Gravity Interpretation of Marada Trough and Beda Platform

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Abstract .

Geophysical data available for the study of this study area between the Beda platform and Marada trough form is desired luxury showed information on geological structures subsurface and the distribution of the layers of the area, It was very clearly influenced the study area to have occurred between Beda platform and Marada trough is desired luxury and this influence resulted in a major fault in the north-east of the study area was trend northwest and the impact on each study area there is a range of other faults scattered in the region.

Gravity data obtained from the Libyan Petroleum Institute and represent of Bouguer map gave an explanation of the existence of high positive and high negative in the study area and the explanation was the presence of major fault trend to northwest.

Anomaly separation regional, local this has shown a group of anomalies distributed on study area.

Keywords: zaggut oil field, gravity data, Beda Platform , Marada Trough , sirt basin.

- Introduction:

Libya, situated on the Mediterranean foreland of the African Shield, extends over a platform of cratonic basins that can be divided into two geologic regions, each of which includes a number of sedimentary basins (figure. 1 and 2).

The northern part of the country is situated on a tectonically active subsiding margin (Gumati, et al., 1991), and includes from west to east the Sabratah Basin, Benghazi Basin, Sirt Basin and Cyrenaica Platform (figure. 1).

The southern part of Libya, which lies within a stable cratonic area, includes the Ghadamis and Murzuq Basins to the west, separated by the Tibisti crystalline basement massif from Al Kufra Basin in the east. As a result of their position at the edge of the African Plate, these basins were affected by successive phases of continental collision and plate divergence (Pickford, 1992). Major hydrocarbon discoveries have been made in the Paleozoic sequence of the Ghadamis and Murzuq Basins, and in the Mesozoic and Cenozoic sequence of the Sirt and Sabratah Basins.

The tectonic features of the Sirt Basin were formed by large-scale subsidence and block faulting in response to Latest Jurassic/Earlv Cretaceous rifting (Roberts, 1970; Goudarzi, 1980, Guirad and Mourin, 1992, Guiraud, 1998), which controlled the sedimentary deposition pattern during Late Cretaceous and Early Tertiary (Gumati and Kanes, 1985). It is a unique area to study the Cretaceous and Tertiary tectonic processes of north central Africa in relation to changes in the plate motions and the intraplate stresses.

The Mesozoic-Tertiary tectonic evolution of the African Plate is directly linked to the opening history of the Atlantic Ocean and the dynamics of Africa-Eurasia convergence (Guiraud et al., 1992). Other studies have shown that tectonic processes taking place at the plate boundaries influence the state of stress in large parts of the adjoining plates and, through this, affect the evolution of the sedimentary basins located on these plates (Cloetingh, 1988; Ziegler, 1988; Janssen, 1996). As a consequence, part of the continent and its adjacent ocean may share a regional stress field (Cloetingh and Wortel, 1986) that can lead to reactivation of the sedimentary basins located far from the active plate boundary (Ziegler, 1988, 1990; Ziegler et al., 1995).

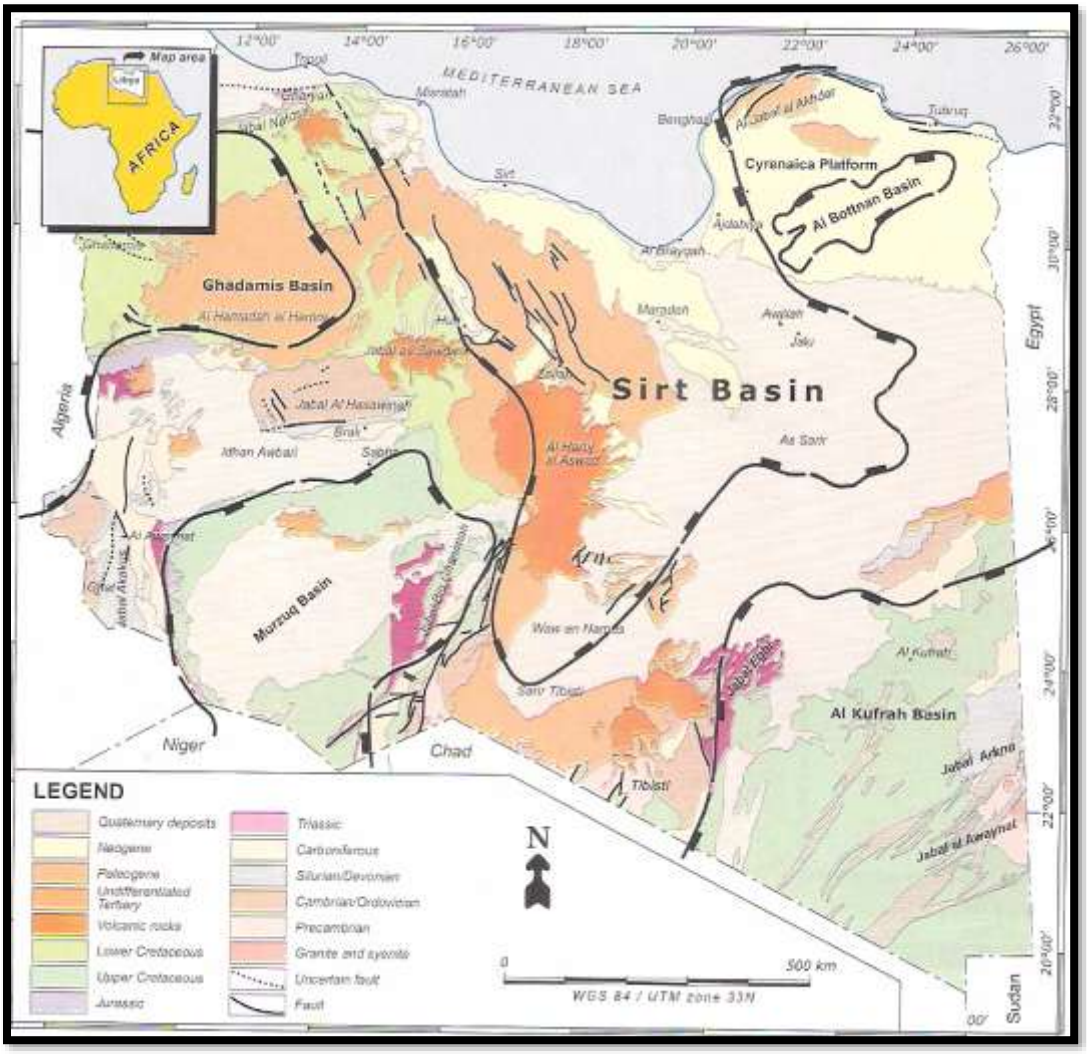

Figure 1. Geologic map of Libya. Modified after Industrial Research Centre 1977.

The Sirt Basin (Fig. 1) in north central Libya is one of the youngest sedimentary basins of the African Craton, with an onshore area of approximately 375,000 km2 and an estimated sedimentary volume of 1.3 million krn ', It contains more than 100 oil and gas fields, including several giants. The basin comprises a broad NW trending embayment. It is bounded to the south by the Tibisti Massif and to the west by AI Gargaf Uplift and the Ghadamis and Murzuq Basins. To the east, it is bounded by the Cyrenaica Platform and AI Bottnan Basin, and to the north by the Gulf of Sirt.

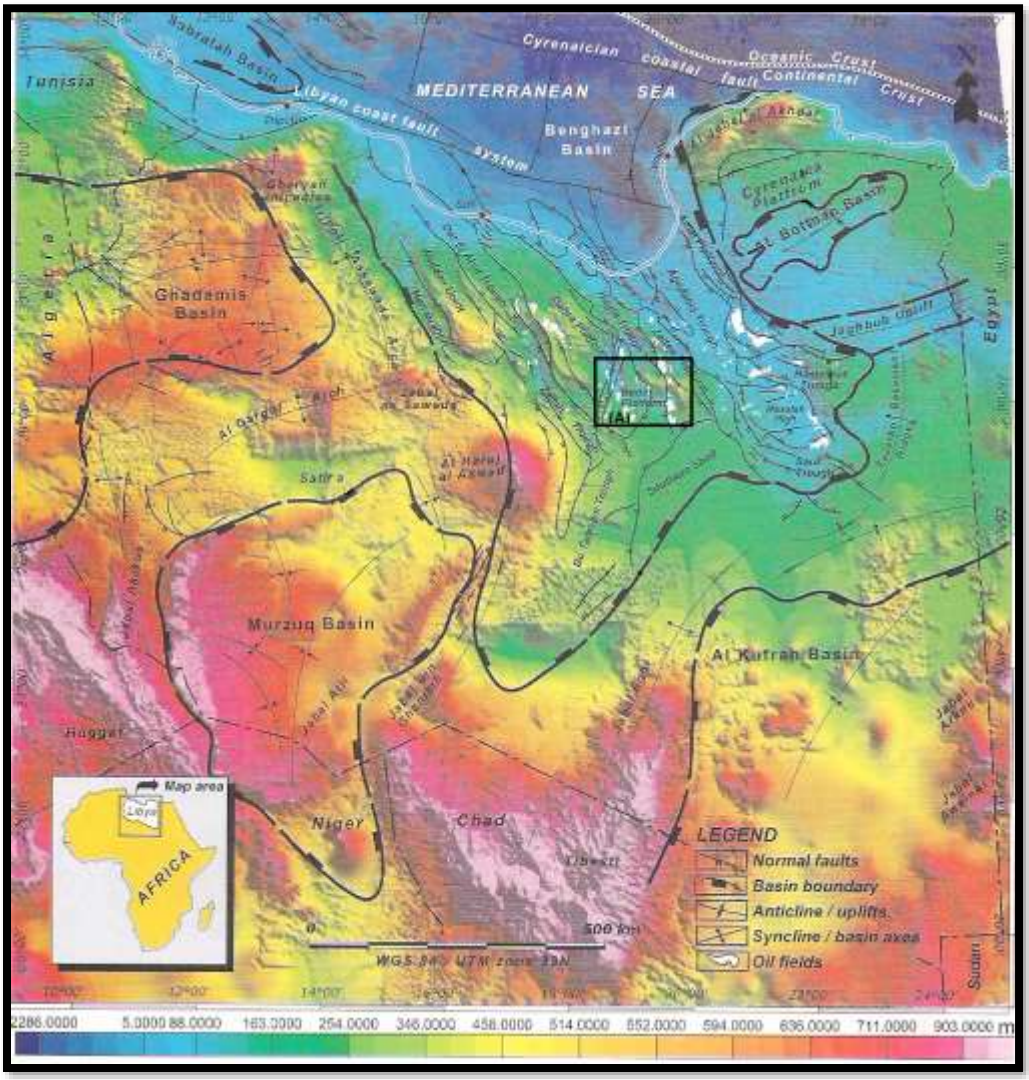

Figure 2. Map showing the digital topography of Libya, the tectonic framework,And the location of the Libyan sedimentary basins. inset map shows the location Of Libya in Africa, box (A) indicates the location of study area. Tectonic framework is modified after Mouzughi and Taleb (1981), with results of present study included. Digital topography and bathymetry are from GLOBE, NOAANational data center.

The main theme of this study is the gravity interpretation of the small Marada trough and the Beda platform.

The study area is between latitude 19.20 and 19.60. And Latitude 28.15

This study examines the continuity of the extension Marada trough and Beda platform .

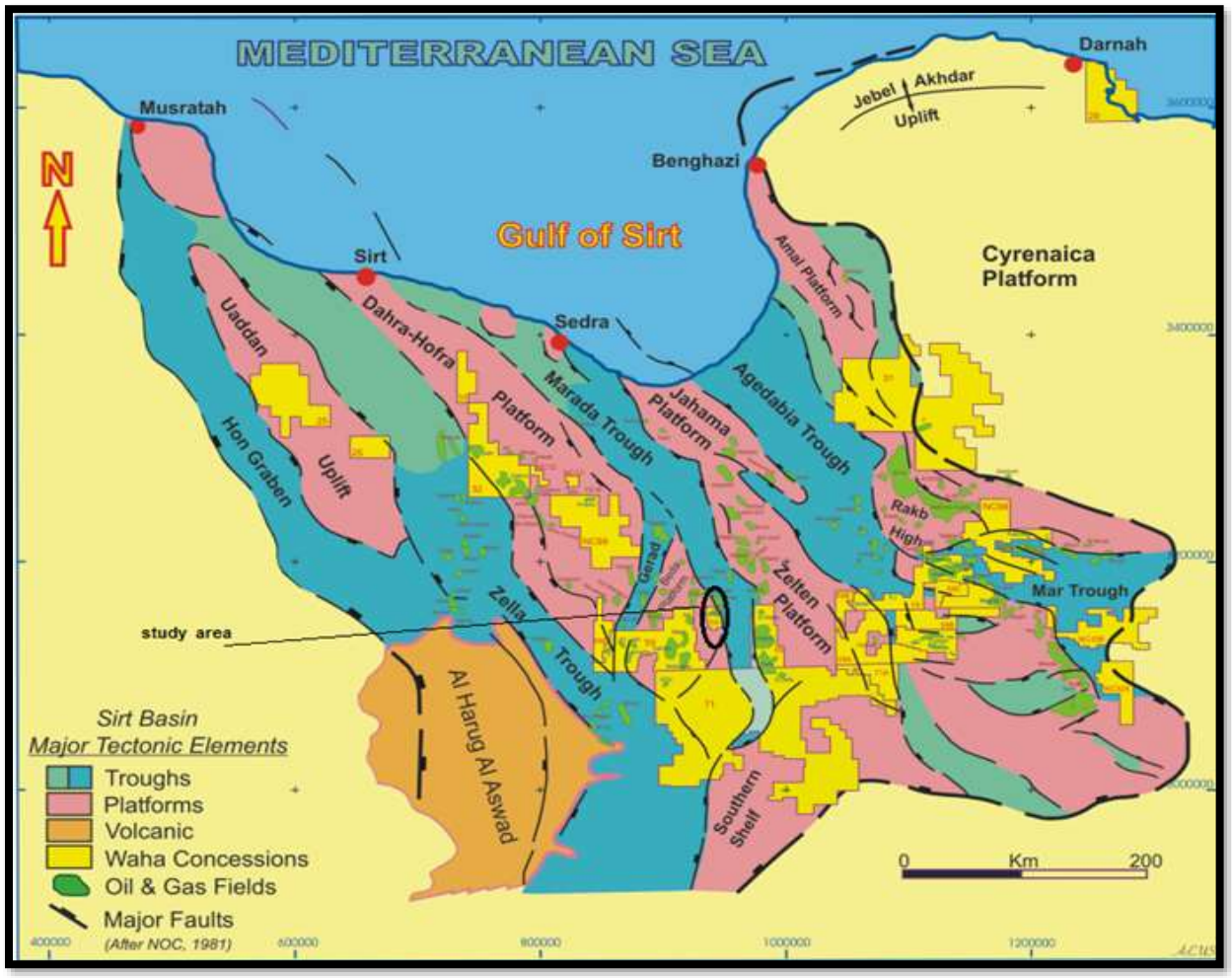

Figure 3. shwan the bounded of the sirt basin and study area.

- Gravity Method .

Gravity data provided by the Libyan petroleum institute were the result of a collection from different oil companies that work in Libya .

The distribution of these gravity data, as shown in (figure. 4)

Tends to be very irregularly spaced with areas of dense data and areas of sparse data . This irregularity could be due to topography .

The Bouguer gravity values were gridded using 1×1.

All work was conducted using Oasis Montage (Geosoft) package owned by Libyan petroleum institute .

The objective of the gravity method is to extract geological subsurface information , which is caused by deep-seated as well as shallow features. Therefore regional or local ,laterally or vertically gravity analysis can focus on and gives most kind of geological information. Thus regional – residual anomaly separation with many kinds of mathematical and computer techniques was performed to separate local geological features.

Data of Study Area .

about 240 gravity values represent the data used in this study (Figure4)

The gravity data gathered is irregularly spaced . Data in this form is unsuitable for a processing and contouring so it is necessary to represent the data by determining its value at points located equally apart at the nodes of a grid . Different techniques have been developed and used After trying different grid intervals, 1Km grid interval was adopted for this study and contoured . In this study we used minimum curvature technique (Briggs, 1974) . This data set was used to construct the bouguer gravity map of (Figure 5). Large – scale deep – seated structures are predominant on this map . In some cases it is very difficult to recognize smaller or shallower features in such cases , one can see the importance of anomaly separation routines which consist of removing regional anomalies resulting from deep – seated structures so as to emphasize residual anomalies associated with the shallow source of primary interest.

This map(Figure 5) was generated values gridded at 1Km, intervals using the minimum curvature technique (Briggs. 1974) , the grid was contoured using the Geosoft package .

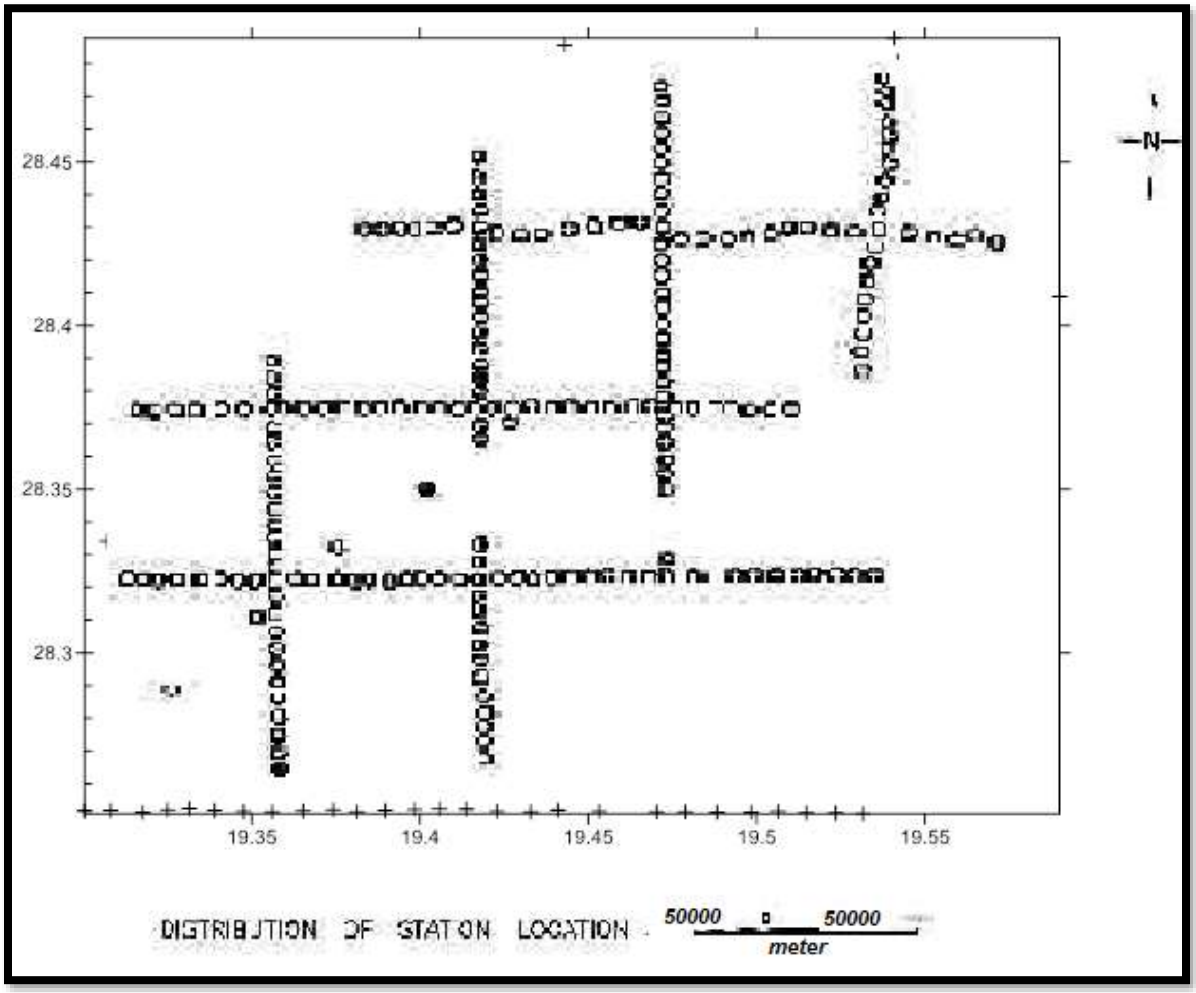

Figure. 4 . distribution of the gravity data.

The Bouguer anomaly map shows positive and negative anomalies Over the study of area . For example these anomalies reflect major structural elements Marada Trough and Beda Platform (Figure 5) the trend of major structural NW to SE

The direction of the main fault zone separates the area into two parts.

In general Bouguer anomaly map shows increasing gravity values from -16 to -33 m.gal toured the center and means of increasing the NE to the middle, and influence as a result of the separation between Marada trough and Beda platform , but the study area limited to the existence of high negative and the range of values from -16 at -33 m.gal .

In general , positive and high gravity values can be seen on platform and negative values and low gravity on trough show as represents (Figure 5).

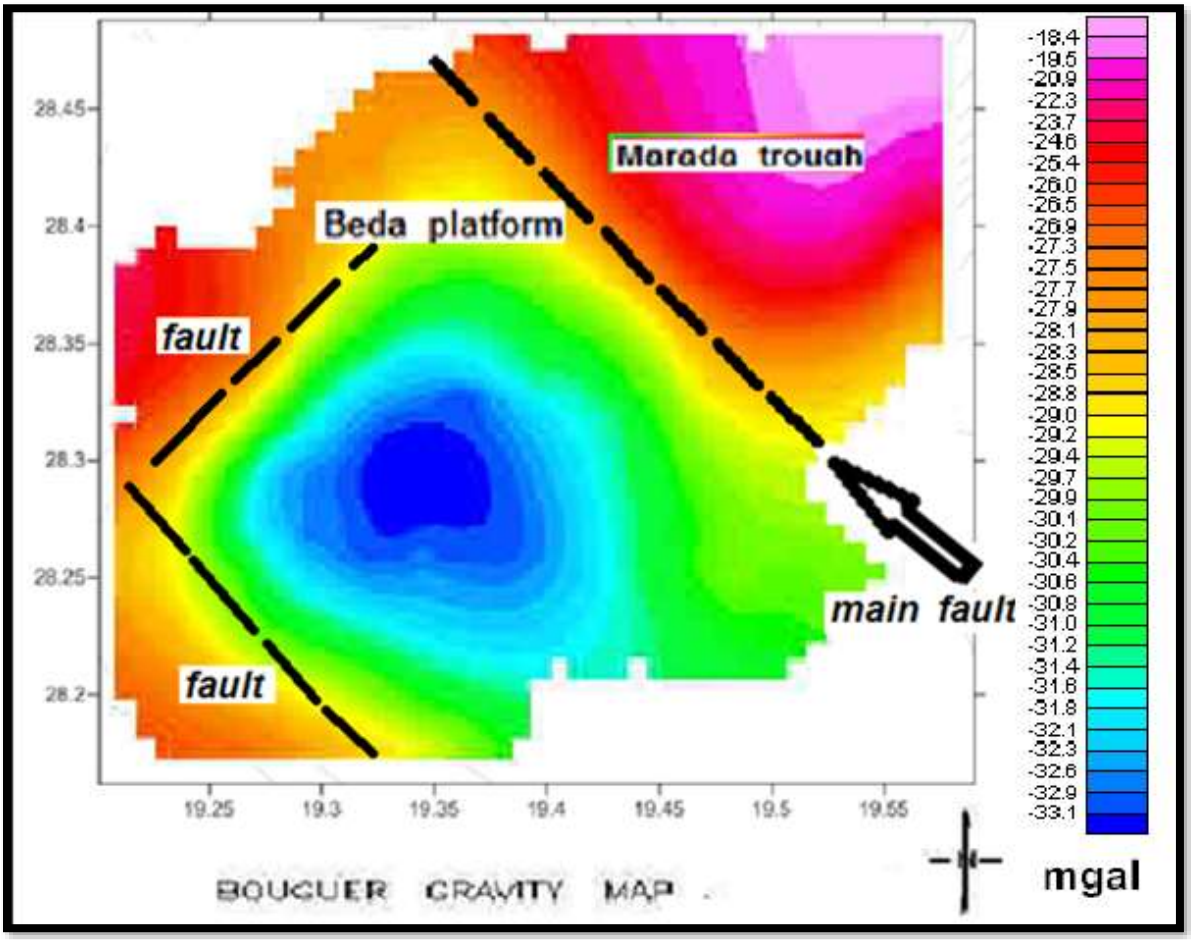

Figure 5. Bouguer anomaly map

- Anomaly separation .

A common procedure to approximate the regional gravity field is by using a low-order surface polynomial .

In this study we generate 2rd order surface polynomial maps as approximation to the regional gravity trend .

The second order surface polynomial map was chosen as the best approximation of the regional gravity field over the study area (Figure 6). This is not random step but this choice is based on the fact that gravity values shown in this map generally increase in a regular manner from but it is nonlinear gravity gradient .

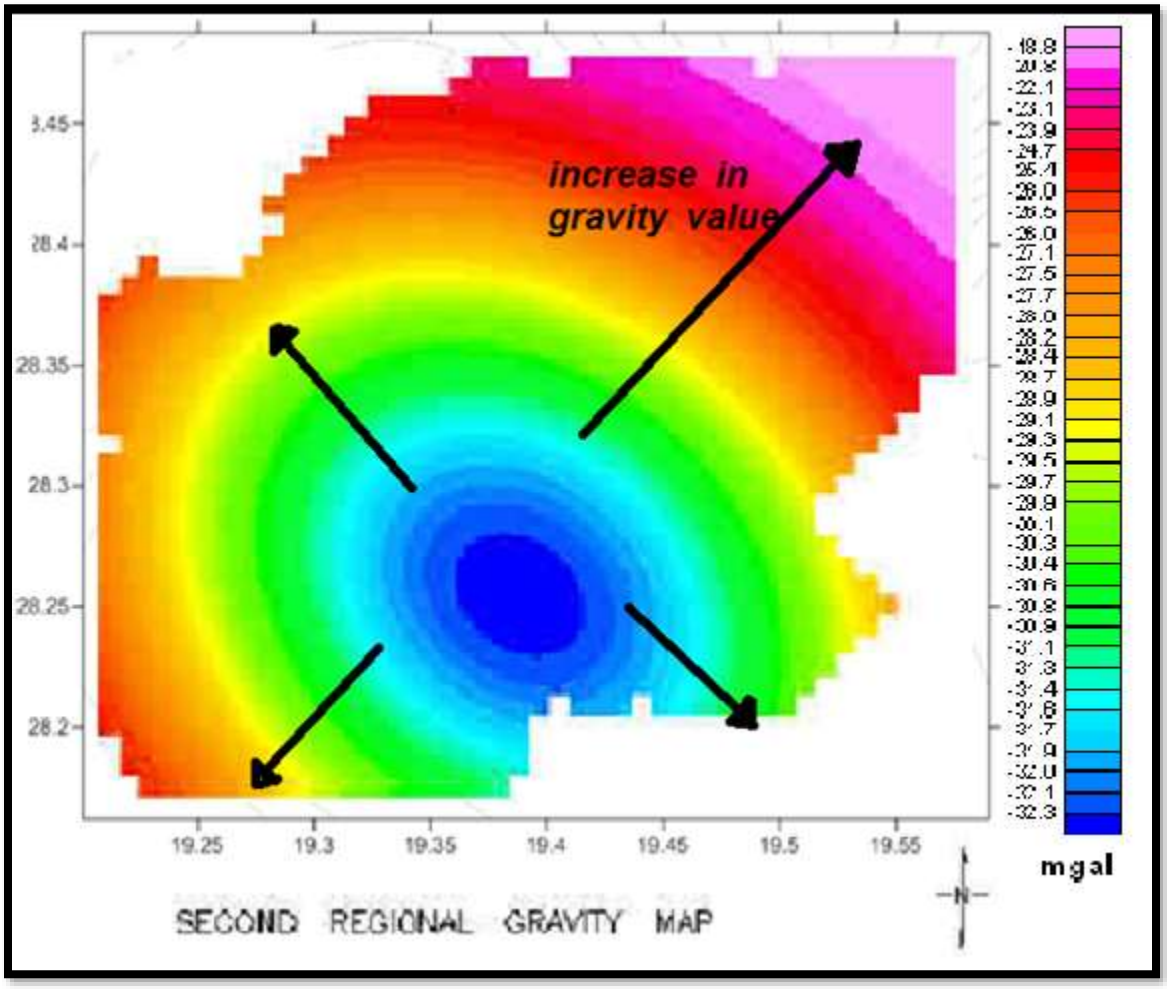

Figure 6. regional gravity map represents second order polynomial .

- The 2nd order residual gravity anomaly .

The residual gravity anomaly obtained by isolating regional gravity from bouguer gravity maps therefore local features will be clear faults , troughs and another structure .

Second residual gravity map (Figure 7) shows increasing the resolution of the features and separated but the region it is divided in to four parts part one northeast high positive the values of gravity 2.9 mGal, and second part middle in the study area but the high negative about the -2.3 mGal, the third and four parts in the south and weast also high positive about the 2.5 and 2.9 mGal .

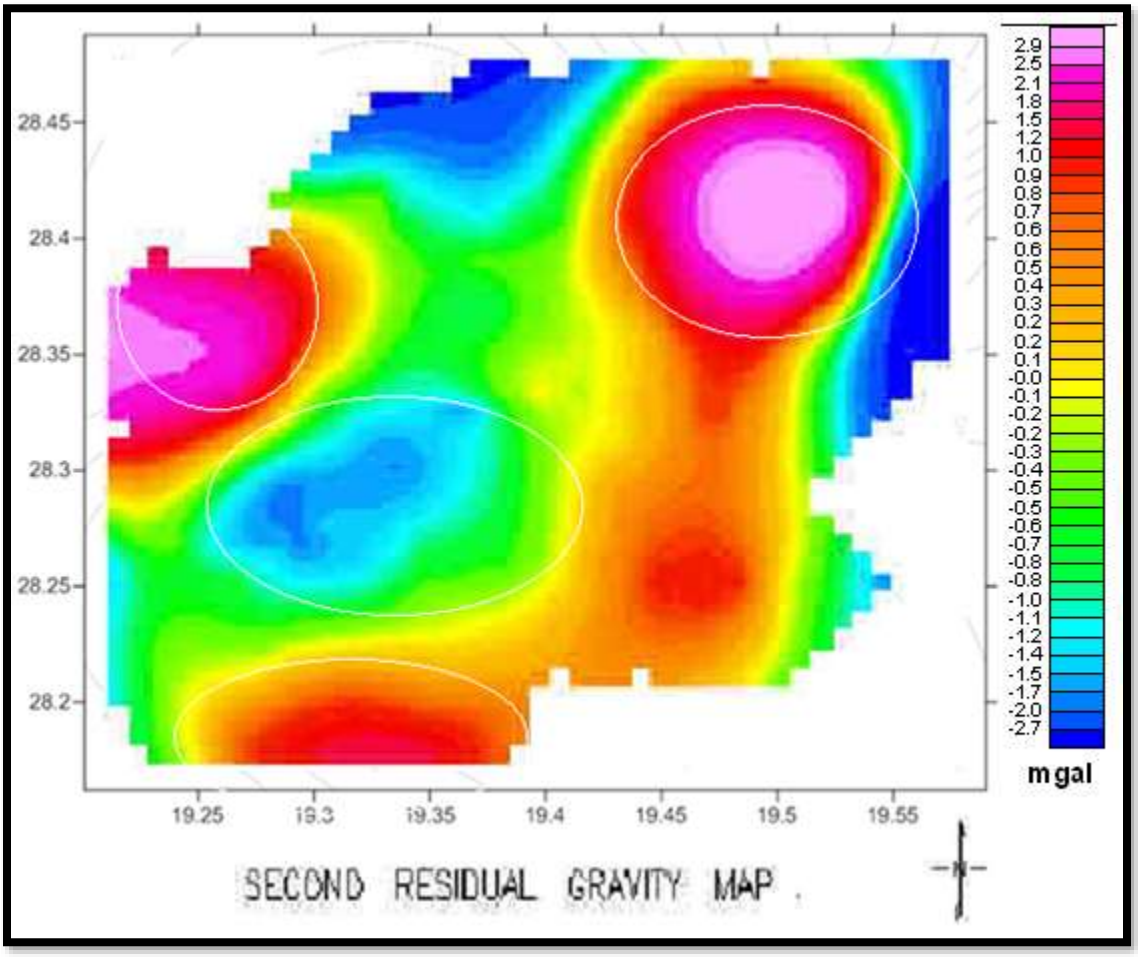

Figure 7. second residual gravity map .

- Larger area covered.

About 672 Gravity values represent the data used and covered for a larger area of the study area (Figure 8)

These data are distributed and organized.

The study area shows the wider details and extensions of the Beda platform and Marada trough outside the study area

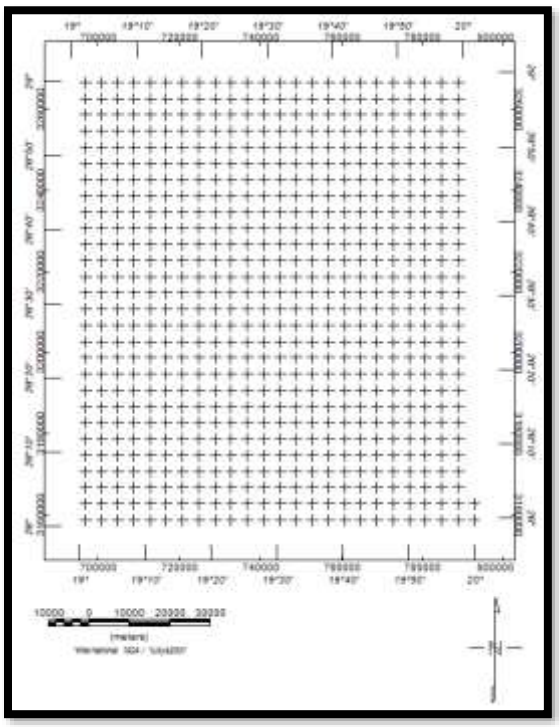

Figure. 8 . Larger area covered Shows regular distribution .

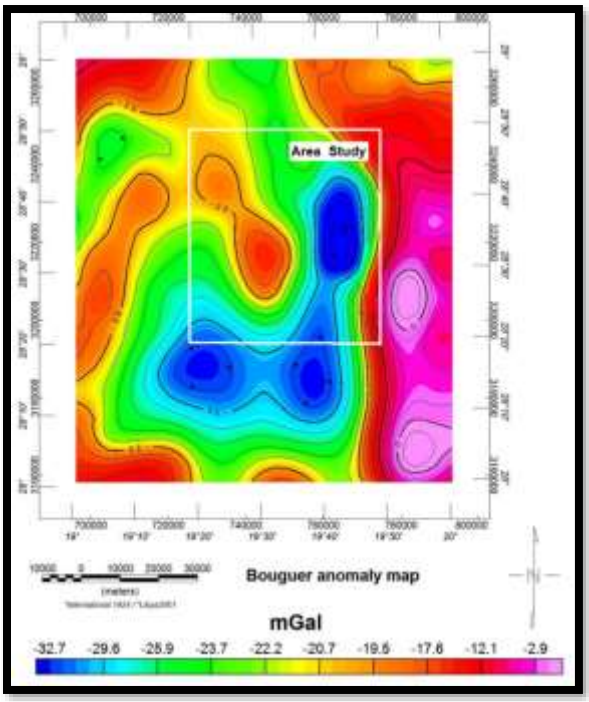

Figure. 9 . Larger area covered .

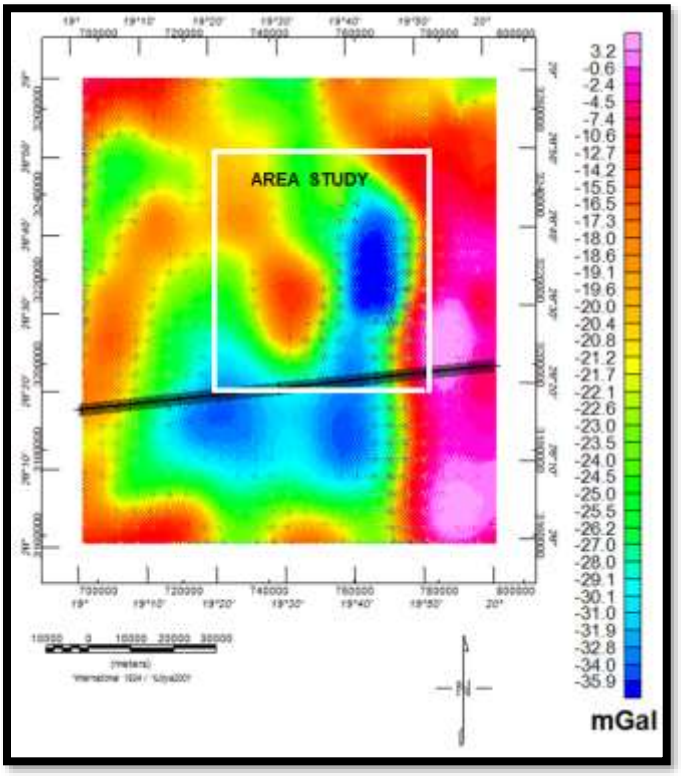

Figure. 10. Profile EW .

The east-west profile (Figure 11) , which underwent various geological structures, showed an increase in the values of the Bouguer to the east, which was estimated 3.2 mgal.

This explains the major fault that separates between

Marada trough and Beda platform .

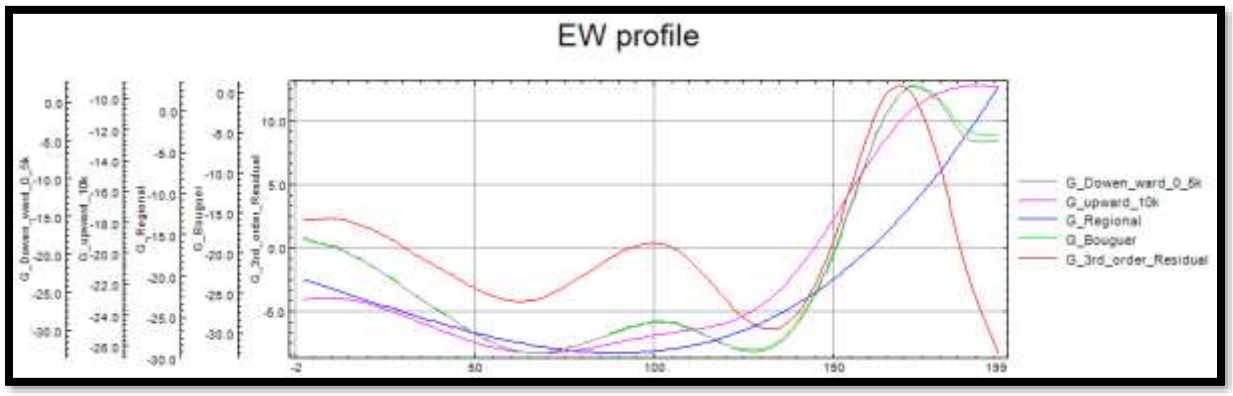

Figure. 11results of profile EW.

- Conclusion .

Gravity part is a good tool and is widely used to investigate and interpret the subsurface geology , because it can cover large areas with cheaper cost than other geophysical tools like seismic. Different sorts of mapping were carried out to attempt to separate local and regional features. These maps showed that all major structural features Beda platform and Marada trough, extend from shallow to deep.

the study area can be subdivided in to Beda paltform and Marada trough in the far north and northeast and the trend of major structure is north west .

Gravity anomaly commonly shows positive values in the north and northeast there is high density resulting from Marada tough however Beda paltform negative values.

The continuity of the Marada Basin and the Bida platform was clear outside the study area .

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