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Re-processing of 2D seismic data from Razzak oil field, Western Desert, Egypt

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Abstract

The Razzak oil field is located, together with several other oil fields, along the Qattara - AlameinRidge in the north Western Desert of Egypt. This ridge comprises the main hydrocarbon producers in the Alamein Basin, with several closed structures, which are in a favorable geological setting with respect to hydrocarbon prospectively.The Alamein basin is the main source area for the Alamein, Razzak, Yidma, Burg El Arab and North Alamein fields. Production from these fields is from multi stacked Cretaceous reservoirs comprising Alam El Bueib sandstones, Dahab sandstone′s, Alamein dolomite, Bahariya sandstones and Abu Roash "G" Dolomite. Razzak field was discovered in March, 1972 it is producing from four different horizons, Abu Roash "G" (AR/G), Bahariya, Aptian Dolomite, and Alam EL Bueib BA-1 marker (EGPC,1992). In this paper re-processing technique applied on one 2D seismic line to obtain an improvement on the final stack seismic section. Then perform a comparison between the stack section obtained from re-processing technique and the old stack section to shown the enhancement. The seismic line used in this paper is Razaak 18- 87 in SEG Y format. Vista software is used to accomplish seismic data processing by applying different processing flows on Razzak 18.

1. Introduction

Razzak oil Field is one of the most important oil fields in Egypt, produces mainly from the Upper Jurassic and the Aptian (lower Cretaceous) formations. The Razaak oil field is located in the blocks 349,350 and 351, The Razzak field located in the northeastern part of the Western Desert, between latitude 30° 23′ 59.9923″ N and 30° 36′ 0.0062″ N and longitude 28° 23′ 59.9906″ E and 28° 36′ 0.0116″ E, north of the Qattara depression, about 55 km south of the Mediterranean coast, and about 150 km south of Alexandria city. The Razzak field is located in the early cretaceous Alamein basin which occupied the northern part of the western desert of Egypt, as show in figure (1) (EGPC, 1992).The Razzak field lies on a northeast plunging anticline in a large faulted structural noseamong one of three conspicuous mapped anticlinal features within Razzak area. These three anticlinal noses are aligned with the Alamein-Yidma trend on the Cenomanian and Aptian seismic horizons, having the same trend of the Syrian Arc system which continued during the Eocene time (Said, 1962, and Norton, 1967). The first anticlinal nose lies at the extreme southwestern part of the Razzak area, with two producing wells (RZK-4 and RZK-12) drilled on its crest in West Razzak.

The second anticlinal nose trends northeast and lies on the extreme northeast part of the study area in East Razzak. The third anticlinal nose is the most important structural feature for hydrocarbon trapping and oil production in the Razzak area. Ten wells were drilled on both its crest and flanks. This trap acquires the form of a northeastern plunging anticlinal nose lying on the central part of the Razzak area. This nose is dissected into several blocks by two sets of intersecting normal faults. These two sets of faults are trending northwest-southeast and northeast-southwest following what are known as Erythrean and Aualitic trends. Most of the northeast-southwest faults are parallel to the plunging axis of the anticlinal nose.

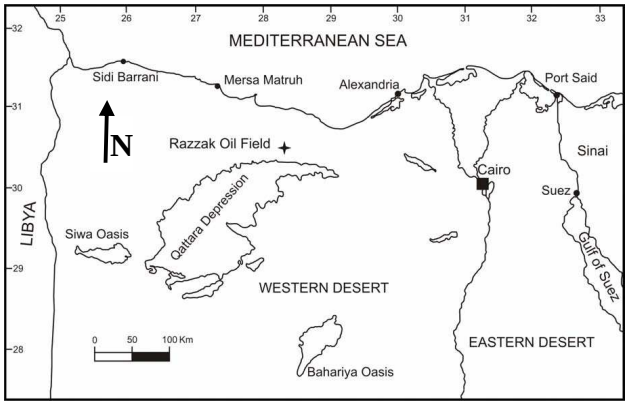

Fig (1). *The location of Razzak oil field, Western Desert, Egypt.*

The three structural culminations are West Razzak, Razzak Main and East Razzak. Show in figure (2), these culminations are on the downthrown side of a major northeast-southwest trending fault which has both reverse and normal thrown along its length.

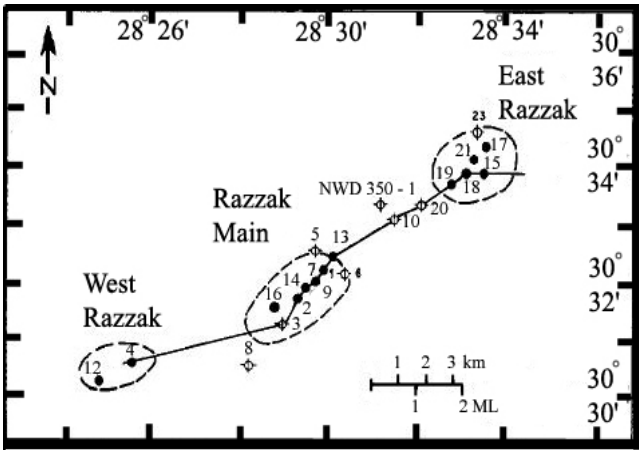

Fig (2). *Razzak field complex main fields. (Abdine et. al. 1993., Shaheen EL Sayed, 1988)*

The stratigraphic succession penetrated in the Razzak field as view in figure (3), ranges from Miocene to Early Jurassic in age and has a total thickness of more than 13,000 ft it about (3963 meter).

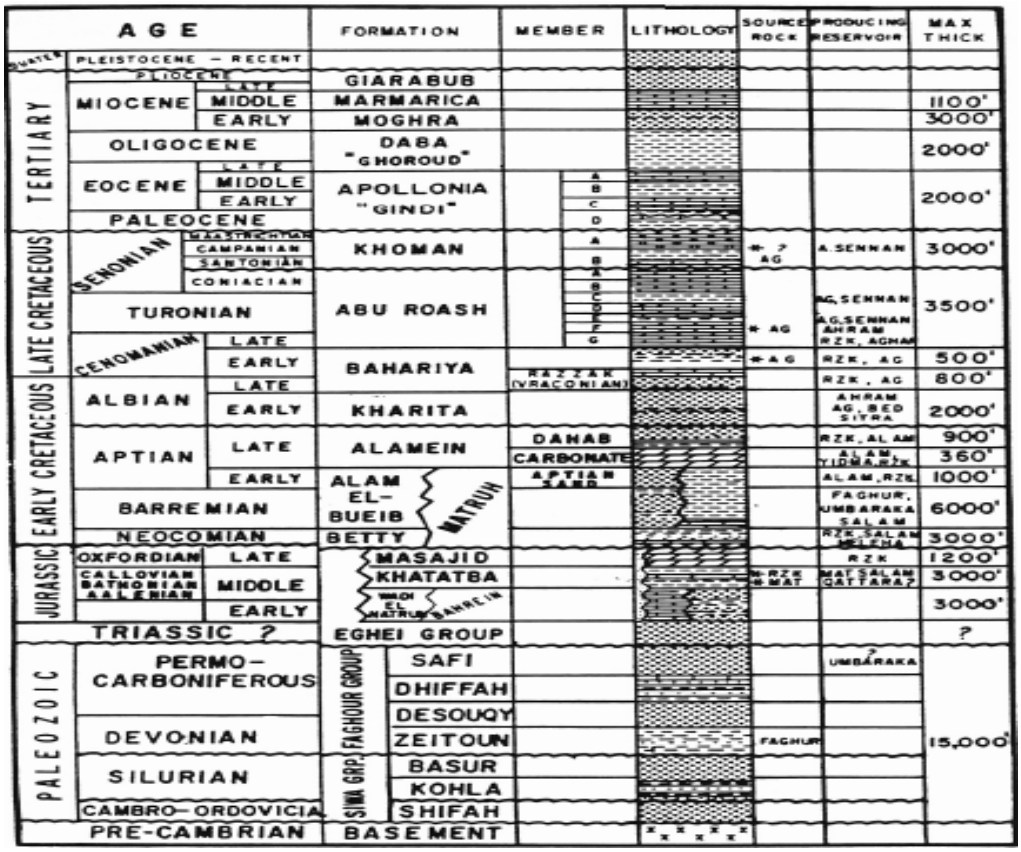

Fig (3). *Stratigraphic section penetrating in Razzak field. (EGPC, 1992)*

2. Methodology

VISTA 2D/3D software is used to accomplish seismic data processing, by applying the processing flows on seismic line. Frist uploaded the seismic line Raw data(Field Record in SEG Y Format) to the software and checked the elements and headers of this line to begin applied the steps of processing on it. Displayed screen shot of the seismic line before and after applied each flow on it. Viewed the stack seismic sections obtained from re-processing technique. Finally, perform a comparison between the old stack seismic section and the stack section obtained from re-processing technique.

2.1. Gain Test

First Flow

This flow consist of six steps input, Kill trace, Mute trace, Scale, Exponential gain, and output, respectively the flow window; figure (4).

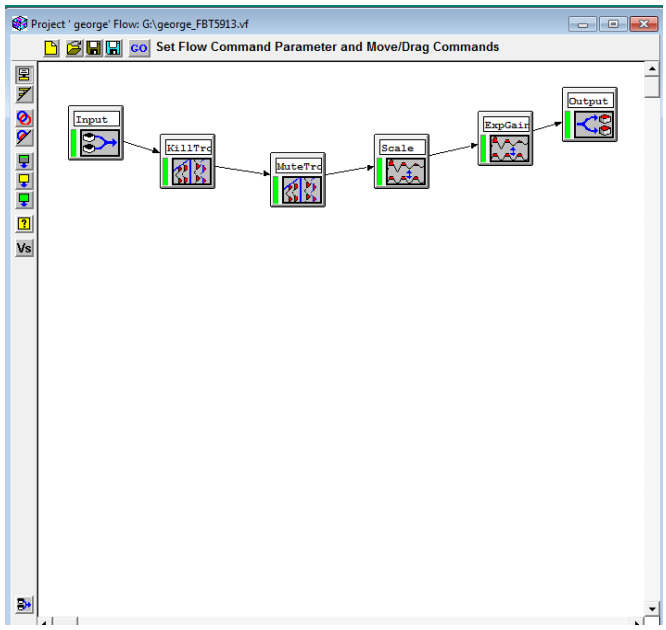

Fig (4). *The seismic flow window which applies on data.*

Input data is Razzak –087- 018 in standard domain (time domain) the time range from 0.00 to 5000.00 ms, sample rate 4.00 ms and the total trace is about 98826. The data ordered by Field Station Number show in figure (5). Kill traces are applied by uploading the file of Kill trace made in vista software. In Mute traces step we uploading file of Mute trace made on vista software.Then applied top mute header and bottom mute header without applied surgical mutes. Mean scale is picked to be applying on this data without applied signal bandpass filter. The exponential gain is applied on seismic data by using constant equals "1". The output result obtained; figure (6).

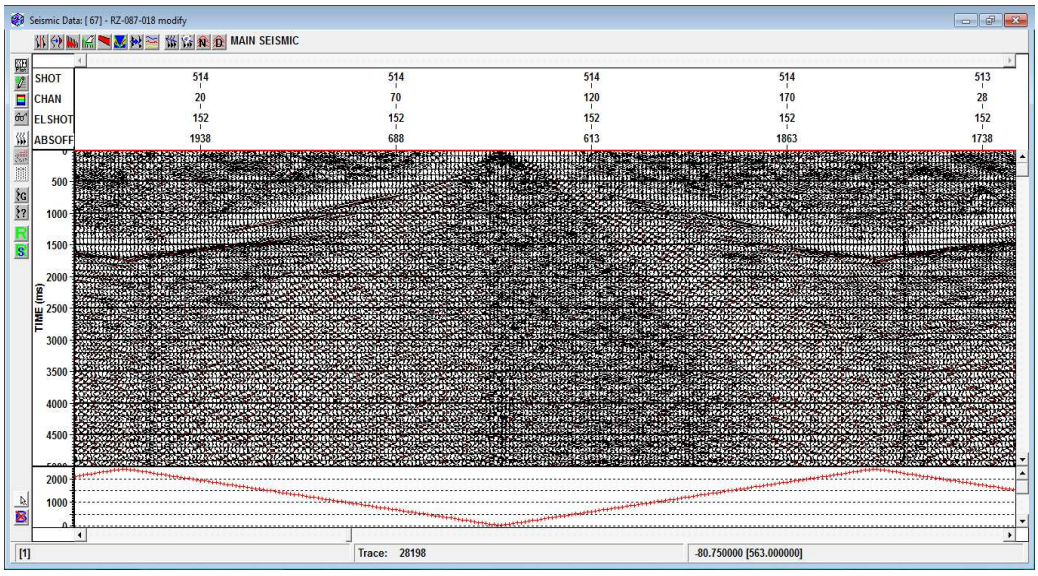

Fig (5). *The shot record of Razzak field line 18.*

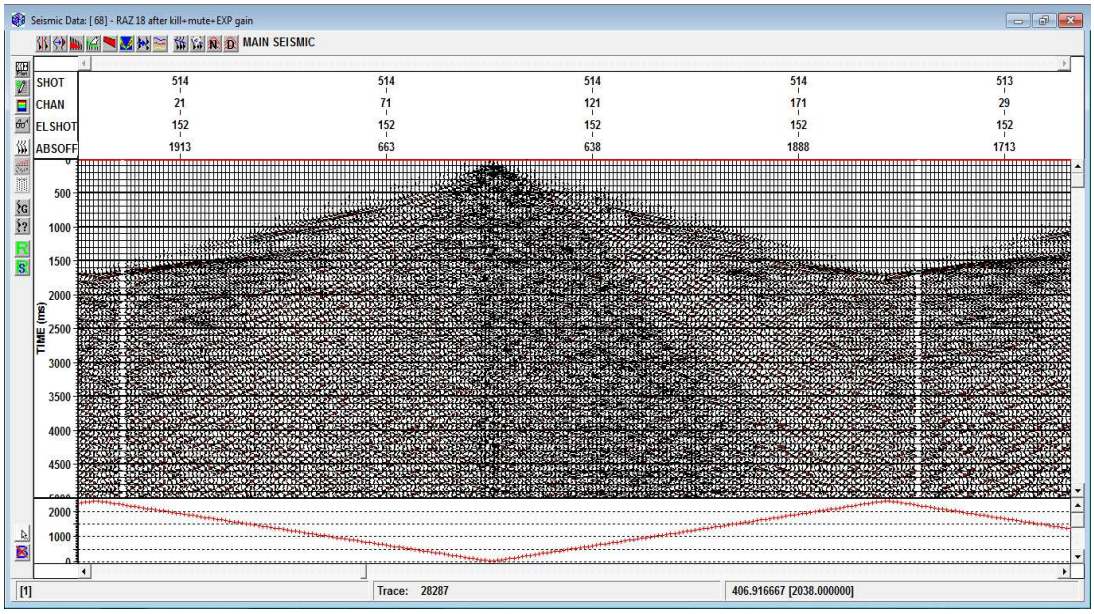

Fig (6). *Shot record of Razzak field line 18 after apply the processing flow.*

2.2. F/K Filter Test

Second Flow

This flow consist of nine steps, these steps are input, kill trace, mute trace, scale, exponential gain, deconvolution ,statics shift, FK filter and output respectively, the flow window; (7). Input data is Razzak –087- 018 in standard domain (time domain) the time range from 0.00 to 5000.00 ms, sample rate 4.00 ms and the total trace is about 98826. The data ordered by Field Station Number showed in figure (5). Kill traces are applied by uploading the same file of Kill trace used before. In Mute traces step we uploaded the same file of Mute trace used before.Then applied top mute header and bottom mute header without applied surgical mutes. Mean scale is picked to be applied on this data without applied signal bandpass filter. The exponential gain is applied on seismic data by using constant equals "1". The predictive deconvoltion is applied on the data as deconvolution type with operator length equals 120 ms and prediction lag about 36 ms without applied operator taper. The static shift is done by aiding of the header static by choosing the elevation of receivers from the header on seismic line. Uploaded FK file which made on Vista software. The FK attributes parameters used are power amplitude equals "1", smoother traces equals "7" and smoother frequency equals "5" without applied restorable AGC. The output result obtained; figure (8).

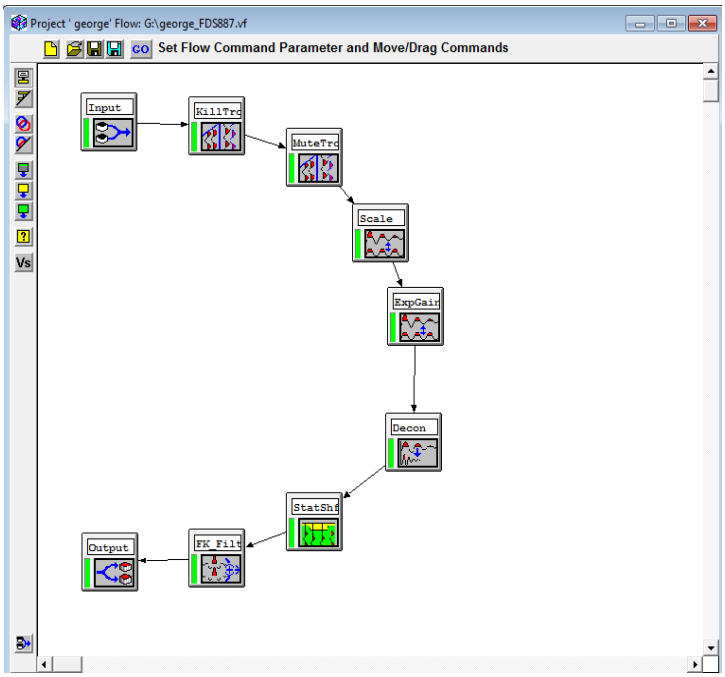

Fig (7). *The seismic flow window which applies on data.*

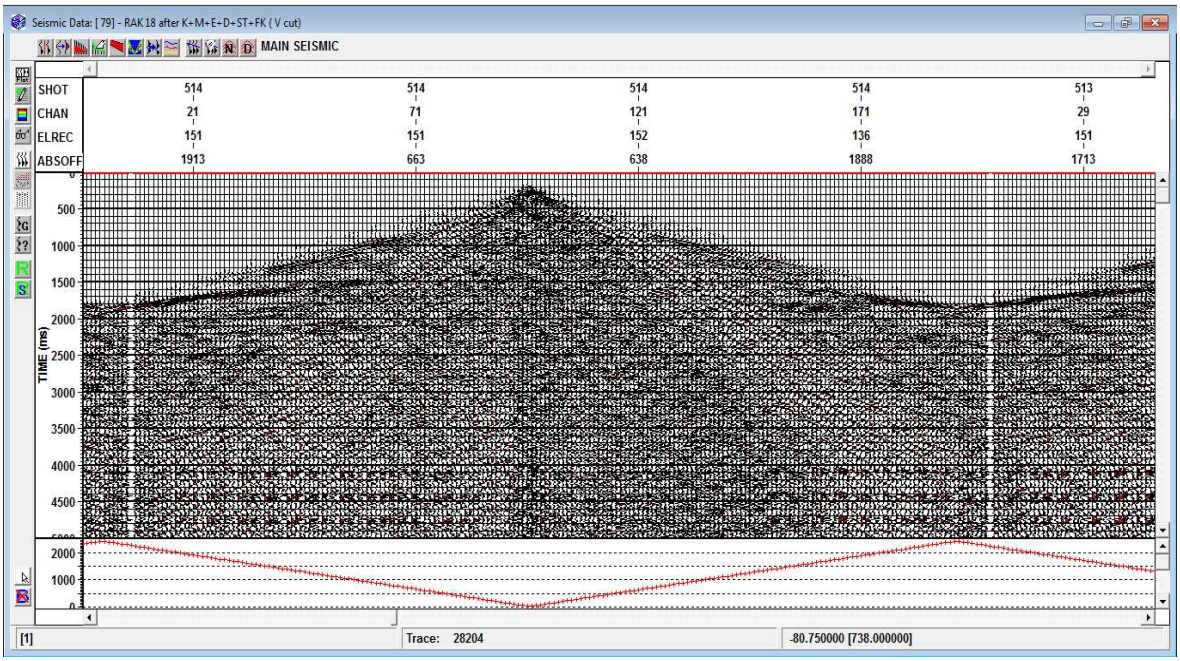

Fig (8). *Shot record of Razzak field line 18 after apply the processing flow.*

2.3. Common Mid-Point (CMP) Stacking

Third Flow

This flow designed to produce the stack seismic section, this flow consist of twelve steps. Start with input and end with output. The sequence of this flow is order that Input, kill trace, mute trace, scale, exponential gain, deconvolution, static shift, FK filter, deconvolution, NMO correction, CMP stack, and output. The flow window shows in figure (9). In this flow the data order by CMP number. Steps from Kill trace to deconvolution, applied on data with the same parameters which used before in pervious flows. In NMO step uploaded velocity file, the file contains the value of time and interval velocity for each CMP number. The velocity file made on vista software. In the CMP stack step choose "stack optian 1/ (N+X)" from stack optain, with "X" equals "1". The stack seismic section obtained show in figure (10).

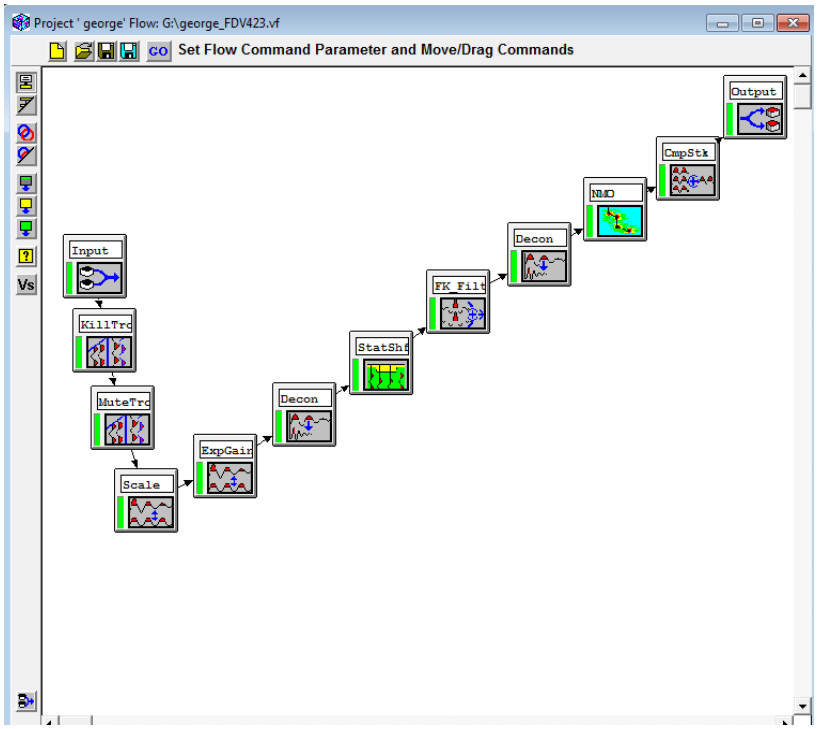

Fig (9). *The seismic flow window which applies on data.*

2.4. Filtering, Scaling, and CMP Stacking

Forth Flow

The flow is used to produce stack section. The forth flow consists of fifteen steps. These steps are Input, kill trace, mute trace, scale, spherical divergence, exponential gain, deconvolution, static shift, FK filter, deconvolution, ormsby filter, AGC, NMO correction, CMP stack, and output respectively, the flow window display in figure (11). In this flow the data order by CMP number. Steps which used in the previous flow applied again on data in the Forth flow with the same parameters. Also in this flow added new steps such as spherical divergence, ormsby filter, and AGC to apply on the data. In spherical divergence step enter two values, one for time and the other for RMSvelocity. By entering the time equals zero ms as a constant value and change the value of velocity.One time equals 500 m/s, other equals 1000 m/s and the last value equals 1500 m/s. In ormsby filter the software required four values of frequency, low truncation frequency, low cut frequency, high cut frequency, and high truncation frequency, respectively. Those values enter to software by handing, its equals 3, 5, 44, and 54 sequences. Choose also the option of restore mutes after filtering. In AGC step, choses the length of AGC window equals 500 ms, and normal equalization L1 without applied signal bandpass filter. The stack seismic section obtained show in figure (12).

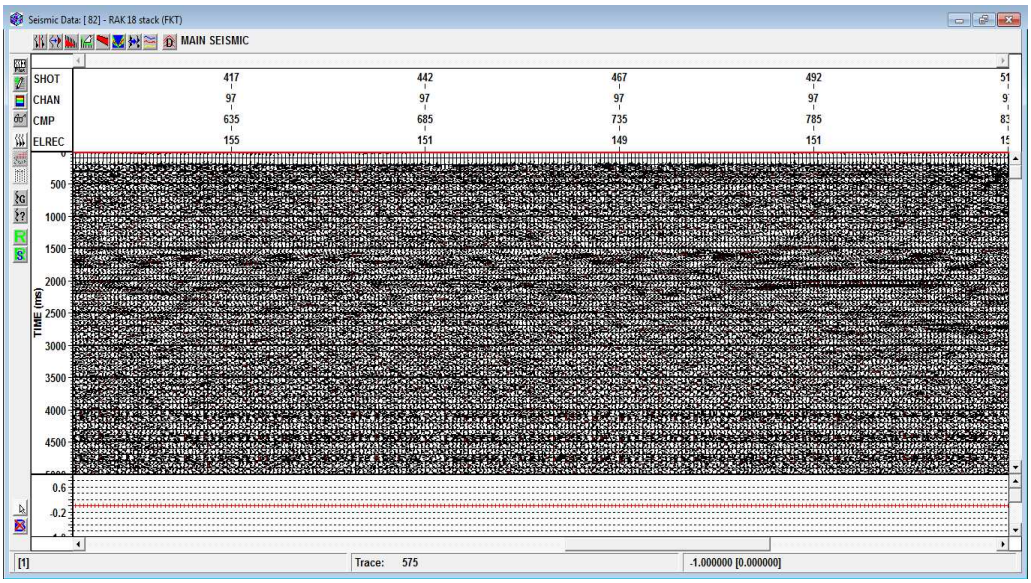

Fig (10). *The stack seismic section obtained from this flow.*

The old stack seismic section of Razzak 18 showed in figure (13).

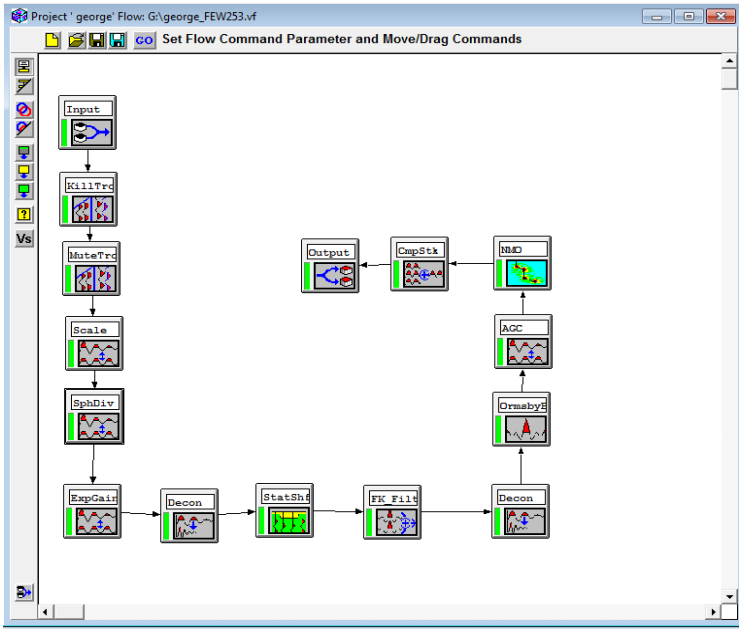

Fig (11). *The seismic flow window which applies on data.*

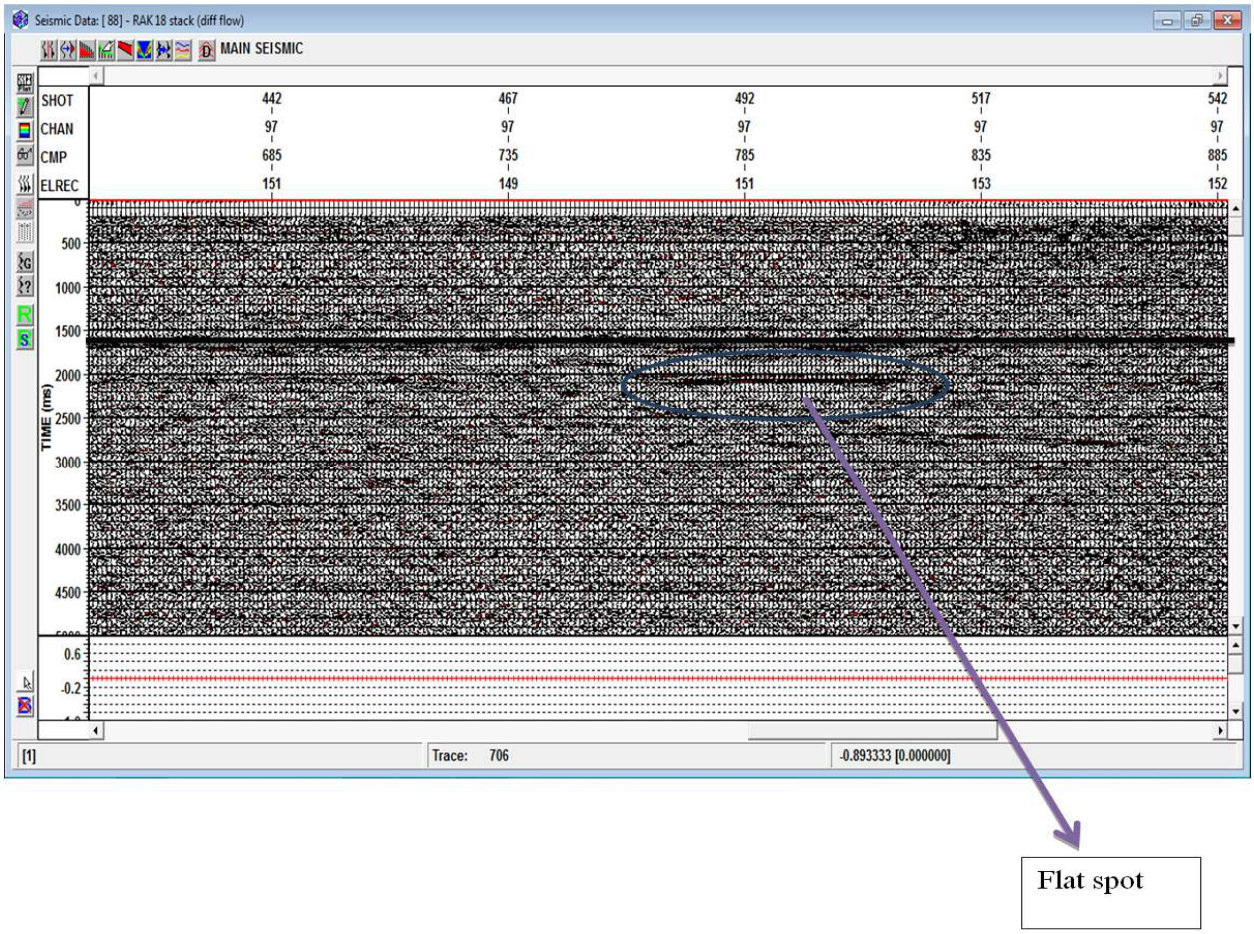

Fig (12). *The stack seismic section obtained from this flow.*

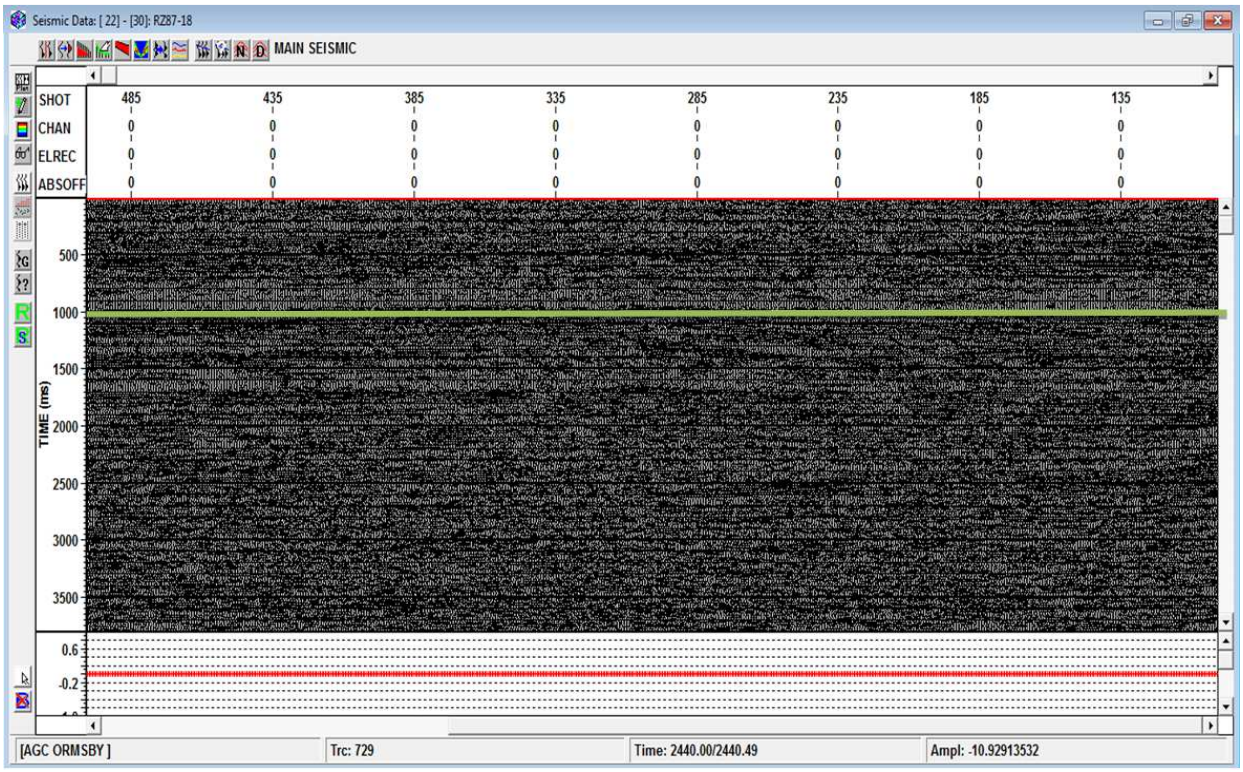

Fig (13). *The old stack seismic section of Razzak 18.*

3. Summery and Conclusion

The Razzak line 18 in SEG Y format used to apply four different flows on it. The processing flow made on Vista software. The last two flows produced two stack seismic sections; figure (10), figure (12). The stack seismic section obtained from fourth flow is obviously clearly than the other section. Preform a comparison between the stack section obtained from Fourth flow; figure (12) and the old stack section: figure (13). From the stack section; figure (12), it is noted that there is a one reflector referred by bold black line. Under this reflector there is a phenomena referred by circle related to seismic theory it called a flat spot which appear obviously. There is not any important event else can be note in this line related to seismic theory. On the other hand in the old stack seismic section; figure (13), it is noted that there is a one reflector as re-processing stack section referred by bold green line and there is not the flat spot which referred in re-processing section. Also cannot detected and recognized any event else in this section due to resolution and also not clear obviously.

Stack seismic section obtained from Re-processing is clearly viewing than the old stack section. The Re-processing section showed flat shot phenomena which cannot view in old stack section. Also its resolution is higher than the old section. From above the Re-processing stack section give an enhancement on Razzak line. It also improved the signal and showed the flat spot phenomena.

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