ON THE OIL FIELDS LOCATED IN SOUTH - EASTERN TURKEY

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At the end of the drilling research work made on the Raman Structure, which constitutes one among more than 15 anticlinal structure located in South Eastern Turkey, 7,000,000 tons of proved drilled crude oil reserves have been ascertained (fig. 1).

The Raman Structure, which is the first producing oil field in Turkey, reveals at the same time the oil possibilities of the other structures observed or assumed to be present but concealed under the Neogene cover in the S.E. region.

In fact, No. 2 Well located on the Garzan Structure, 20 kms. to the North of Raman, has recently been completed and found to be a producer as the Raman wells.

The producing zone found in the Middle Cretaceous, both at Ramandağ and at Garzan, corresponds to the second probable payzone of the region, as the Eocene Limestones are here cropping out. Two other payzones are to be expected in deeper horizons. It was intended to penetrate to those petroliferous horizons assumed to be present in the Jurassic and in the Devonian, but due to drilling difficulties the deep test well No. 14 has been abandoned at a depth of 2362 meters. Well No. 16 is now carrying on for the same objective.

The crude found in the Middle Cretaceous at Ramandağ is known to be of low quality with an average gravity of 20° A.P.I. and containing very little gas. The crude oil of Garzan well is more gaseous and of 26° A.P.I. gravity.

The Raman wells and also Garzan well are all pumping wells with about 100 to 150 tons daily initial production.

Refining products of Raman crude obtained from the topping plant contain much black residue of little value. But no one can predict that the oil which would eventually be found in the same horizon at places in the region could show the same low quality and low productivity as in Raman. As a matter of fact, Garzan well supported much this point of view at least in regard of the quality.

On the other hand, the existing evidences are in favour of finding more productive good quality oil in the deeper horizons at Ramandağ. In that case the value of the Raman field will evidently be much increased. Same possibilities are to be expected in the whole region of S.E. Turkey.

The oil fields are situated in the fore-deep basin in between the Dinarides -Taurides in Turkey- forming the main southern wing of the Alpine geosyncline and the Arabian Shield which forms the foreland. This basin forms the border folded zone which begins from the S. E. flanks of the

Zagros mountains extending towards NW-SE direction in southern Iraq and extends to Saudi Arabia. The section of this zone which lies within Turkey takes a sharp turn at Hakkari in the E-W direction towards Diyarbakır and from here extends in NE-SW direction to Adana-Hatay.

The fore-deep portion of the geosyncline which occurs as a single unit in Iran is divided within Turkey into two parts by the Bitlis Cordillera and even further west in the Adana-Hatay region it is separated into three sections following the bifurcation of the Cordillera with the Misis and Amanos ranges (fig. 2).

Thus the border zone which, extends from Iran and Iraq northward through Turkey was regarded as two different sections and under the names of « Ege-Iranides » and « Border Foldings» two tectonic units were distinguished from each other. As it will be observed on the map, all the Cordilleras have been included in the Ege-Iranides group.

We must also point out here that in the writer's book «Tectonique de la Turquie, etc.» published in 1947, due to incomplete information and data in hand at that time, we were forced, after we had directly correlated the «Border Foldings» in Turkey with the Iran-Iraq border zone, to include the «Ege-Iranides» in the «Nappes Section» which corresponds to the Taurides in Iran.

In our opinion if the «Ege - Iranides » and the « Border Foldings » are jointly compared with the Iran - Iraq border zone, some problems, the explanation of which may seem difficult will be solved to some extent. The correlation of thin and entirely, different facies within the borderfoldings in Turkey with the very well developed Miocene - Pliocene series of the Iran border zone is one of these problems. Although it is possible to explain this event, as a sudden regression of the sea which took place during the early Tertiary period towards the South East, then the explanation of the Mio - Pliocene development within the Van and Adana basins showing the same facies as that of Iran, will be difficult.

The other problem is the correlation of the Iranian Asmari limestones with the Qarah Chauk limestones in Iraq. Although both occur within the same regional structural unit, the Asmari limestone is found under the Miocene beds in Iran but in the vicinity of the Arabian Block the Qarah Chauk limestones are found under the Miocene. These limestones were assumed to be the same although both their lithologic facies and stratigraphic levels were different. The Asmari indicates Miocene characteristics and the Qarah Chauk shows Eocene features. It is generally believed that the differences are due to the facies changes and to the depositional conditions during several complicated transgressions and regressions.

In our opinion, it is necessary to search along the Iran - Iraq Border Zone to determine whether the corresponding «Ege - Iranides» and «Border Foldings» groups existing in Turkey extend southward. The correlation, assumed by the writer, of Qarah Chauk with the Midyat limestone and the Asmari with the Adana limestone will facilitate the solution of the Asmari-Qarah Chauk problem until the proper explanation is determined.

After outlining so far the general tectonic pictures which as a whole interest the border zone, we would like

to make an expose of the stratigraphic and structural features of the «Border Foldings», sensu stricto, section which also includes the Raman and Garzan fields.

The substratum of this geosynclinal basin consists of metamorphic schists, quartzites and crystalline limestones, as seen near the Bitlis Cordillera in the North and at Derik in the South as well as of the lower and pre-paleozoic series containing the Trilobite fauna which date Cambro - Ordovician formations.

Between the substratum and the series above it a clear angular unconformity can be observed. Between the upper series however only slight unconformities were observed. Therefore it is necessary to accept the fact that the epi-continental basin was formed on the top of this substratum and this basin received sediments beginning with the Devonian period which is the oldest formation seen at Hazro NE of Diyarbakır.

STRATIGRAPHY

Paleozoic The oldest formations in the basin outcrop at Hazro in the N. W. and at Harbol in the S. E. The Devonian is exposed at Hazro whereas at Harbol only the upper series of the Permo - Carboniferous crops out.

In the Hazro section near the edge of the basin the formations are thin, whereas at Harbol they are much thicker.

We have no data in hand as to the thickness of the marly and sandy Hazro Devonian which contains Spirifer and Kbynchohellas. At Hazro 100 meters of the Devonian is exposed in the outcrop. With a slight unconfofmity, the upper series of the Permo-Carboniferous consisting of limestones and quartzites, covers the lower series of the paleozoics.

The Harbol Series comprised of shales and intercalated massive black limestones are known to belong to the Carboniferous as the shales contain Productus fauna. The thickness of series is about 500 meters. From their stratigraphic position, the «Giri quartzites» 300 meters thick, on top of the Harbol Series are assumed to be Permian.

Mesozoic Triassic formations lie conformably on the Permian. J. E. Maxson has studied the Triassic in two separate parts:

1: - «Goyan Formation» : Brown and green shales with grey limestone beds, sandstones and marly limestones. Pseudomontis clarai Emmerich has been found in the formation which is characteristic for Werfenian. The thickness of this formation is 250 meters.

2. - «Tanintanin Formation» : Consists of dark dolomitic limestones with Halobia aff. halorica. According to P. Arni they are similar to «Dachstein Limestone» of the East Alpine Ladininian - Norian age. The thickness of this formation is approximately 500 meters.

The upper parts of the Tanintanin formation show Jurassic characteristics. The Jurassic series composed of massive dolomitic grey limestone is usually limonitic. As no clear lithologic difference has yet been seen between the Triassic and the Jurassic it is difficult to discriminate the two series from each other. Jurassic was found as a result of the microfossils obtained in a well at Gercüş drilled 639 meters below the Middle Cretaceous. The thickness of the Jurassic limestones is

approximately 250 meters. The Jurassic and Triassic limestones are so similar that it is difficult to delineate between the two formations.

The Cretaceous series also occurs with conformity above the Jurassic and can only be differed from the Jurassic by the grey marly limestones of the lower Cretaceous. Above the marls which have a thickness of 150 meters, Cenomainan and Turonian dolomitic limestones are found. These are named as «massive limestones» and can only be differed from each other by microfossils. The total thickness of these two series which have approximately the same thickness is 650 meters.

At Raman there is a slight unconformity between the Turonian dolomitic limestones which contain oil and the Senonian series above.

The conglomeratic limestone beds forming the lower parts of the Senonian are called «Şırnak Beds» bearing the forams of *Orbitoides media* d'Arch., *0. gensacica* Leym. and *Omphalocyclus macroporus* Lmk. and are attributed to Campanian-Maestrichtian.

The upper parts of the Senonian which are known as «Lower Kermav Series» are in the form of grey shales with Globotruncana. The thickness of these shales is 200 meters.

Tertiary Without any lithologic change occurring the Senonian «Lower Kermav» shales extend into the lower Eocene with a thickness of 600 meters. These shales are named as «Upper Kermav» series.

Between the Paleocene and Middle Eocene are a series of reddish brown sandy shales and marls called the «Gercüş Formation».

These transitional beds have a thickness of 200 meters and are of continental and partly lagunal facies.

Lutetian is made up of the limestones called the « Midyat limestones». This series is composed of two parts, one being at the base in the form of hard limestones with concretions, and the other occurs at the top in the form of soft chalky limestones. These soft limestones may probably be upper Eocene. The thickness of «Midyat limestones» is approximately 400 meters, the lower"and upper sections each being 200 meters thick.

So far in SE. Turkey Oligocene has not been identified. In this period although the presence of a stratigraphic hiatus may be probable it is possible to find Oligocene beds within the 700-800 meters thick section found in the Midyat limestones which are seen at various locations such as Kasrık Boğazı and which normally should show a thickness of about 400 meters. Oligocene may be found in some places but it is obvious that it shows discontinuity throughout the entire region.

The Miocene with a slight unconformity rests on the Midyat limestones. The Miocene series composed of gypsiferous marls, sandstones and shales contain thin conglomeratic limestones and show a 500 meters thickness in the Diyarbakır plain and a 750 meter thickness in the vicinity of Cizre.

The Pliocene series which with gentle dips cover the Miocene are more sandy and conglomeratic than the latter.

The Pleistocene pebbles, in the form of horizontal terraces mantle unconformably the lower series which from the Pevonian to the end of Plio-

cene are separated by slight disconformities.

The basalt lavas, 40 meters thick occur in the form of horizontal terraces which cover the Pliocene and are probably found at places above the Pleistocene, these lavas are of Post-Pliocene age.

Tectonics As we have mentioned above, the «Border Foldings» zone which embodies Kaman and Garzan corresponds to a fore-deep geosynclinal area and possesses the characteristics of an epicontinental subsidence basin.

The absence of a pronounced angular unconformity from the Devonian to Pliocene within the deposits in the basin indicates that the region had maintained the border zone characteristics both in the Hercynian and alpine geosynclines. This region, exposed to rather week folding during the orogenic movements of the Hercynian, was mostly under the effect of Alpine movements. This effect was however not very severe.

It appears that the effects of the Alpine movements which caused the main foldings occured in the Oligocene. The pressure became stronger in the Miocene but the horizontal movements completely died down at the end of Pliocene. In the Pleistocene and Quaternary the vertical dislocations occured which gave birth to the basalt lavas at the edges of the basin.

The Alpine foldings in the «Border Folded Zone» are adopted to the general trend of the region and formed a large curved belt which is characterized with long anticlines trending towards SW-NE, E-W, NW-SE in the West, center and the East. The pressure forming these anticlines was in the direction of the Arabian Block and caused the anticlines to take an asymmetrical form. Their northern flanks have gentle dips whereas the southern flanks are much steeper and sometime overturned.

The pressure did not occur with the same intensity along the entire border zone belt. The location where the horizontal movements were the strongest is in the Hakkari area where the belt makes a sharp turn. Towards the West and the Southeast the effects of the pressure decrease.

In the Diyarbakır - Cizre section there are more than 15 closed anticlines some of them having a length of more than 100 kilometers. The closures of the anticlines which possess various apex points are generally over 500 meters. Apart from those seen on the surface the existence of other anticlines under the Pleistocene and Alluvial covers is very likely (fig. 3).

PRODUCING ZONES

The probable payzones in S. E. Turkey can be studied in four important levels. These are Middle - Lower Cretaceous starting from Eocene limestones, Jurassic - Triassic and Upper-Middle Paleozoic series. In various outcroppings throughout these series oil seepages have been observed. It may also be possible to spot an upper payzone within the Miocene which shows an important thickness and extension in the Cizre and Diyarbakır regions. But no indication to prove this possibility has yet been ascertained. As the Upper Eocene limestones possess a complete cover only in these two regions, a probable payzone belonging to this level shows a favourable outlook in limited sections. The Middle-Lower cretaceous payzone presents wide possibilities in S-E Turkey. The

Jurassic-Triassic and the Upper-Middle Paleozoic series further down however are also in the same state.

In the Ramandağ region (Garzan included) as the Eocene limestones are found to be in an exposed state, the possibility of the first petroliferous level is out of question. For this reason in place of the uppermost payzone the Middle Cretaceous becomes subject for prospection in the region. The Turonian limestones covered by a series of shale (1000 meters thick) from the marly formations of the Lower Eocene to the Senonian marls, are found to be the first payzone. In Raman and in Garzan this level has been the producing zone.

In Raman Well No. 14 where the drilling was pushed to a depth of 970 meters from the upper level of the payzone, the micropaleontological studies have not been made yet. Although stratigraphically the level is not definitely known, it is understood from the lithologic tests that the 400 meters thick light grey Turonian limestones, 250 meters thick dark grey and sandy Cenomanian limestonesfinterbedded with shales and the 250 meters thick dolomitic cream coloured limestones of the Lower Cretaceous were drilled and finally 70 meters of black and oolithic shales have been penetrated. According to our estimate these oolithic shales represent the Jurassic formations. (fig. 4).

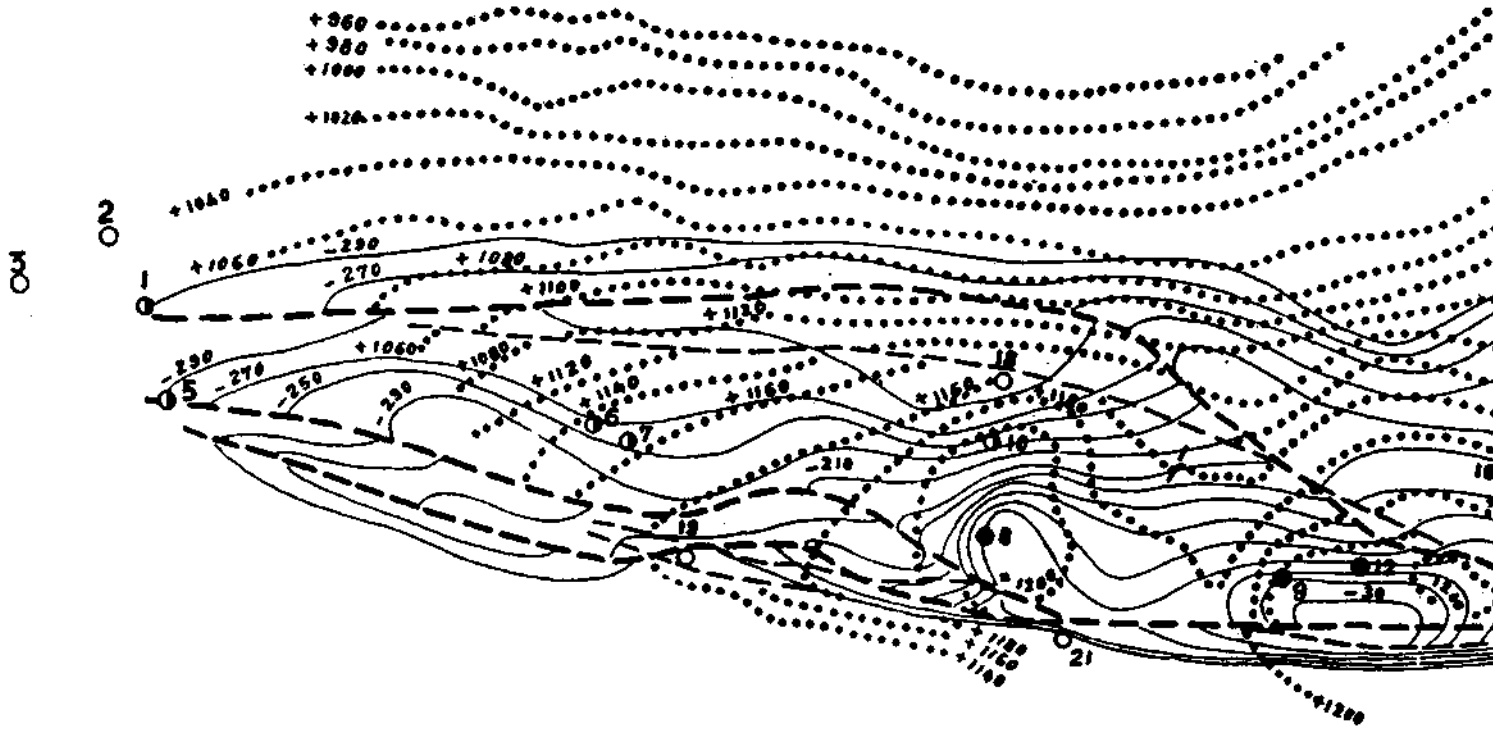
The productive payzone within the Turonian limestone in composed of a 100 meters thick part as from the top of the limestone. About 80 meters below, there is another 12 meters thick petroliferous zone which was drilled at Raman but the production tests of which has not been carried out. From this lower zone towards deeper sections, within the 250 meters thick grey limestone dark asphaltic shows also continue together with slight oil shows and with the 200 meters thick shaly dark grey limestone series these asphaltic shows increase. Within the 250 meters, thick cream coloured dolomitic limestones shows of asphaltic heavy oil has been found in places and in the lower parts within some vacuoles the shows of yellow coloured light oil were seen.

With respect to this situation probable Jurassic payzone has not yet been penetrated. Therefore, in Raman only the Turonian payzone is being known.

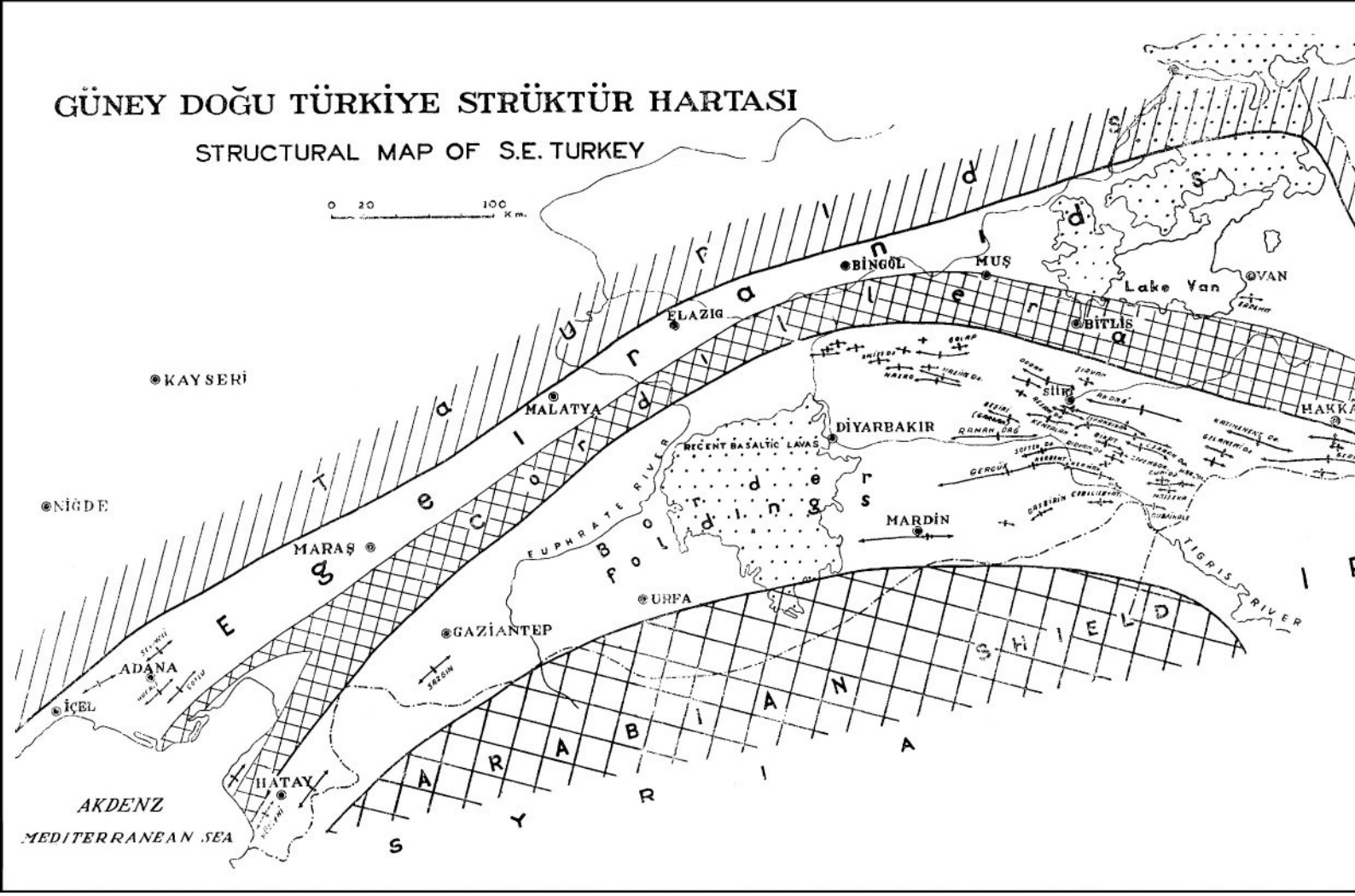
If the asphalted and non producing formations attributed to be Cenomanian and Lower Cretaceous, correspond to Jurassic and Triassic series as estimated by some geologists, then only the Paleozoic horizon remains as an objective for prospection.

RAMAN PETROL SAHASI ST

STRUCTURAL CONTOUR M

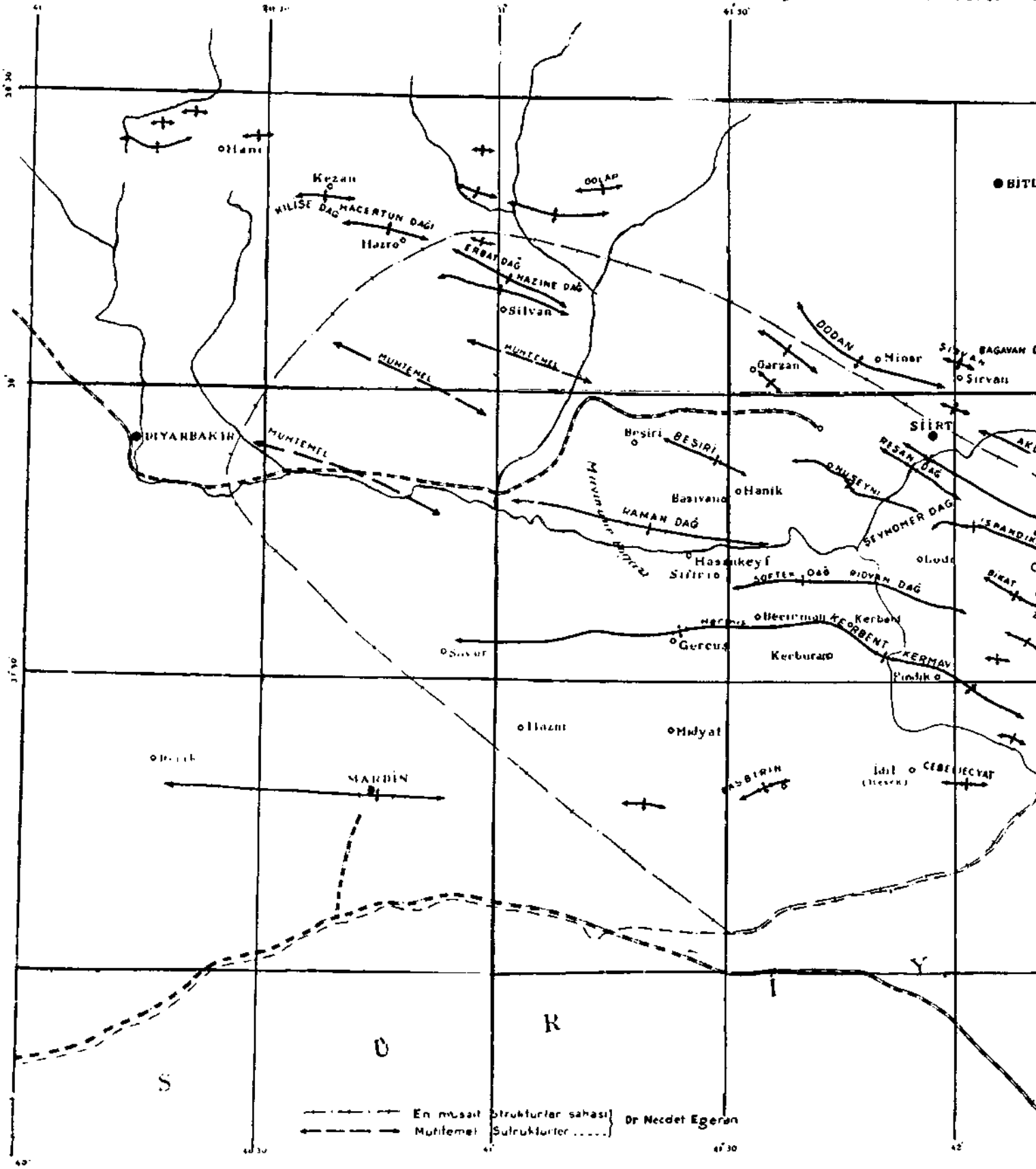


Sürfas Konturu	....	Surface contours (top Lower Midyat)
Yeraltı Konturu	——	Subsurface contours (top Turonian)
İstihsal Kuyuları	●	Producing wells
Sulu Petrol Kuyuları	◐	Oil wells with bottom water
Sulu Kuyular	○	Dry wells


GÜNEY DOĞU TÜRKİYE STRÜKTÜR HARTASI
STRUCTURAL MAP OF S.E. TURKEY
0 20 100 Km.
Taurides
Anatolides
BİNGÖL
MUŞ
ELAZIG
Lake Van
VAN
BİTLİS
KAYSERİ
MALATYA
SİİRT
HAKKARİ
DİYARBAKIR
RECENT BASALTIC LAVAS
NİĞDE
MARAŞ
Erzincan Basin
MARDİN
EUPHRATE RIVER
Bolkar Dağları
URFA
TIGRIS RIVER
GAZİANTEP
ADANA
İÇEL
HATAY
ARABIAN SHIELD
SYRIA
AKDENZ
MEDITERRANEAN SEA

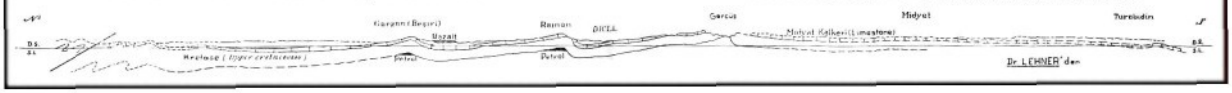
GÜNEY DOĞU TÜRKİYE

STRUCTURAL MAP



RAMAN VE GARZAN ATRÜKTÜRLERINDEN GEÇEN REGIONAL KESIT

REGIONAL SECTION THROUGH RAMAN-GARZAN STRUCTURES



RAMAN Nº 14 KUYUSU

RAMAN WELL Nº 14

M. TAŞMAN'dan
(Tadilen)