SEISMIC REFRACTION STUDY TODELINEATING THE AL AZIZI-YAH FAULT, CENTRAL GEFARA PLEAN, NORTH - WESTERN LIBYA, USING THE MEAN-MINUS-T, AND ABCMETHODS.

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Abstract:

The study included an application of mean-minus-T and ABC methods for a profile of seismic refraction survey with length of about 2000 meters to delineating Al Aziziyah fault,north-western Libya. The thickness and velocity variations of subsurface layers were measured - from these measuremerts – there are two systems of faults, primary and secondary founds in sj reads (4-5 and 16-17) and (7-8 and 8-9) respectively.

Introduction:

The study area is located in the north-west of Libya, on the smoothly climbing great Gefara Plain which extends from the coast of Tripolitania to the JabalNafusa Mountains at about 80 Km. South of the Mediterranean Sea. The Al Aziziyah fault [1] Figure (1), crosses the Gefara Plain for a distance of about 100 Km. extending from Al Aziziyah area to the Tunisian border.It was probably affected by the movement that started late cretaceous early Tertiary, The faults are often normal mainly belongs to the two categories; a northwest-southeast and east-west trending fault, the Al-Aziziyah fault is belongs to the second category.

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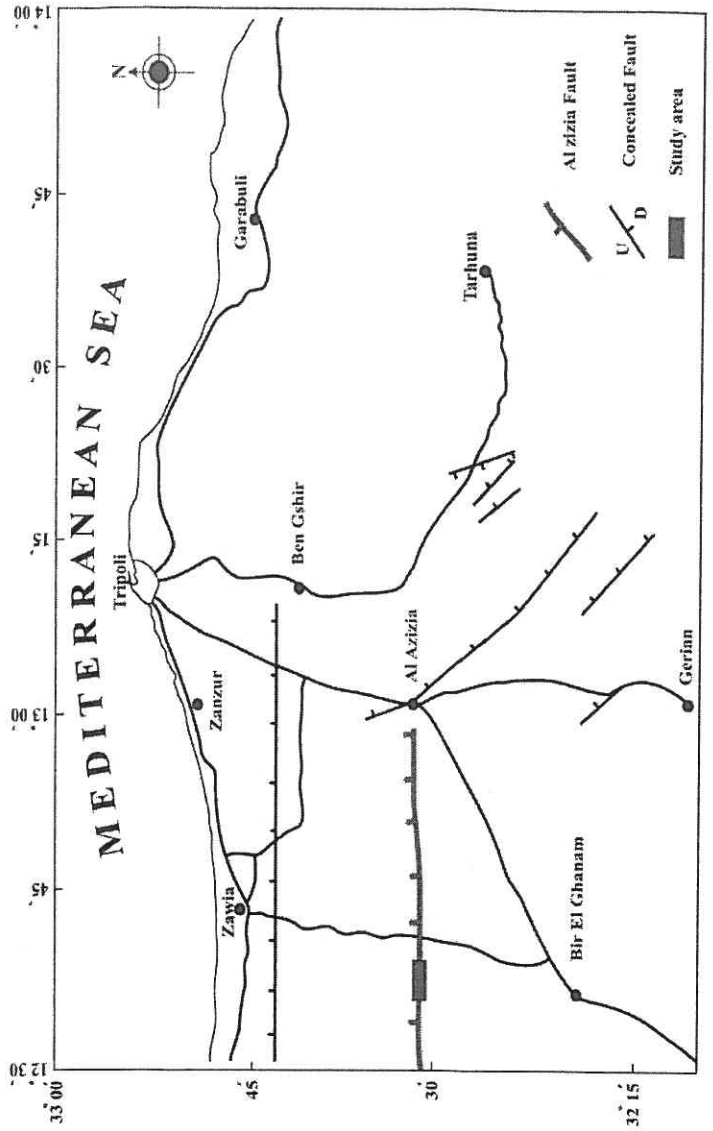

Fig (1) Location of the study area (modified after Belaid, 1980)

The structure map of Trabulus sheet [4] shows other fault extending from Bin Gashirarea to the Tunisian border; It is located about 10 Km. from the shore line of the country.

About 2000 meters of continuous seismic refraction profile measuring technique with reverse recording and short distance between shot point and seismometers are employed in this study, using a mean-minus-T [2] and ABC [5] methods. The shot points and the seismometers are in the same line Figure (2). The aim of the study is to delineating Al-Aziziyah fault in the area, by application of Mean-Minus-T and ABC methods for determining the velocity variations and thickness of weathering and sub weathering layers which have different geological formations.

Methodology:

The 12-channel seismograph – TERRALOCMark III seismic refraction instrument with – high energy – non explosive source called KANGAROO SR-2 –is used in this survey. Figure (2) shows a standard field setup for 12-channel seismograph which are used in this study, the seismometer and shot-point spacing intervals are 10 and 50 meters respectively. The seismograph record is placed at the end of spread (1) offset theprofile, one geophone cable was used; for connection of geophones (1-12). Shot points A1, A2, A3, A4, A5, A6, and A7, were fired to cover spread (l), for spread (2), the seismometers and their cables were moved to the position started from the last two geophones (11,12) in spread (1), fired were repeated from shot points A3, A4, A5 , A6, A7, and two reverse shots A8, and A9 are added. To provide a definite time relationships between the

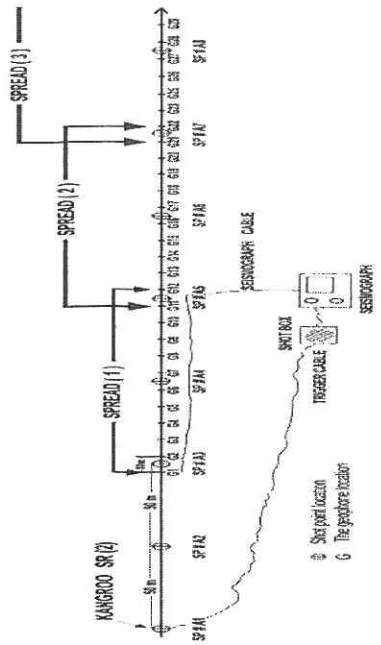

FIGURE (2) CONTINUOUS PROFILING FIELD ARRANGEMENT

two spreads, seismometers 1 and 2 in the second spread must be at the same location as seismometers 11 and 12 in the first spread. The recorded of first arrival times (velocity curves) are joined to each other by means of the over lapping seismometers at the changing position of the spreads. The recording procedures were repeated for other shot points locations to continuous shooting the profile of about 2000 meters, which divided into several spreads.

Geology of the Study Area:

Some small isolated hills rise with elevations up to 135 m. in the central part of the Jefara plain. These hills consist mainly of silty sandstones and carbonaceous rocks which belong to the Triassic system. The Al-Aziziyah formation is widely distributed through the eastern part of the investigated area, it consists mainly of bedded dolomatic limestone characterized by its dark color, intercalated by clays, and chert bands are common occurrences.

Interpretation and Results:

The Mean-Minus - T method was used for detailed determinations of subsurface velocities. The method is an application of the up-dip concept [3]

for refractor velocity evaluations; it is fallowed by the ABC method for determining the sub surface depths. The time-distance curve is plotted along the profile where every two spreads are plotted together Figure (3). Seismic velocities are determined to sub surface layers Figure (4) and the results of velocity measurements are summarized in table (1). The ABC method is used to determine the depth using the velocities which are determined from The Mean-Minus-T Method.

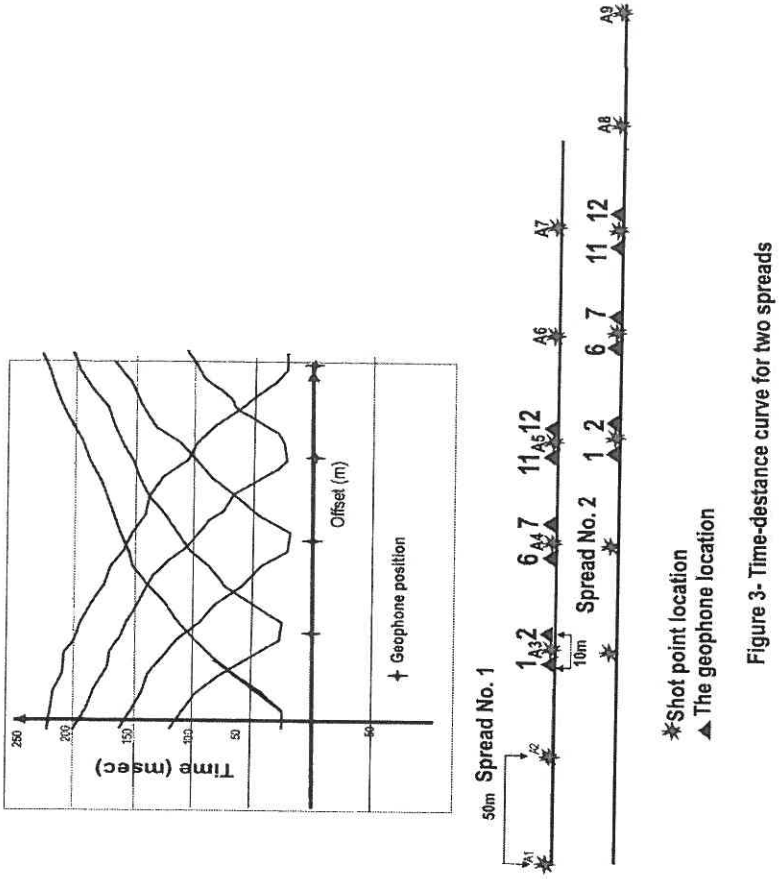

Figure 3- Time-destance curve for two spreads

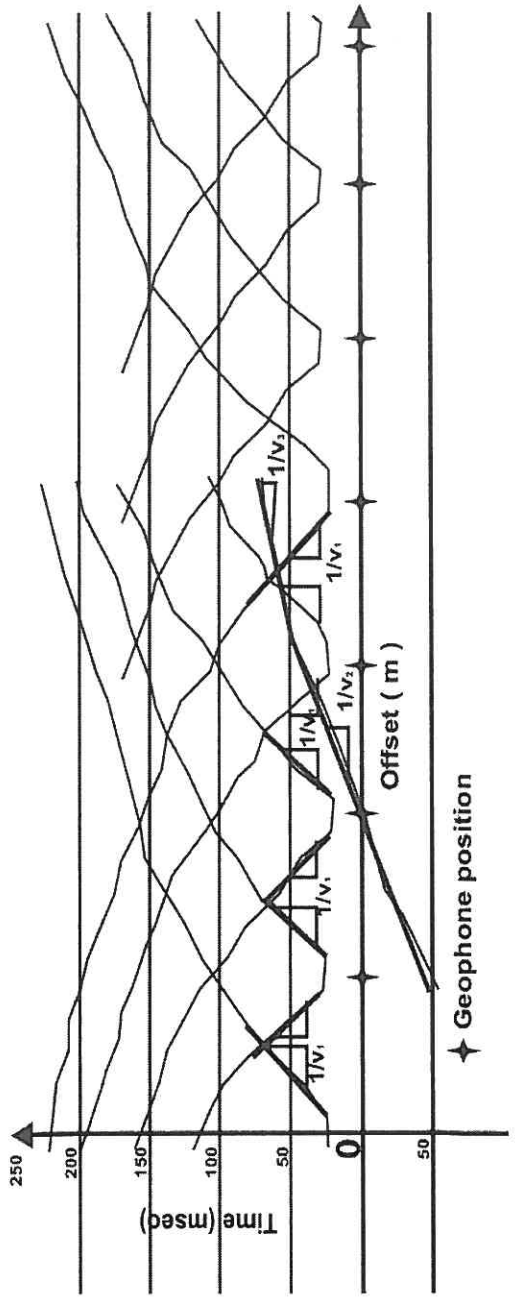

Figure 4 - Velocities of sub surface layers, using mean-minus-T method

Table 1- Velocities determination by mean-minus-T method

Spread No.	V1 (m/sec)	V2 (m/sec)	V3 (m/sec)
3-4	489.9	1562.5	1708
4-5	459.58	1168	2087
5-6	477	1271	2250
6-7	518	1159	1872
7-8	457	1290	1726
8-9	377.82	1168	1670
9-10	367.75	1164	1655
10-11	409.08	1164	1591
11-12	400.64	1168	1888
12-13	419.58	1168	2022
13-14	392.3	1099	2087
14-15	385.89	1235	1964
15-16	419.58	1191	1822
17-18	519.57	1299	2151

The sub surface layers thickness are summarized in table (2). After determining the variations of velocity and thickness of sub surface layers, the geological cross-section is plotted to delineate the positions of faults figure (5). The section also is noted that very small dip variations-can cause very pronounced irregularities in the time-distance curve as a result of normal fault.

Table (3) shows the domain of velocities and thickness of sub surface layers and geological formations of these layers.

Table 2- The thickness of sub surface layers

Spread No.	H1 (m)	H2 (m)
3-4	23	3.94
4-5	28.4	11.75
5-6	29.9	16.2
6-7	30.4	8.43
7-8	26	9
8-9	23.59	10.45
9-10	23.7	13
10-11	26.8	12.9
11-12	25.9	13.5
12-13	26.89	12.9
13-14	25.86	10.65
14-15	24.45	14.67
15-16	25.97	11.18
17-18	30.68	13.43

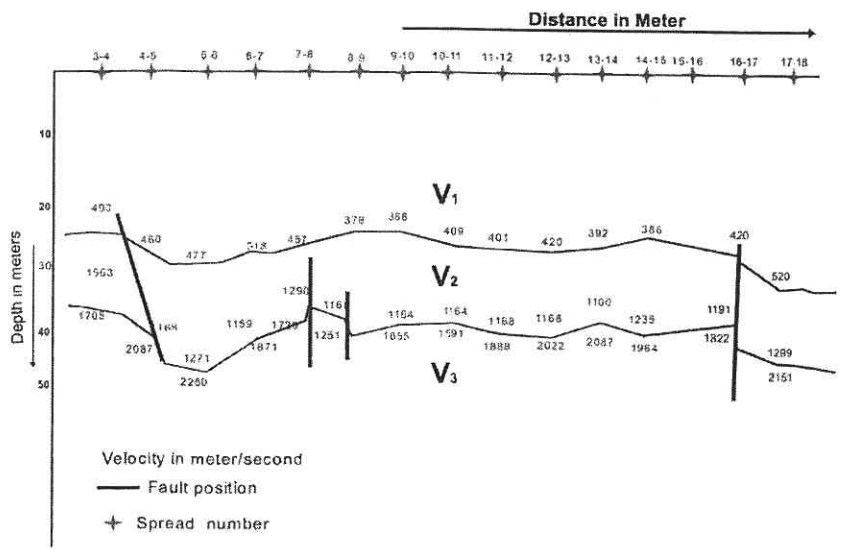

Figure 5 - Variations of depth and velocities of subsurface layers
Table 3-The geological formation of the sub surface layers

layer	Velocity (m/sec)	Thickness (m)	Geological formation
1	368-520	23-31	Weathered soil layer, composed of sand, silt, gravel
2	1099-1563	4-16.2	Sand, silt, sandstone, gravel
3	1591-2250	-	Sandstone with weathered limestone

Conclusion:

The variations in velocity and thickness are measured for sub surface layers; according to these variations the probable delineation of Al-Aziziyah fault in the area under study is well defined.

Acknowledgment:

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Reference:

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