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WESTERN RICERCHE GEOFISICHE S.p.A.

for

AMBASSADOR ITALIANA PETROLI S.p.A.

Reflection seismic survey in the permit

" T E L L A R O "

November 26th - December 21st 1964

FINAL REPORT

Party F-5, base: Modica

Pescara, January 4th 1965

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Enclosures

I SUMMARY

The purpose of this brief reflection survey conducted by our Party F-5 on the "TELLARO" permit in the Ragusa area of Sicily was to establish whether or not a closed structure existed within the limits of the permit.

The local stratigraphic conditions were generally known in this area. Our aim was to determine if there was closure against a known fault which was parallel to and traversed within the northwest margin of the permit running in a northeasterly direction.

Three seismic lines were surveyed, one line paralleling the major fault cited above on its southeast and the other two lines were shot normal to this first line in such a position as to approximately tri-sect the former. The survey was confined for the most part to that portion of the permit lying southeast of the major fault with the depth objective being the "Taormina" formation, a Dolomite limestone of the Triassic period.

The field operations commenced on Nov. 30, 1964 and were completed on Dec. 17, 1964. In the first few days of the survey we conducted various experimental tests involving field techniques.

The crew headquarters was established in the city of Modica near the southern limits of the permit.

II CONCLUSIONS

Three horizons (A, B & C), were mapped which offered from very poor to fair continuity. None of these horizons

show any definite possibility of the hoped for closure. All are more or less conformable, generally depicting a gentle dipping monocline to the north and east. This is particularly true of the "C" horizon which dips from 1950 to 2150 meters south to north. This horizon is believed to be the top or near top of the "Streppenosa" formation which lies atop the "Taormina". In any case the question of whether this be one or the other formation is accademic since in this limited zone there is no pronounced angular disconformity between the two horizons. What is shown, at all levels, is very gentle northeast dip with some occasional vagabond dips of greater magnitude which are attributable to diffractions or reflected refractions.

An intermediate horizon (B) was mapped about 1300 meters below sea level. An Isopach was prepared between horizons "B" and "C" which indicates the axis of minimum thickness between these two horizons to be tending in an east-west direction.

The shallow map (A) depicts the horizon varying in depth from 560-830 meters below sea level.

The position of the major fault shown on all three contour maps is believed to be very reliable. The cross lines TL-D and TL-E were not extended far enough to the west to enable us to definitely determine the amount and direction of the fault "throw".

III M A P S

Horizon A (encl. 3). The reflection used in mapping this horizon was sometimes good and at other times very poor

or nonexistant. On part of line TL-D a "phantom horizon" was drawn at this mapping depth.

Horizon B (encl. 4). Also this horizon follows a rather consistent reflecting horizon which would indicate a marked variation in the elasticity of the geological section at this depth. There is shown some possibility of fault closure of from 15 to 30 meters depth on the "B" horizon which is due to a slight flexure on the TL-F line, the reliability of which is questionable. Also at this mapping level a "phantom horizon" was used on a portion of the TL-D line.

Horizon C (encl. 5 & 7). This horizon is presented in both time and depth sections and represents a reflection that was evident for the most part on all the seismic lines. Where continuity of this reflection was lacking correlation methods were utilized. The depth contours were obtained by displacing in three dimensions the values shown on the time map. (Encl.7).

Isopach between "B" & "C" (encl. 6). This map was prepared by taking directily, shot point for shot point, the difference in depth between horizons "B" & "C". Since the variation in relative thicknesses between these respective horizons had a maximum range of 150 meters this map is the same as would be a map prepared by first taking the difference in time between the two horizons and then converting to depth using a constant velocity.

IV RECORDS

The record quality was generally fair. We were able to follow one particular horizon throughout the entire survey. The possibility of modifying field techniques were severely

limited by local topographic conditions and economic considerations. Extended geophone and shot hole patterns were restricted because of the marked and frequent elevation changes prevailing locally. Fortunately, field tests which were made on the first day of operations revealed that no serious ground roll disturbance was present. There was scarse evidence of some disturbance whose wavelength was less than 30 meters. It was seen that by using 12 geophones per group placed parallel to the profile line and extending for 35 meters we could effectively cancel most ground disturbance. On some records there is present some "noise" due to falling rocks caused by the shot explosion. The main problem was to introduce sufficient energy into the ground to overcome the low coefficient of reflected energy of the reflecting horizons in this area. To best accomplish this aim patterns composed of 16 shot holes were drilled and loaded with 5 kilograms of dynamite per shot hole.

V CROSS SECTIONS

For each line we have prepared a Variable Area record section and a conventional depth section where the individual reflections from each profile are "picked" and plotted to scale with their appropriate horizontal displacement.

Two variable area sections were prepared on the TL-D line. The first was made without any overlap of the amplified signal, the second with 30% overlap in two directions from trace 1 thru 12 and 13 to 24. The filter used had a low and high passband of 37 and 58 cycles at its 50% points. Lines TL-E and TL-F were prepared using a low percentage

overlap (50% in one direction from traces 1 to 6, from 12 to 7, 13 to 18 and 24 to 19).

A 30-55 cycle filter was used on the TL-E section and a 27-48 cycle filter was utilized on the TL-F line. On all sections a slow automatic volume control position was used.

The horizon traced on these Variable Area sections does not represent an interpretation of the section itself but rather is an interpretation made from the individual field records.

The depth sections were made on a 1:10,000 horizontal and vertical scale. The cross sections are plotted in terms of reflections times converted to depths corrected for weathering and reduced to a reference plane 400 meters above sea level as per Western's velocity system.

$$V_{AVG} = 2438 \frac{1 + 1 .286\ D\ .\ 10^{-3}}{1 + .682\ D\ .\ 10^{-3}}$$ where D = depth.

VI COMPUTATION

The computation were simplified by the fact that there was little or no weathering layer to contend with on this permit.

The reference plane was 400 m above s.l.

Correction velocity: 2500 m/s.

VII OPERATIONS

Surveying. The topographic survey was performed with a SALMOIRAGHI transit where elevations were "shot" at every

group stake and shot point. The vertical control closed within one meter and the horizontal traverse within 25 meters. Maps of the Istituto Geografico Militare served as the topographic base control.

Drilling. The entire area of the survey is characterized by a limestone outcrop covered with a few inches of topsoil. The near surface compacted layer of limestone varyed from one half to one meter thickness followed by a layer of porous limestone. We had hoped to utilize portable air tipe drill units (PIONJAR) to facilitate the access to the field locations and to keep damage claims to a minimum. At the outset of this survey the area was subjected to such unseasonally heavy rains that the porous limestone became so infiltrated with water that we were compelled to abandon all attempts at air drilling. We resorted to using two Western standard truck mounted Model 1200 rotary drilling units which enabled us to maintain a satisfactory drilling rate but at the same time caused damages to soar in a manner that had not been earlier anticipated. This was due to two primary reasons; first, each shot hole pattern covered a surface area of 1000 square meters which were usually located on damp cultivated ground on which the drills and water trucks needed to traverse. Secondly, this area is divided into very small plots of ground, and each plot is enclosed with stone fences. It was too frequently necessary to dismantle these fences to allow the passage of the drilling equipment and we necessarily had to compensate the owners for the labor involved in tearing down and then re-erecting these stone fences.

Water for the drilling operations was in very short supply and usually very distant from the area of operations.

However two cubic meters of water, mixed with a little bentonite usually sufficed for 16 shot holes drilled to 3.40 meters depth each.

Recording. A Western 24 trace FA-35 AM magnetic tape unit was employed to record the 420-420 meter spreads. Geophone arrays of either 12 or 24 geophones, extended parallel to the seismic line, were utilized. No overlap existed between geophone arrays.

The shot hole pattern consisted of two parallel lines, each having 8 shot points spaced at 7 meter intervals, 20 meters apart. Five kilos of dynamite were loaded and shot in each shot hole, or 80 kilos per shot pattern.

The magnetic tape and monitor record were recorded in a broad band filter whose low and high band-passes were 11 and 85 cycles at the 50% points.

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A. Bucarelli

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STATISTICS

DRILLING	
Drilling days (8 hours)(1)	48.5
Holes drilled	496
Meters drilled	1604
Holes per day	10.2
Meters per day	33.07
Average holes depth, m	3.23
RECORDING	
Recording days (8 hours)(1)	18.9
Profiles recorded	31
Km covered	12.600
Explosive used, kg	2153
Caps used	481
Magn. tapes used	33
Profiles per day	1.6
Km per day	0.667
Kg of expl. per profile	69.5
Caps per profile	15.5
Kg of expl. per km	170.9
Magn. tapes per profile	1.06

(1) - Travel time from Pescara and Vittoria (2nd drill) to Modica, and back, is not included.

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