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VERTICAL AND HORIZONTAL DISTRIBUTION OF HYDROCARBON OCCURRENCES EXHIBITED FROM THE LITHO-SATURATION CROSSPLOTS OF THE AREA NORTH OF QATTARA DEPRESSION, WESTERN DESERT ; EGYPT .

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ABSTRACT

Petrophysical parameters of the rock fluid constituents, including formation porosity, fluid saturation and the relative existence of various proportions forming the rock materials of the Bahriya and Abu Roash formations, are necessary to evalute the favourable zones for hydrocarbon occurrences in the study area. A concise account of the implicated hydrocarbons can be explained using the litho-saturation crossplots of the drilled wells together with gradient and saturation maps.

INTRODUCTION

The present work deals with the enumeration of the various geological inferences adapted for finding oil and gas in the study area as indicated in Fig. (1),

where six drilled wells are located, kanayis-1x, Fadda-1x, Minqar-1x, Nasr-1x, Kheima-1x and Marzuk-1x.

Vertical distribution of hydrocarbon occurrences at each studied well can be presented and explained through the litho-saturation crossplots which exhibit the variations in rock materials and petrophysical parameters encountered with depth.

Porosity values are computed for clean and shaly sediments of Bahariya and Abu Roash Formations. Fluids and gases contained in the rock pores are classified into gas, water, movable and residual oil saturations. Empirical equations and charts are used in this category after Schlumberger [2,3,5].

The forementioned petrophysical parameters for the two studied formations in the six analyzed wells are presented vertically, zone-wise. Normalized values for each parameter are presented laterally, formation-wise, in a number of isoparametric maps.

LLITHO-SATURATION CROSSPLOTS

Such plots show the petrophysical parameters for each zone in the following individual wells in the location

of drilling only and without any horizontal interpolation expressing any lateral variations between these wells. The numerical values of such parameters are indicated in Table 1.

Kanayis 1x:

Bahariya and Abu Roash Formations are differing in their lithologic constitution porosity and fluid content as shown in Fig. (2). Porosity values are mostly equal in occurrences in the two formations. Such pore spaces contain more than 70% of water and the remainder is residual hydrocarbon. No movable hydrocarbon and gas saturations have been recorded.

Minqar-1x:

Residual hydrocarbons are existed, while the movable ones show minor proportions in the upper part of the Bahariya Formation and the lower part of the Abu Roash Formation Fig. (3). The porosity values of the two Formations are relatively similar (20% p.u.).

Fadda-1x:

The major part of hydrocarbon is residual, while the movable type forms a minor proportion Fig.(4). The porosity of the Bahariya Formation in this well is

relatively higher compared to the porosity values in the other wells, (except in Kanayis-1x well).

Nasr-1x:

The porosity values of the two studied formations of this well are nearly similar, and relatively smaller compared to that in Kanayis-1x well. Most of pore spaces are filled with water rather than residual hydrocarbon Fig. (5).

Kheima-1x:

In this well pore spaces are filled with water except in few zones where they are filled with residual hydrocarbons which are pronounced in the Bahariya Formation, and nearly absent in Abu Roash Formation Fig.(6). Porosity values of the two investigated formations are relatively small.

Marzuk-1x:

In this well, water associated with residual hydrocarbon are filling the pore spaces of the two studied formations of a relatively higher amount of porosity values Fig. (7).

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LATERAL VARIATIONS OF HYDROCARBON PLAYS

A number of gradients and saturation maps have been constructed in order to clarify the lateral variations of hydrocarbon plays.

Some of the petrophysical parameters, such as the available pore spaces and fluid content of the two studied formations, are utilized with this manipulation for judging their lateral variation and the factors controlling such variation which may be either stratigraphic or structural or both

Porosity gradient maps:

With respect to Bahariya Formation, low porosity values occupied the central part of the study area Fig. (8) where a gradual increase in porosity pertcentage is observed in the northeast and southwest directions. Lower porosity values are also occupying the central part of the area with regards to the Abu Roash Formation. North , West and South , West direction show a gradual increase of porosity units, Fig. (9).

Water Saturation:

The distribution of water saturation is strongly influenced

by variation of the total corrected porosity in the considered area.

Reasonable matching is observed between the two parameters with respect to Abu Roash Formation, in which water saturation increases with increasing pore spaces Fig. (11).

In the Bahariya Formation, there is a shift for the low anomaly from the western part of the total corrected porosity map to the eastern part of the investigated area of the water saturation map, Fig (10).

Hydrocarbon Saturation:

Higher saturations exist in the eastern part of the investigated area in the Bahariya Formation. Good resemblance exhibits between the total and residual hydrocarbons Fig.12, 14 indicating immovable type for such type of hydrocarbons. On the other hand, the movable hydrocarbon staturation Fig. 16, shows an eastward increase indicating a probable migration of hydrocarbon east of the investigated area.

The total hydrocarbon saturation of Abu Roash Formation Fig. (13), reveals high saturation in the southwestern part of the area in concordance with the water saturation and total porosity distributions Fig. (11 & 9).

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CONCLUDING REMARKS

The most important conclusions revealed from this study can be summarized as follows:

1. The total porosity gradient of the Bahariya Formation is slightly higher than that of the Abu Roash Formation. The general coinidence arising between the porosity gradients of the basin during the Cenomanian-Turonian-Santonian times reflects the effect of erosion as a major factor for increasing the porosity gradient of the Bahariya and Abu Roash Formations.

2. Water saturation maps of the Bahariya and Abu Roash Formations show a regional matching with the total porosity gradients. In the Bahariya Formation there is a shift occurring in the area of low anomaly from the western part in the total porosity gradient map to the eastern part of the investigated area in the water saturation map. This indicates the presence of tectonic movements causing tilting of the Bahariya Formation during deposition.

3. The hydrocarbon saturation of the Bahariya Formation is almost discordant with water saturation and total porosity. The deficiency of hydrocarbon in the western part of the study area may reflect the probable eastward migration of the movable types, leaving the residual ones in place.

4. Most, if not all, of the hydrocarbon saturation present in Abu Roash Formation is in the form of residual type due to the migration of the movable oil to a relatively higher

parts.

5. The residual hydrocarbon saturation of the Bahariya Formation exhibits a kind of harmony with the hydrocarbon occurrences. This may attest the eastward migration of the movable oil from the western part of the study area to its eastern part.

6. The formation of the trap in a time later than the creation of the encountered hydrocarbons may seep the lighter and movable hydrocarbon components leaving these traps in a barren state.

ACKNOWLEDGEMENT

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Table (1): Petrophysical parameterrs of Mingar-Ix

Zone No.	Depth	SP	GR	Rxo	Rt	FDC	SNC	CNL	T (°F)	Rmf	Rmf	Rw	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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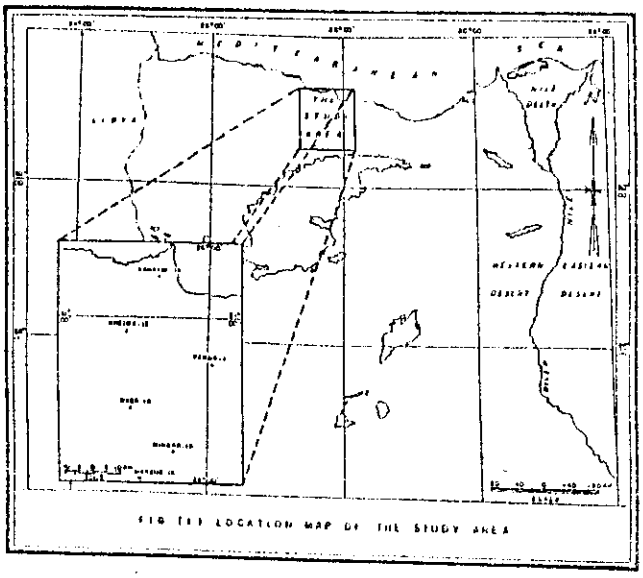

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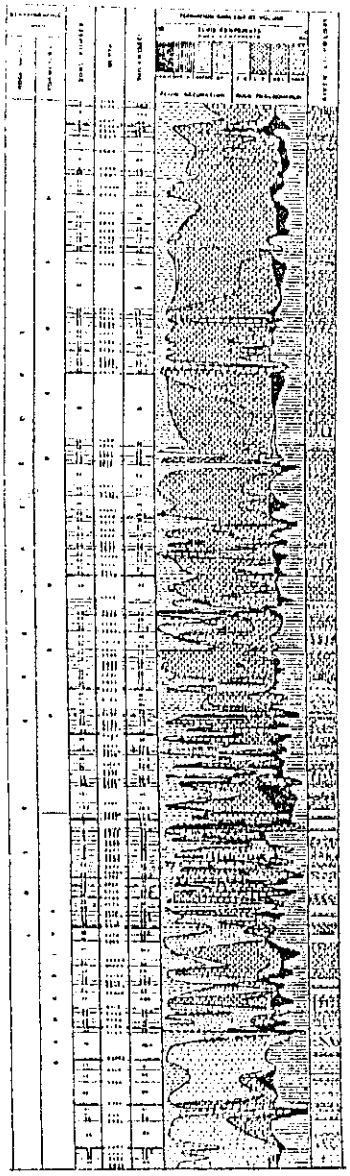

FIG [3] LITHO SATURATION CROSS PLOT OF BANAVA WELL

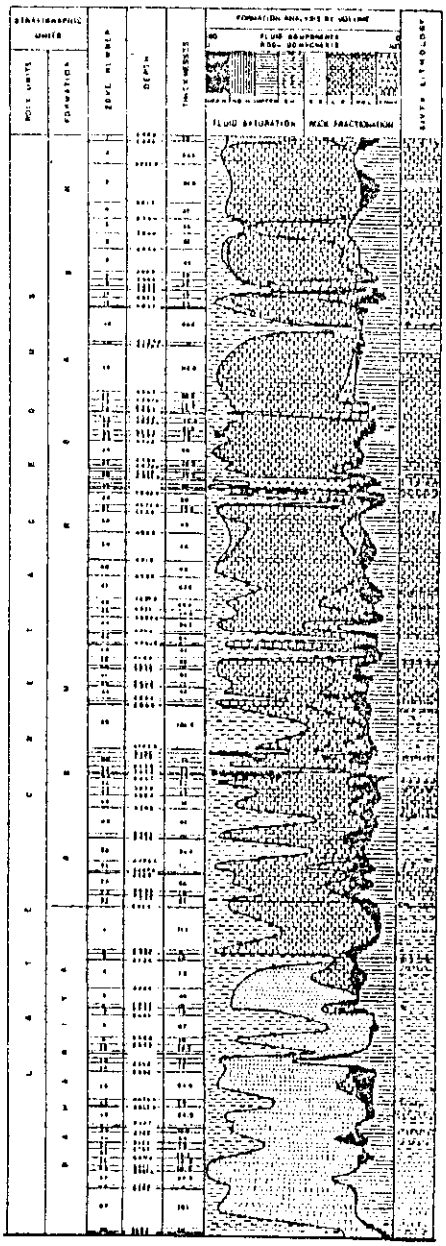

FIG [3] LITHO SATURATION CROSS PLOT OF MINDAR WELL

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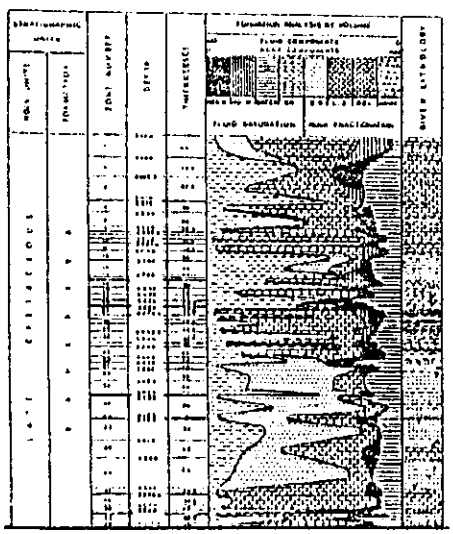

FIG [illegible] LITHO-SATURATION CROSS PLOT OF FADDY WELL

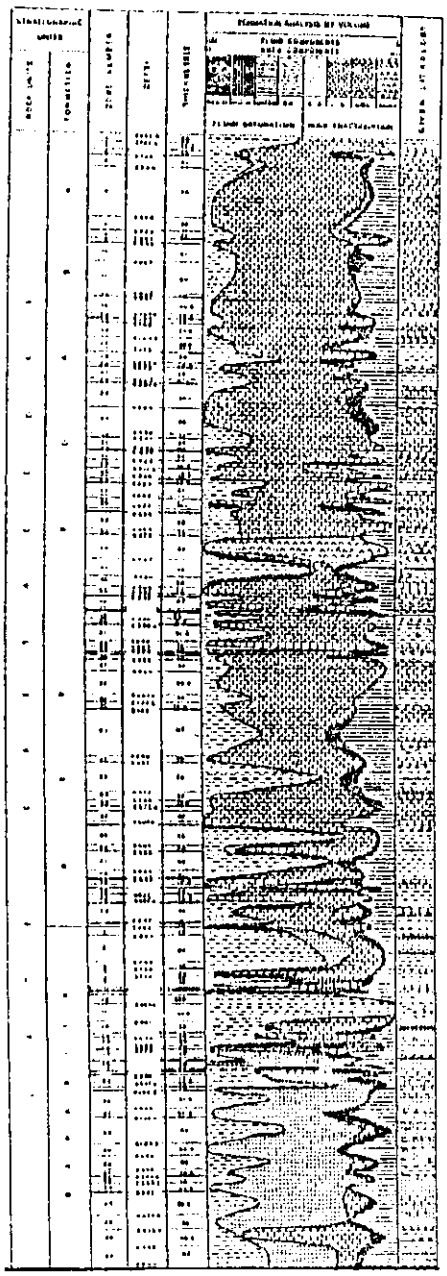

FIG [illegible] LITHO-SATURATION CROSS PLOT OF NASR WELL

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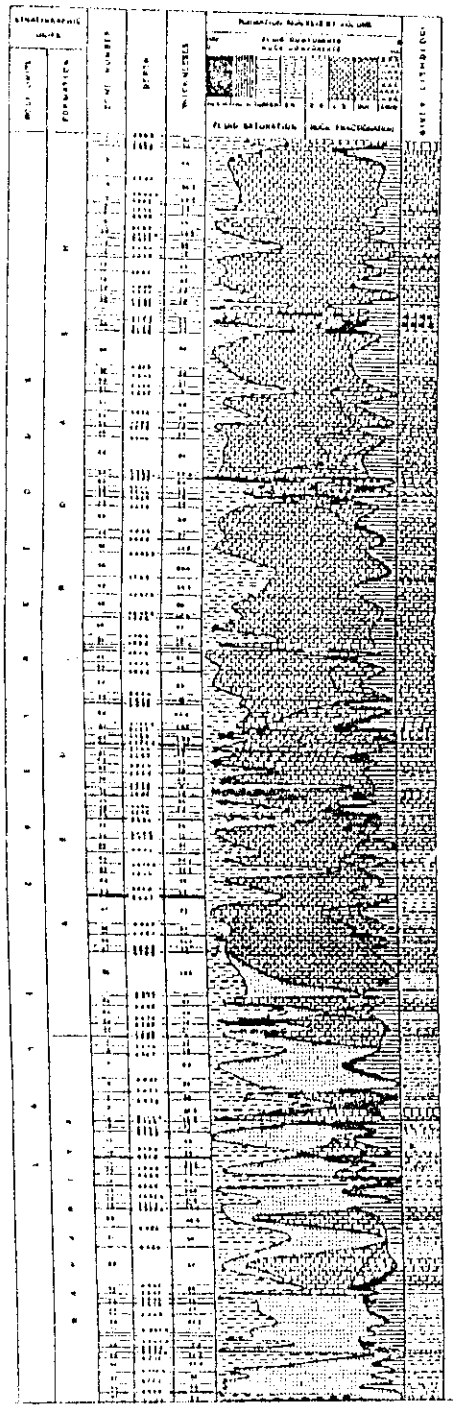

FIG [illegible] LITHO-SATURATION CROSS PLOT OF RHEIMA WELL

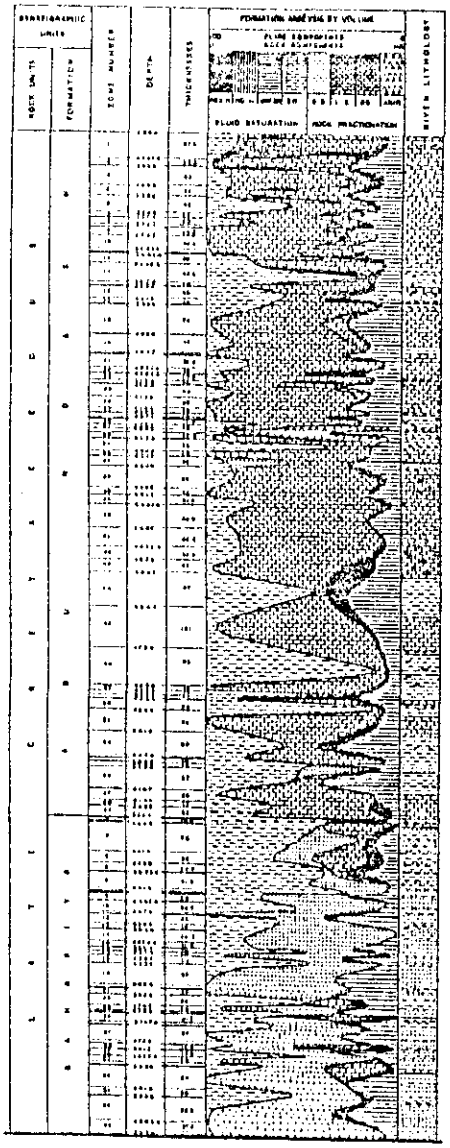

FIG [illegible] LITHO-SATURATION CROSS PLOT OF MANZIU WELL

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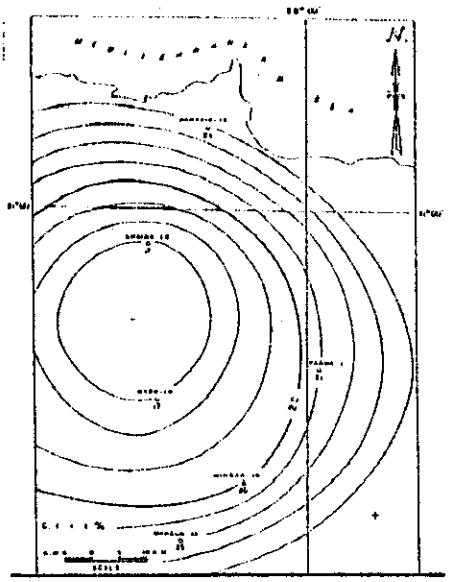

FIG. (8) TOTAL POROSITY GRADIENT MAP OF BAHARIYA FORMATION

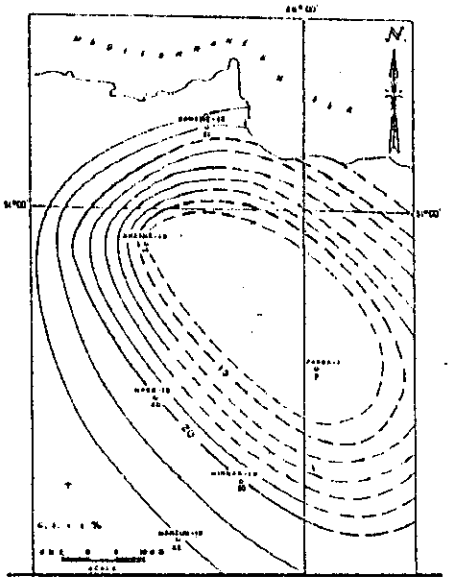

FIG. (9) TOTAL POROSITY GRADIENT MAP OF ABU ROASH FORMATION

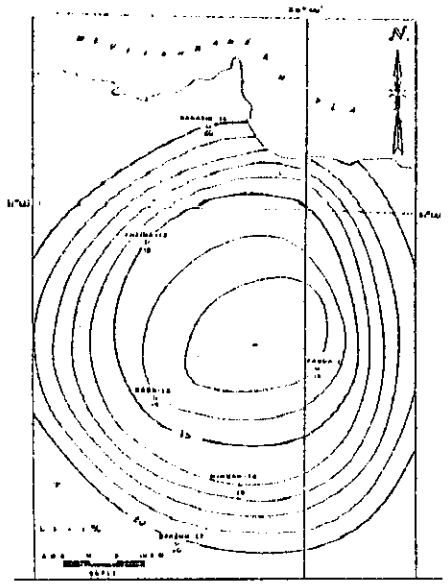

FIG (10) WATER SATURATION MAP OF BAHARIYA FORMATION

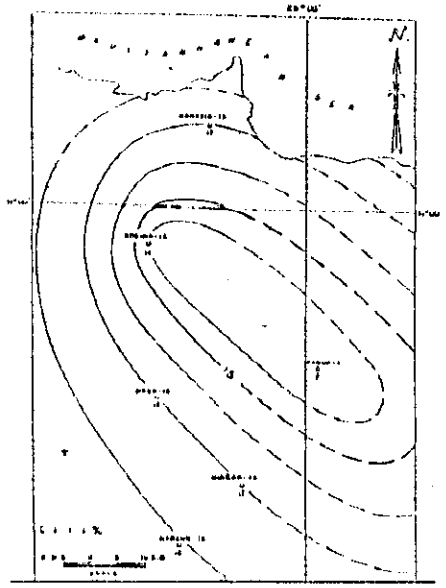

FIG (11) WATER SATURATION MAP OF ABU ROASH FORMATION

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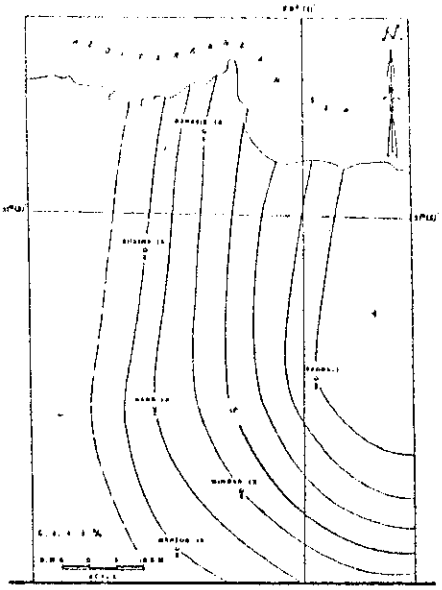

FIG (12) HYDROCARBON SATURATION MAP OF BAHARIYA FORMATION

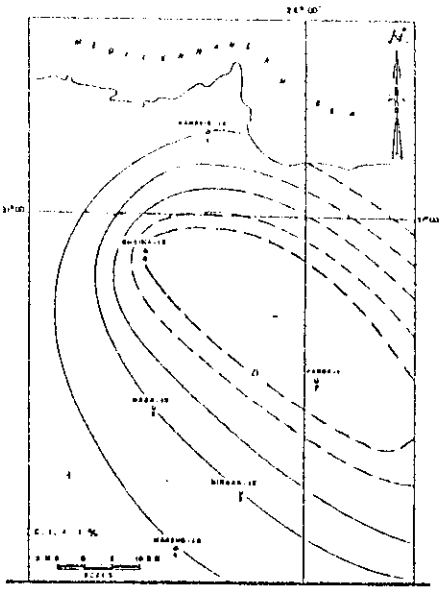

FIG. (13) HYDROCARBON SATURATION MAP OF ABU ROASH FORMATION

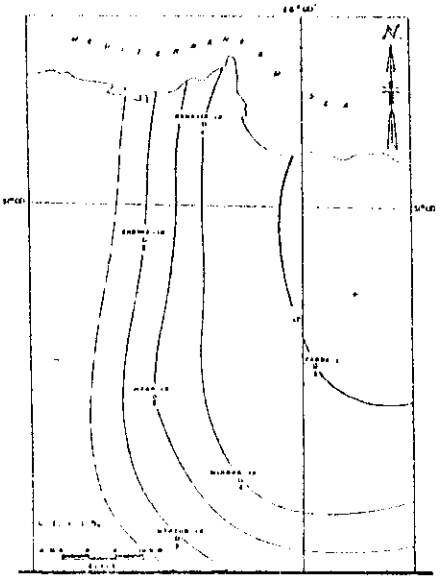

FIG (14) RESIDUAL HYDROCARBON SATURATION MAP OF BAHARIYA FORMATION

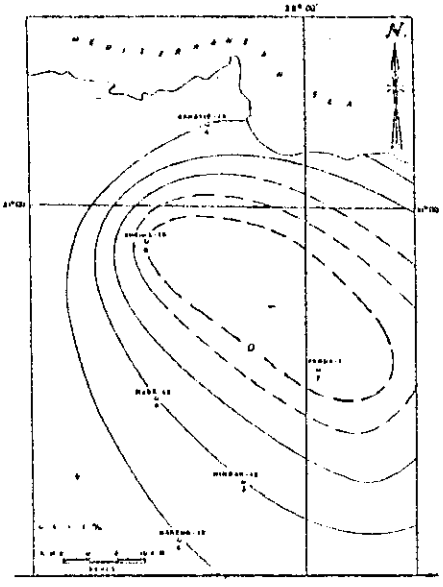

FIG (15) RESIDUAL HYDROCARBON SATURATION MAP OF ABU ROASH FORMATION

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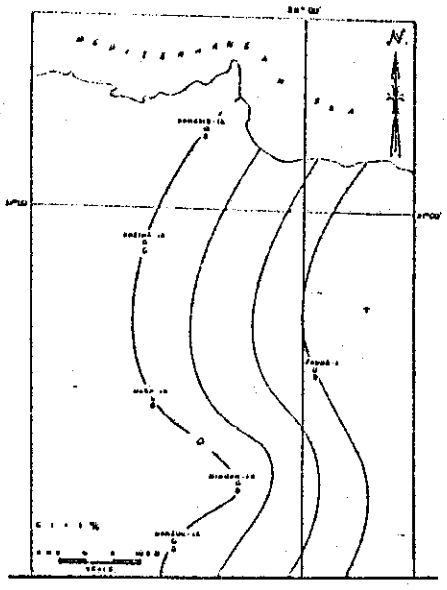

FIG (18) MOVABLE HYDROCARBON SATURATION MAP OF BAHARIYA FORMATION

التوزيع الرأسى والافقى لتواجد الهيدروكربونات الموضحة من مقاطع تشبع الصخر للمنطقة الواقعة شمال منخفض القطارة ، الصحراء الغربية ـ مصر

أ. احمد على حسن و شادية عبد الرحيم
قسم الجيولوجيا ـ كلية العلوم ـ جامعة طنطا
مصر

تتعلق الدراسة بتوزيع الهيدروكربونات من واقع تشبع الصخور المختلفة رأسيا وأفقيا وذلك من خلال رسم خرائط توضح تغيير المسامية والتشبع بالماء وكذلك الهيدروكربونات بنوعيها المتحرك والساكن. من تلك الدراسة اتضح أن الهيدروكربونات المتحركة قد هاجرت الى جهة الشرق بالنسبة للمنطقة الواقعة تحت البحث.