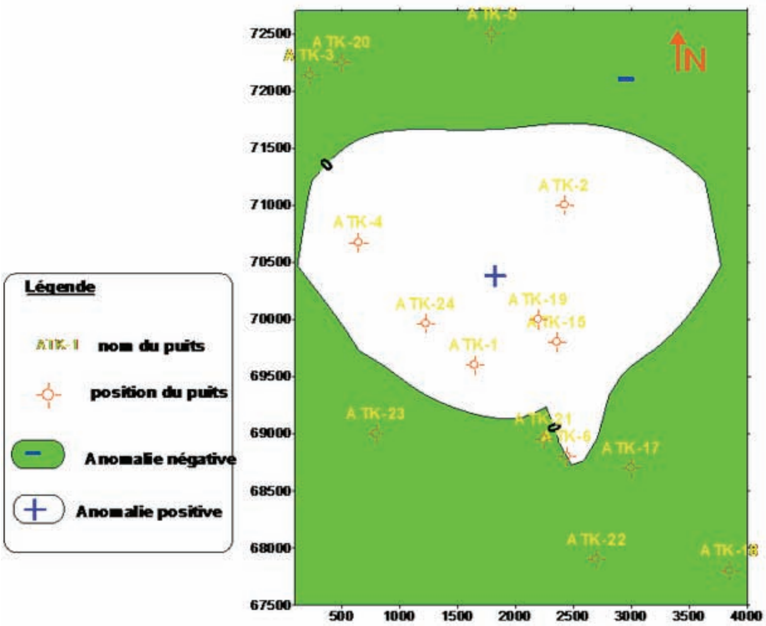

Fig. 19: Map of Saturation anomalies of TAG- B

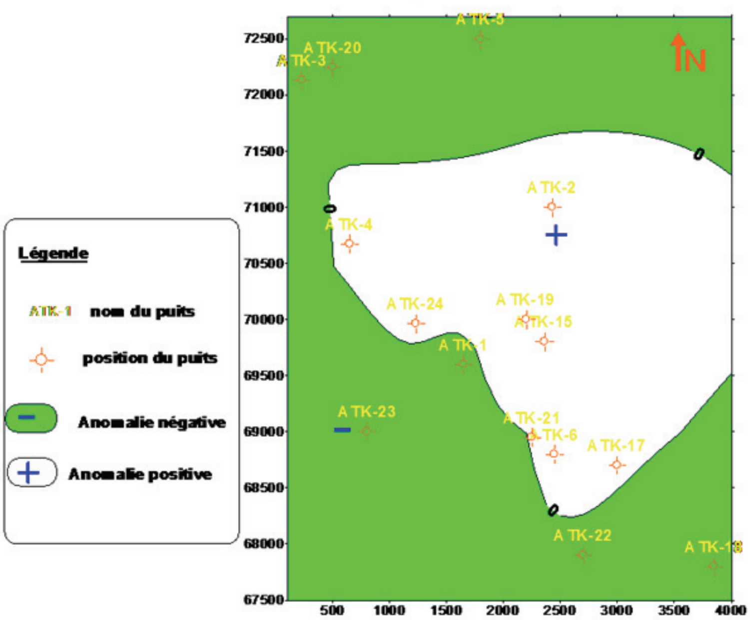

Fig. 20: Map of Zonation of TAG- A

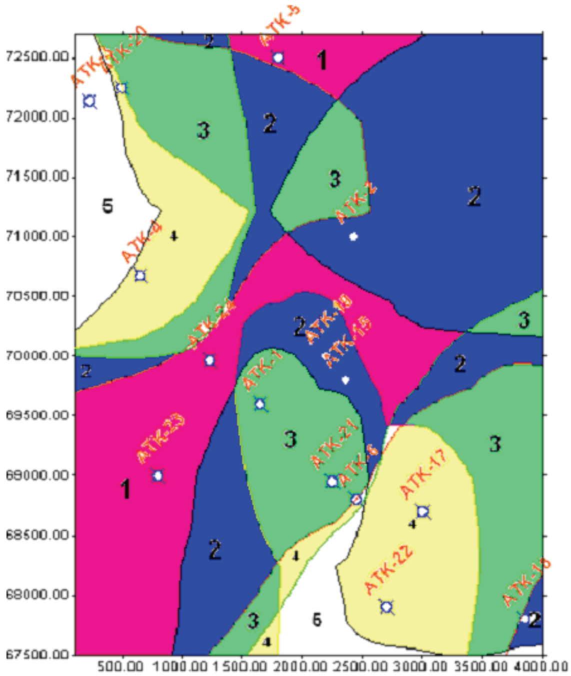

Fig. 21: Map of Zonation of TAG- B