Available online www.jsaer.com

Journal of Scientific and Engineering Research, 2019, 6(7):229-240

Research Article

ISSN: 2394-2630
CODEN(USA): JSERBR

Structural Mapping of Solid Mineral Potential Zones over Southern Part of Kebbi State, Northwestern Nigeria

Bonde D.S.[1], Lawali S.[2], Salako K.A.[3]

[1]Department of Physics, Kebbi State Univerity of Science and Technology,Aliero. Kebbi State, Nigeria
[2]Department of Science, School of Basic Studies, Yelwa – Yauri, Kebbi State, Nigeria
[3]Department of Applied Geophysics, Federal University Minna Niger State, Nigeria
Correspoding Address: danladibonde@gmail.com

Abstract Geophysical investigation to delineate structural mineral potential zones over the lower part of Sokoto basin was conducted. The area lies between latitude 10.5^0N to 11.5^0N and longitude 04^0 E to 05^0E with an estimated total area of 12,100km^2.·Four high resolution aeromagnetic data was acquired from the Nigerian Geological Survey Agency (NGSA).The data was processed using Oasis Montaj version 7.2.The residual map obtained was subjected to first and second order vertical derivatives, analytic signal and tilt derivatives. These interpretation techniques produced some directional gradient maps of the study area depicting NE-SW trending lineaments. These lineaments identified could play host to minerals, since most magnetic minerals are structurally controlled.

Keywords Geophysical, mineral, Aeromagnetic data, Residual map, lineament

Introduction

Solid minerals are natural resources that form part of the Earth resources which beckon human race for exploitation, extraction and utilization. Modern civilization is heavily dependent on natural resources located in the uppermost layer of the earth. It is in this outer region of our planet where principal sources of energy and the vast majority of raw materials required for the construction, manufacturing and chemical industries are found. Nigeria is endowed with variety of solid minerals. Recent investigations by the Nigerian Geological Survey Agency (NGSA) and private exploration/mining companies have continued to shed more light on this endowment. For instance, the Nigerian Extractive Industry and Transparency Initiative (NEITI) reported that there are over 30 different kinds of solid minerals and precious metals buried in the Nigerian soil waiting to be explored.

Geology surveys in Nigeria commenced in 1903, when the colonial government inaugurated the Minerals Survey Committee. The Committee was to carry out reconnaissance of the mineral potentials of the Southern and Northern Protectorates before undertaking the more detailed and more expensive task of geological mapping of the regions.

The outcome of the survey includes the discovery and documentation of the lignite bodies of Asaba-Ibusa-Ogwashi environ, occurrences of galena, tinstone, columbite, monazite, limestone and clays in various localities of Southern Nigeria.

In Northern Nigeria, significant contributions include location of some occurrences of iron-ore near Lokoja, marble close to Jakura and tin in parts of Kabba, Ilorin and Zaria. In 1909, coal was discovered along the Udi escapement as the major output of the mineral survey of Southern Nigeria. Exploitation effort was made with the setting up of the Geological Survey of Nigeria and the subsequent disbanding of the Regional Mineral Surveys.

The discovery of petroleum and its subsequent domination of the Nigerian economy contributed to the lack of attention to solid mineral exploration despite the wide spread potentials. In fact, the solid mineral sector which used to be the bedrock of Nigeria's economy before the discovery of oil is almost completely abandoned by the Nigerian government. Daniel *et al* [1] opined that over 80% of the country's revenue comes from export and domestic sales of oil and gas.

However, as the hydrocarbon potentials of the prolific Niger Delta becomes depleted or may be exhausted in the near future due to continuous exploitation and with the current economic recession resulting from the drastic fall in oil price in the world market, the Nigerian government is now making a tremendous effort to diversify the economy with emphasis on Agriculture and Mining. This is due to the realization of the crucial role the solid mineral sector can play in the economic recovery of Nigeria.

This paper, therefore seeks to investigate structural mineral potential zones over the lower part of Sokoto basin, by analyzing and interpretation of aeromagnetic data maps of the area. This will be carried out by using first and second order vertical derivatives, tilt derivative, Analytic Signal and Source Parameter Imaging.

Location of the Study Area

The study area are aeromagnetic sheet numbers 95 (Ka΄oje), 96 (Shanga), 117 (Konkwesso) and 118 (Yelwa) lies between latitu

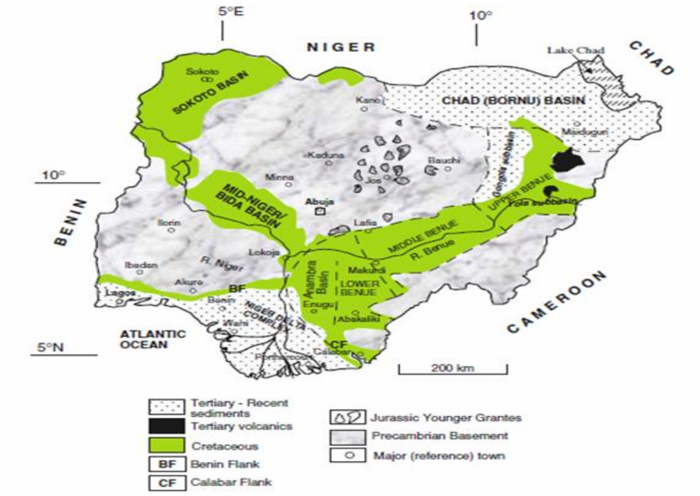


Figure 1: Geological map of Nigeria showing the study area [2]

This study aims to delineate structural potential mineralization zones in the lower part of Sokoto basin. In order to achieve the main aim, the under listed specific objectives are as outlined:

i. To map out the geological structures within the study area that are capable of hosting minerals using first vertical derivative, second vertical derivatives and downward continuation
ii. To identify different magnetic structures and lineaments which could play host to minerals in the area using tilt derivative
iii. To delineate the boundary edges between magnetic sources with contrasting anomalies using analytic signal

Geology of the study area

The study area is part of the vast late proterozoic-early phanerozoicterrane separating the west African and Congo cratons [3]. It comprises late proterozoicmetasedimentary rocks (mainly sericite-chlorite phyllite) intruded by a pan-African granodiorite batholith and an associated narrow contact aureole (50-350m) of mainly pelitichornfels. The metasedimentary rocks belong to the Zuru schist belt, one of the many NNE-trending belts to the low grade (mainly greenschist faces) supra-crustal rocks that are believed to have been deposited as proterozoic cover on older basement rocks [4].

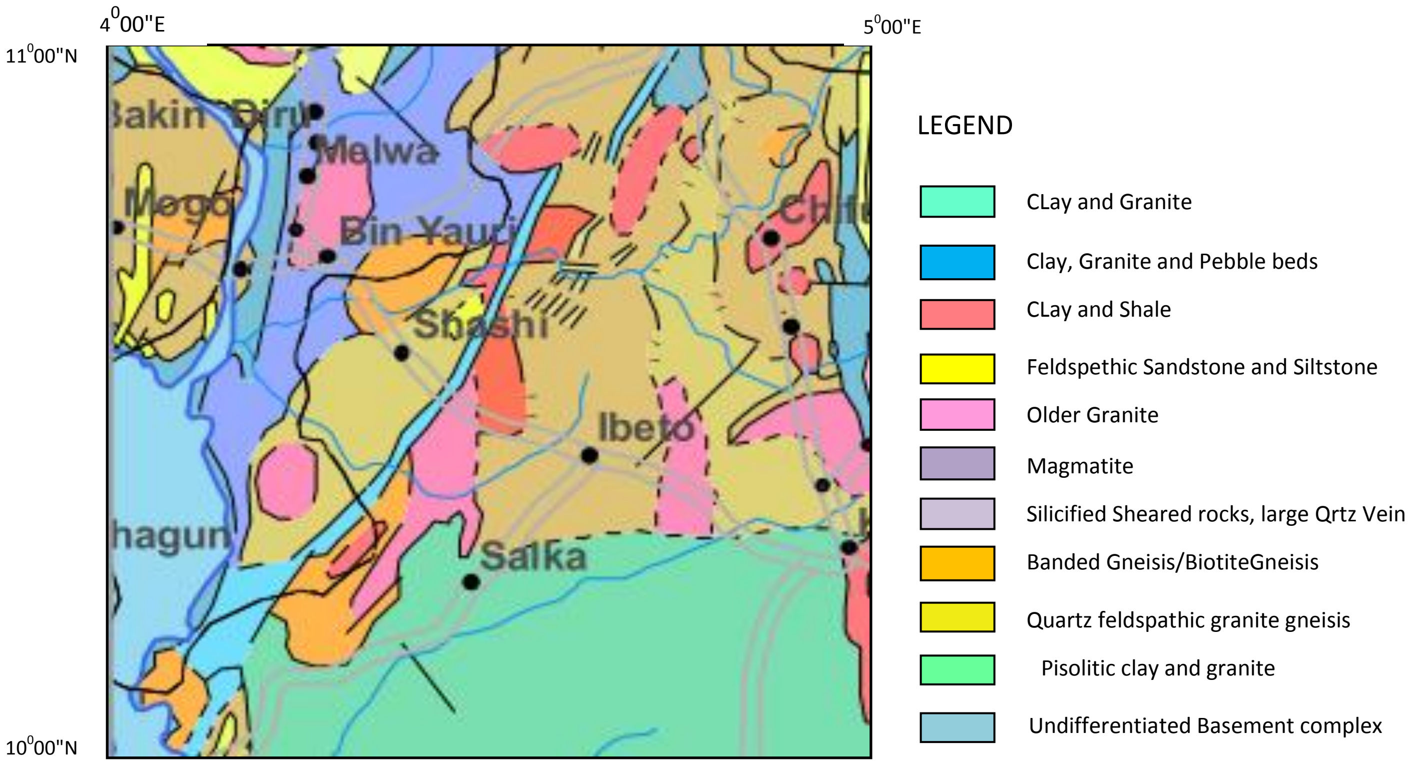


Figure 1: Geological map of the study area (NGSA, 2006)

Garba [4] documented that there is a relationship between tourmaline-rich rocks and metamorphic Gold deposit in the area. In other words, tourmaline appears to accompany Gold mineralization in the area. Muhammad and Abdlfatah [3] delineated new mineralized alteration zones and quartz veins along NE-SW of GarinAwwal which contain significant Gold and Silver mineralization. The Ministry of Mines and Steel Development [5] in its report on Gold deposit in BirninYauri explained that Gold-Sulphide-carbonate quartz veins occur in a brittle fault zones cutting hornsfels of the contact of a pan-African granodiorite batholith intruding pyllites and tourmalinites of Zuru schist belt. Amuda *et al.* [6] Gold mineralization in Kucheri area is confirmed to have an anomalous concentration in most of quartz veins.

Samson *et al* [7] in their work on Mineralogical and Geochemical Characterization of Gold Bearing Quartz veins and Soils in parts of Maru showed that Gold bearing quartz veins crosscut metapelites (slate pyllite with schist) and metagabbro in the area indicating a epigenetic style of mineralization.

Gold occur in Birnin-Yauri within qrtz and quartz-carbonate veins where pyrite, chalcopyrite, galena and minor sphalerite and magnetite are intergrown with a quartz and quartz-carbonate gangue. In some places tourmaline also is an important gangue mineral in the matrix of the veins. The mineralized veins are surrounded (1-3m on either side) by intense alterations in which the fabric of the hornfels is replaced by discrete zones [3-4].

Data Acquisition and Processing

Four aeromagnetic data sheets of total field intensity in $1/2^{\circ}$ by $1/2^{\circ}$ covering sheet 95, 96,117 and 118 corresponding to Ka´oje, Shanga, Konkwesso and Yelwa sheets were acquired from the Nigerian Geological Survey Agency (NGSA).The sheets were processed using Oasis Montaj version 7.2 to produce the total magnetic intensity (TMI) map.Regional-Residual Separation was carried out byPolynomial fitting method.

A derivative helps to sharpen the edges of anomalies and enhance the shallow features [8]. The vertical derivative is much more responsive to local influence than broad or regional effects, and therefore gives sharper picture than the map of total field intensity. The first vertical derivative is used to delineate high frequency features more clearly where they are shadowed by large amplitude low frequency anomalies. This is done using the Laplace transformation expression shown below:

$$\nabla^2 f = 0 \qquad (1)$$

where∇^2f is the Laplace transform which can be expressed in full as:

$$\frac{\partial^2 f}{\partial z^2} = -\left[\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}\right] \quad (2)$$

$\partial x, \partial y \; and \; \partial z$are the differentials in x ,y and z coordinates

The nth vertical derivative can be computed using:

$$\mathrm{F}\left[\frac{\partial^n f}{\partial z^n}\right] = k^n \mathrm{F}(f) \quad (3)$$

The second vertical derivative has more resolving power than the first vertical derivative. Apart from enhancing the shallower anomalies, the second vertical derivatives are also used to delineate geological boundaries between rocks with contrasting physical properties such as magnetic susceptibility. The contoured second vertical derivative outlines the bodies causing the magnetic anomalies [9]. The second vertical derivative is based on equation 3.3 when $n = 2$

where F is the Fourier representation of the field

k is the wave number or frequency

f is the input to be filtered

Tilt Derivative

Tilt derivative and its horizontal derivative are used for mapping shallow basement structures and mineral exploration targets [10]. In potential field images, tilt derivative has made the task of enhancing features and detecting causative body edges easier.

The tilt derivative filter is defined as :

$$\text{TDR} = \tan^{-1}\left(\frac{VDR}{THDR}\right) \quad (4)$$

where VDR and THDR are the Vertical derivatives and Tilt horizontal derivatives of the total magnetic intensity respectively.

$$\text{VDR} = \frac{\partial T}{\partial Z} \text{ and RHDR} = \sqrt{\left(\frac{\partial T}{\partial x}\right)^2 + \left(\frac{\partial T}{\partial y}\right)^2} \quad (5)$$

The total horizontal derivative of the tilt derivative is defined as the square root of the sum of squares of the tilt angle derivatives in the x and y directions and is mathematically defined as:

$$\text{Hence, THDR} - \text{TDR} = \sqrt{\left(\frac{\partial TDR}{\partial x}\right)^2 + \left(\frac{\partial TDR}{\partial y}\right)^2} \quad (6)$$

Analytic Signal

The analytic signal is a notable method for establishing the edges of magnetic anomalies. The simplification of magnetic data involves creating a function which is independent of body magnetization direction and ambient geomagnetic parameters. The analytic signal filter possesses this property and has been used for edge detection and depth estimation of magnetic bodies by several authors. Roest *et al.* [11], applied it for detecting causative body location. Hsu *et al.* [12], used it for geologic boundary edge detection. The filters ability to generate a maximum value directly over the causative body and depth estimation makes it a highly useful technique for magnetic data interpretation [13] and Thabisani *et al.* [14].

The amplitude of the analytical signal of the total magnetic field F is calculated from the three orthogonal derivative of the field defined as:

$$A(x,y) = \left(\frac{\partial M}{\partial X}\right)X + \left(\frac{\partial M}{\partial Y}\right)Y + \left(\frac{\partial M}{\partial Z}\right)Z \quad (7)$$

With M= magnetic field. The analytical signal Amplitude can now be written as:

$$|A(x,y)| = \sqrt{\left(\frac{\partial M}{\partial X}\right)^2 + \left(\frac{\partial M}{\partial Y}\right)^2 + \left(\frac{\partial M}{\partial Z}\right)^2} \quad (8)$$

Results and Analysis

Total Magnetic Intensity Map (TMI)

The total magnetic intensity (TMI) map of the study area (Figure 2) was produced in color aggregate after removal of the 33,000 nT IGRF value. The map shows variation in magnetic signatures of highs and lows ranging from a minimum value of -64.1 nT to a maximum value of 123.6 nT. The orange-pink colors on the color legend depicts areas with high magnetic signatures and light-dark blue colors represent low magnetic signatures while green-yellow colors indicate medium magnetic signatures.

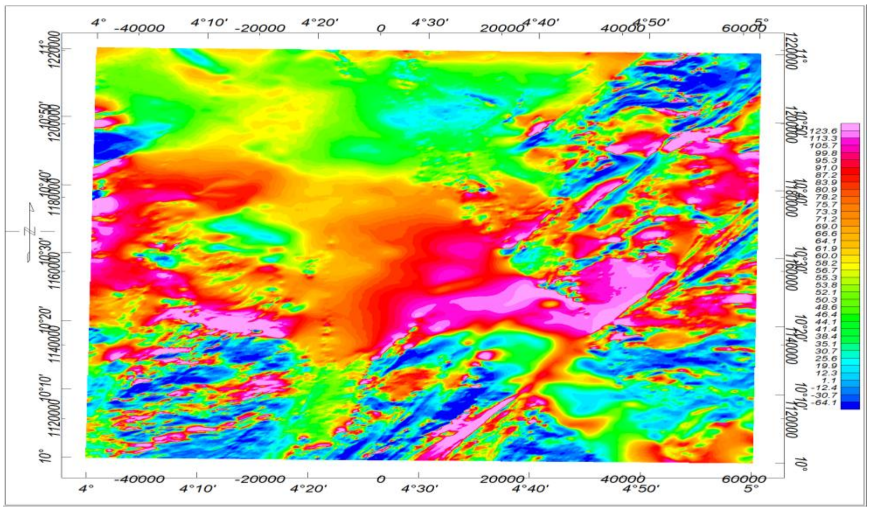


Figure 2

Regional Map

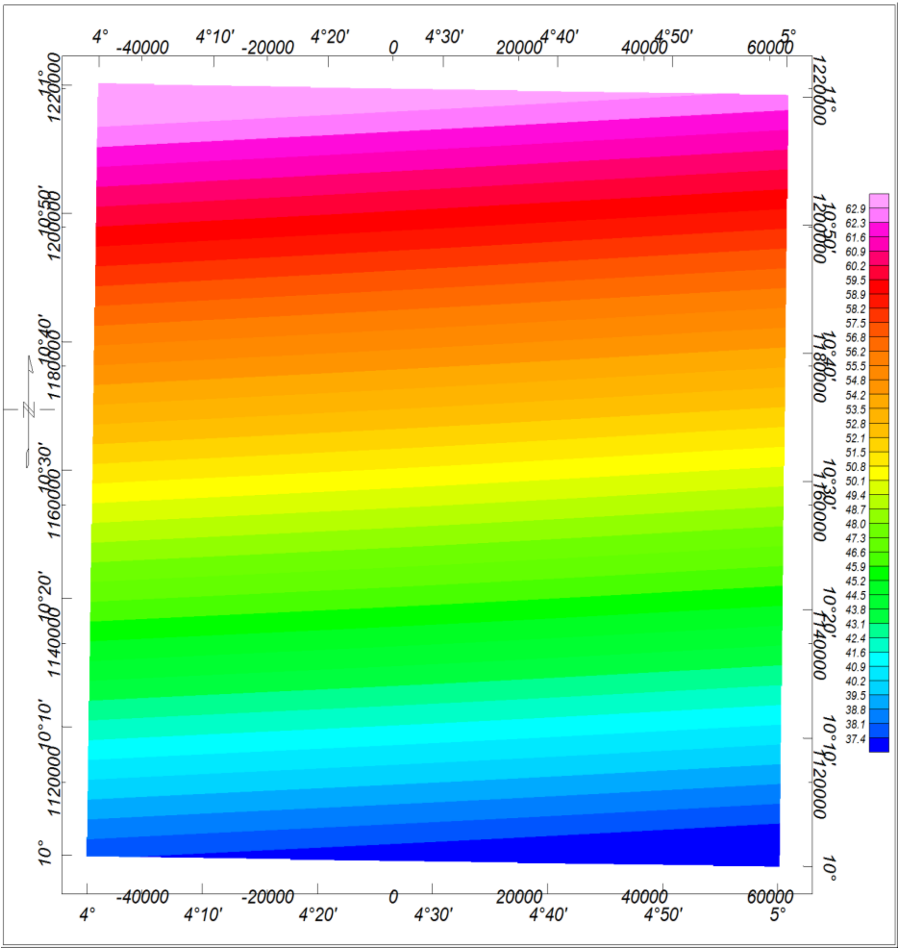


Figure 3

The regional map of the study area (Figure 3) shows clearly that the northern part of the study area is dominated by high magnetic intensity anomalies with intensity values ranging from 52.1 nT to 62.9 nT (orange-pink colors) and the southern part is dominated by low magnetic intensity signatures with intensity values ranging from 37.4 nT to 43.1 nT (light-dark blue colors) while the central part of the study area is occupied by medium intensity signature trending NE-SW which concurred with the structural orientation from the total magnetic intensity (TMI) map (Figure 2)

Residual Map

Figure 4 is the residual map of the study area

extracted from the total magnetic intensity map of the study area. The map reveals variation in magnetic signatures whose intensity values ranged between -110.4 nT and 74 nT respectively. The low intensity signature due to deep seated-low frequency-long wavelength anomalies with magnetic values ranging from -110.4 nT to -19.6 nT (deep-light blue colors) are more prominent at the northeastern and southern region of the area, the high intensity signatures depicted by red-pink colors (7.7nT-74nT) are more concentrated at the centre crosscutting the study area horizontally in similar manner with the TMI map (Figure 4.1) while the medium intensity signatures represented by green-yellow colors (-16.8 nT to 5.2 nT) are scattered virtually all over the area. Similar to the total magnetic intensity (TMI) map, the regional map also revealed structures such as fractures, faults and veins oriented majorly in NE-SW direction.

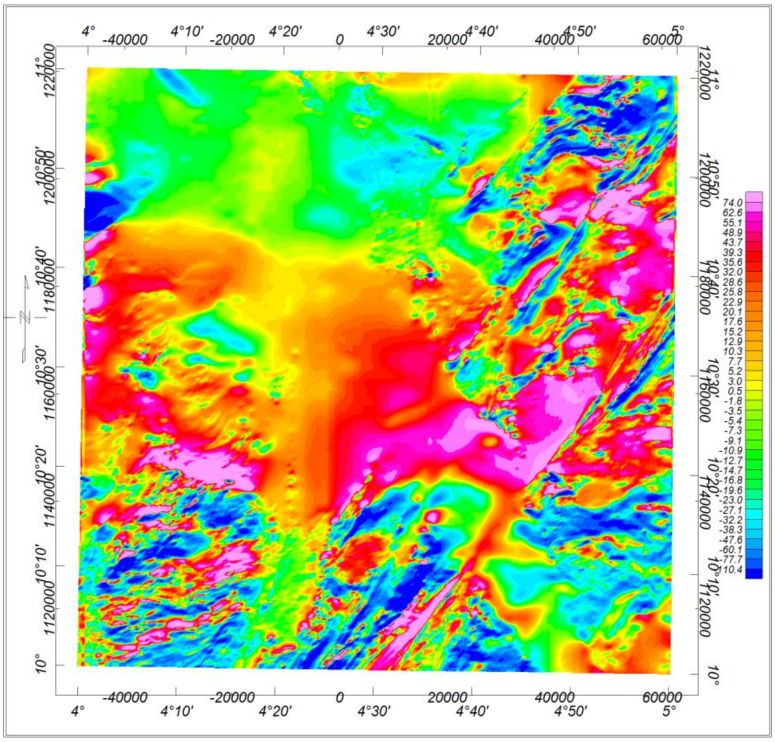


Figure 4: Residual Map of the Study Area

Figure 5a is the mineral resources map of the study area extracted from the mineral resource map of Nigeria produced by the Nigerian Geological Survey Agency in 2006 while Figure 5b is the residual map of the study area. Looking carefully at the mineral resources map of the study area, there are indications of different kinds of minerals scattered virtually all over the area as is the case for the residual map of the area. For instance, the arrows labeled (I) and (VI) show regions occupied by cretaceous sediments with traces of Alluvium depositions on the mineral resource map corresponding with yellowish green-blue portion of the residual map which also depicts alluvium deposition on sedimentary rocks. Arrows labeled (II), (IV) and (V) show the various areas occupied by schist (a type of rock formed of layers of different minerals) on the mineral resource map corresponding with regions occupied by pink-red colors on the residual

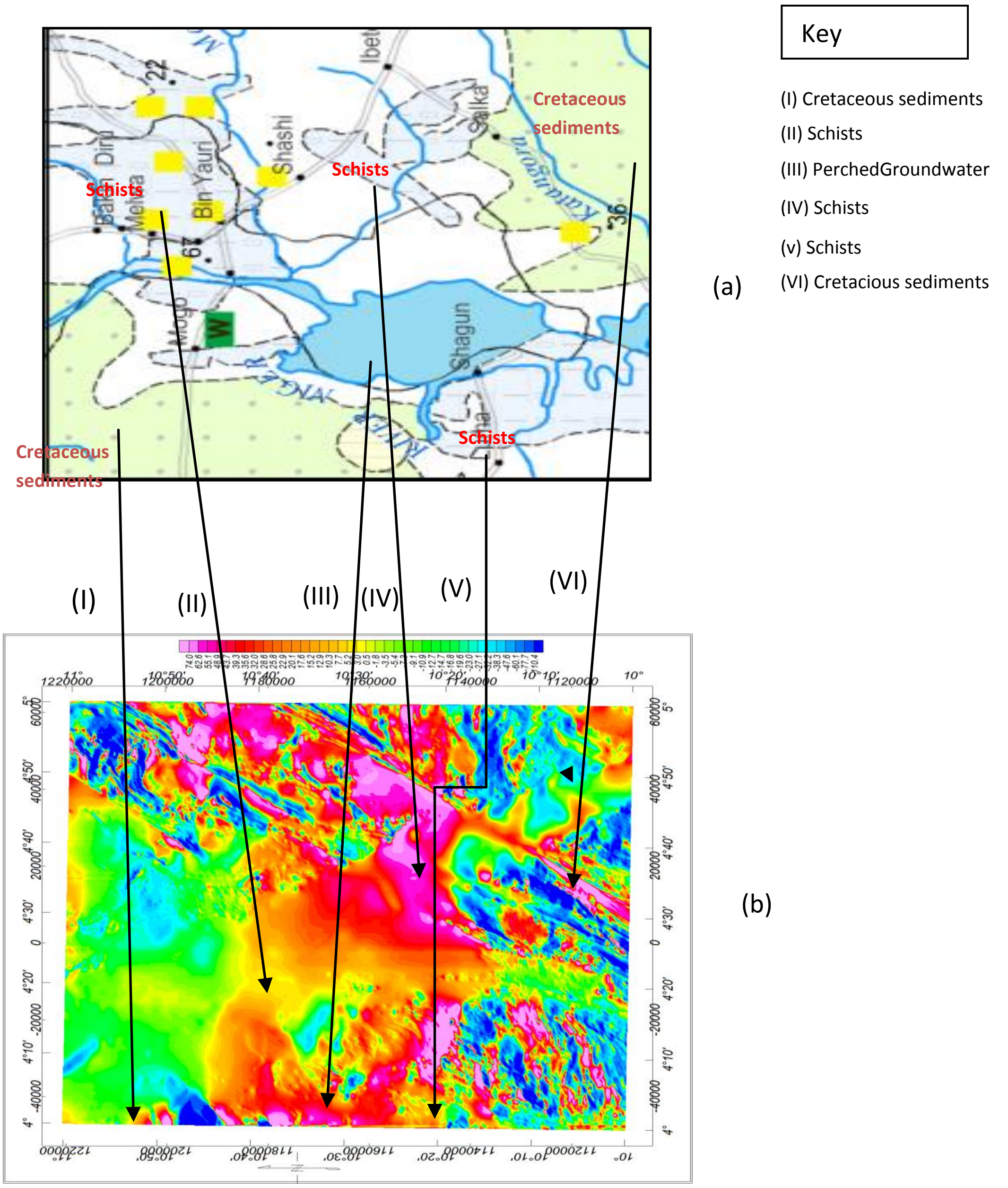


Figure 5

Vertical Derivatives Maps

The first vertical derivative map of the study area (Figure 6) depicts several short wavelengths (high intensity) anomalies embedded in a smoothly varying background at the northeastern and southwestern parts of the study area separated diagonally.

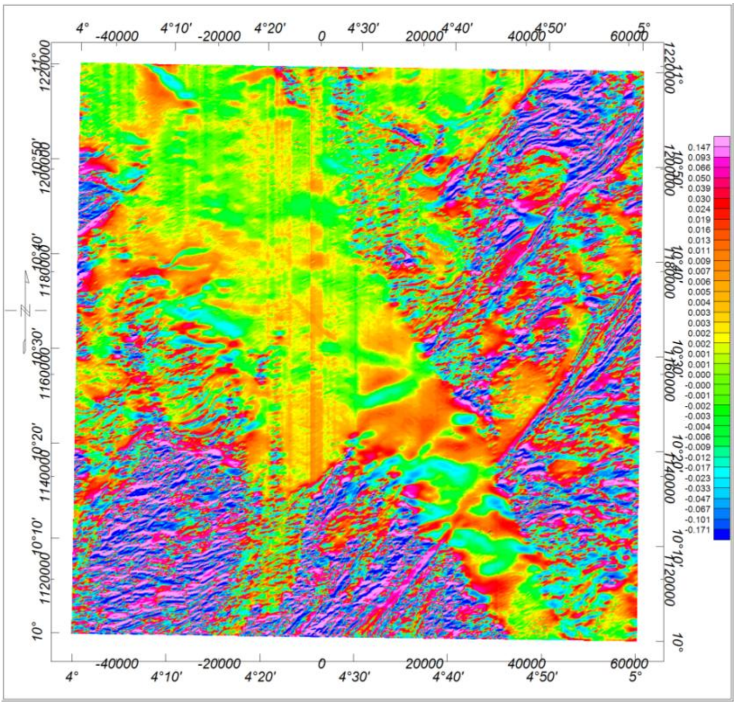


Figure 6: First vertical derivative map

The second vertical derivative map of the study area (figure 7) revealed more clearly the trend of structures observed in the first vertical derivative map (Figure 6) oriented NE-SW. This agrees with the results obtained by Adetona *et al.*, [15], Suleiman *et al*,. [16] and Bonde *et al.*, [17] who identified a system of NE-SW trending lineaments in Sokoto basin, which may provide direct evidence of the existence of reservoir type structure or mineral ore body.

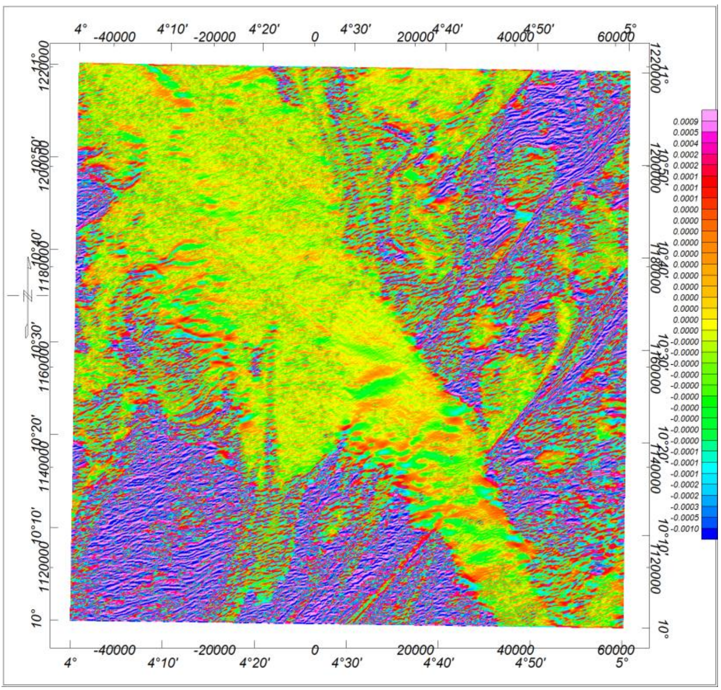
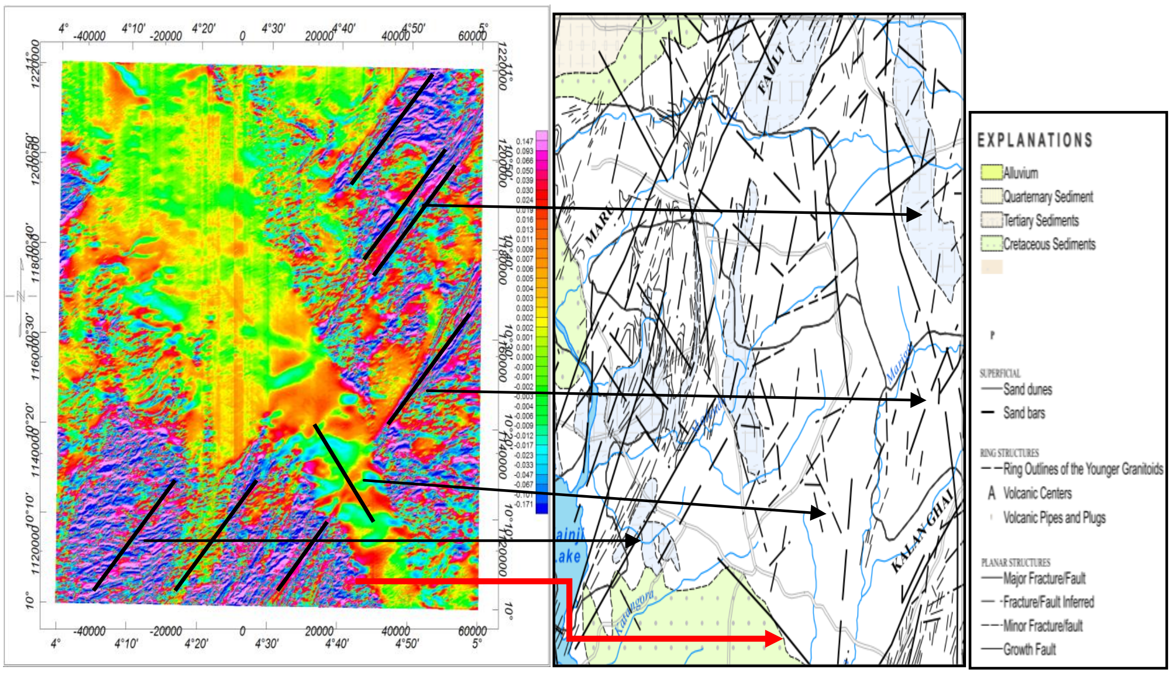


Figure 7: Second vertical derivative map

Lineament Map with First Vertical Derivative Map

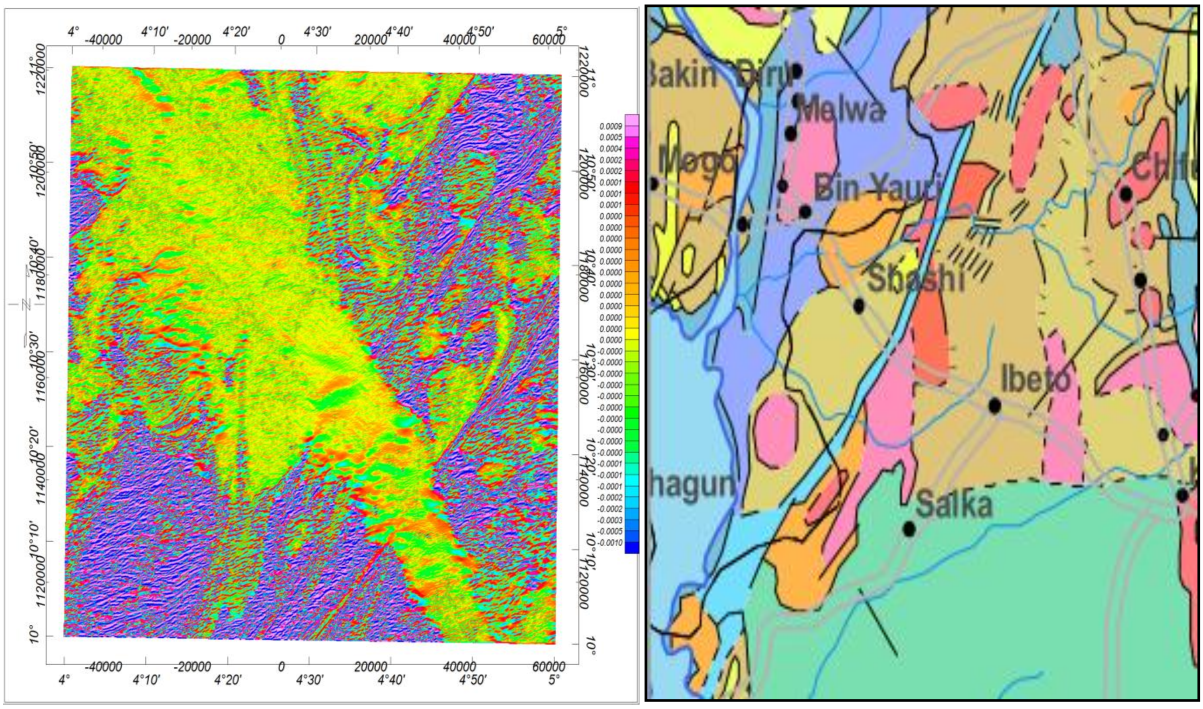
Figure 8a is the lineament map of the study area extracted from the lineament map of Nigeria produced by the Nigerian Geological Survey Agency (NGSA) in 2005 while Figure 8b is the first vertical derivative map of the study area produced using Oasis Montaj software. Careful inspection of the two maps shows that there is conformity in the manner by which the features (lineaments) are aligned. On both the two maps, features like cracks, faults and veins are present and are aligned majorly in NE-SW direction. It is also clear that the geologic contact present at the southwestern part of the lineament map is also present on the first vertical derivative map as indicated by the red arrow below. Hence the first vertical derivative map, agree to a certain extent with the lineament map.



(a) *(b)*

Figure 8: Comparison of lineament map with the first vertical derivative map

Geology Map with Second Vertical Derivative Map



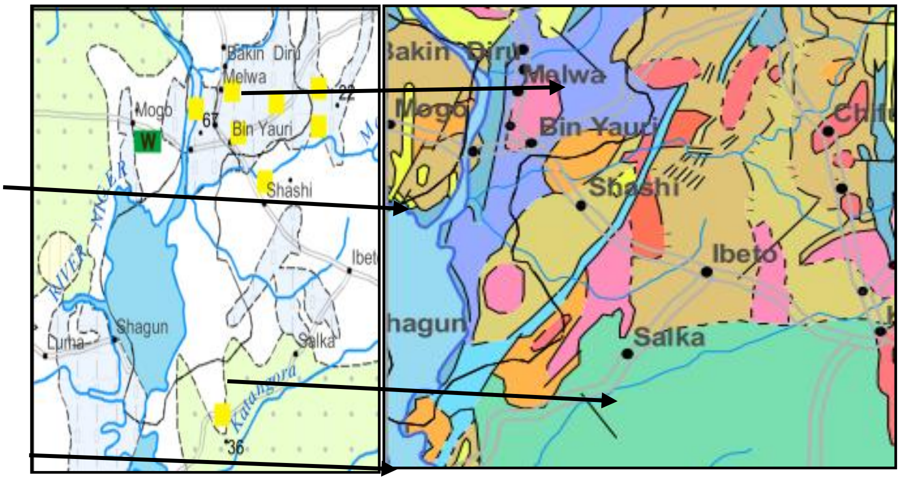
(a) *(b)*

Figure 9: Comparison of geological map with the second vertical derivative map

Figure 9a is the second vertical derivative map of the study area produced using Oasis montaj while figure 9b is the geological map of the study area extracted from the geological map of Nigeria produced by the Nigerian Geological Survey Agency (NGSA) in 2006. A careful examination of the two maps revealed the presence of several short wavelength anomalies embedded in a smoothly varying background on both the maps. Ideally, the structures present on the two maps should agree in both orientation and location. In this case however, there is conformity in the structural alignments (NE-SW) but differ in locations. This difference is attributable to the possible errors originating from the field (during the survey).

Comparison of geological map with the mineral resource map

Figure 10a is the mineral resource map of the study area extracted from the mineral resource map of Nigeria produced by the Nigerian Geological Survey Agency in 2006 while figure 10b. is the geological map of the study area also extracted from the geological map of Nigeria. There is close correlation between the two maps at numerous points as indicated by the arrows. For instance, on the geological map there are regions occupied by undifferentiated basement complex, feldspethic sandstone and siltstone as well as older granite around Yelwa, Mogo and near Salka which are also present on the mineral resource map. On both the two maps is also a portion occupied by perched groundwater on sedimentary rocks around Shagun. Moreover, the southeastern parts of both the maps are regions of cretaceous sediments and clay. Hence, there is structural agreement between the two maps thus with slight difference in structural locations which can be attributed to human or instrumental errors during the survey.



(a) *(b)*

Figure 10: Comparison of mineral resource map with geological map

Tilt Derivative Map

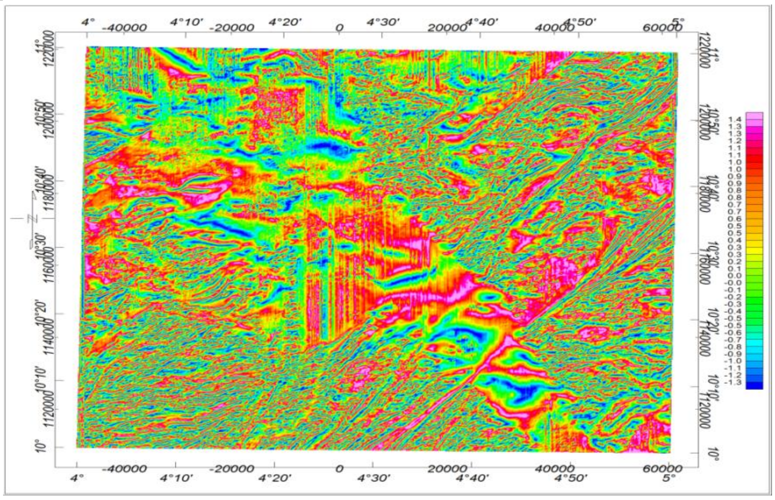


Figure 11: Tilt Derivative Map of the Study Area

The tilt derivative is particularly valuable in amplifying orientations of magnetic sources. Hence it can be used to identify structures capable of hosting minerals. The tilt derivative map (Figure 11) reveals more clearly the structural lineaments such as faults, cracks, joints and veins which play host for minerals in the area. The structural trend on the map agrees well with the vertical derivative maps as well as the downward continuation maps. The distribution of lineaments on the tilt derivative map also indicates rarity of magnetic lineaments at the northwestern part as corroborated by the vertical derivative maps.

Discussion

Summarily, the total magnetic intensity (TMI) map of the study area revealed that the area is magnetically heterogeneous. Based on the variation of magnetic intensity signature however, very strong magnetic intensity values (61.9 nT-123.6 nT) are more prominent at the east-central and west-central parts of the study area while low magnetic intensity values (-64.1 nT-35.1 nT) are more obvious at the northern and southeastern parts of the area with NE-SW structural trends. The medium intensity signature (38.4 nT-60.0 nT) depicted by green-yellow colors can be found virtually all over the area which may imply sedimentary intrusion in to the pre-Cambrian basement.

The regional map (Figure 3) revealed E-W tectonic trend which is economically insignificant in terms of minerals, as it arises from magnetic sources that are usually larger or deeper than the targets. The regional map reveals intensity values ranging from 37.4 nT-62.9 nT. These values are depicted by color legend attached beside the map. Magnetic intensity values between 52.1 nT and 62.9 nT depicted by orange-pink color reflects high magnetic intensity area and this can be traced within the northern region of the map. Magnetic intensity values between 37.4 nT-43.1 nT (light-dark blue colors) represent low magnetic intensity region found in the southern part of the map. The two regions are separated by a portion of medium intensity signature characterized by green- yellow colors.

The residual map contains varied magnetic anomalies whose magnitude varied between 110.4 nT and 74.0 nT. These anomalies are more of high frequency, low amplitude and/ or short wavelength than those observed on the TMI map and have NE-SW structural trends. The northeastern and southwestern parts of the residual map are more or less dominated by low magnetic signatures (light-deep blue colors) typical of a sedimentary terrain while the high magnetic intensity signatures predominantly concentrated along the center cutting across the study area horizontally and is associated with pre-Cambrian basement rocks where solid minerals mostly settle.

Lineament Mapping and Delineation

The first vertical derivative map comprises of basement and sedimentary regions. The map also revealed presence of structures (lineament) aligned in NE-SW. Since structures (lineaments) are known to be good hosts for magnetic minerals, the structures found on the map might favor the mineral accumulation in the area.

Similar to the first vertical derivative map, the second vertical derivative map shows more clearly, the magnetic anomalies and discontinuities oriented in the NE-SW direction. The map revealed clearer image of the geologic features such as faults and veins present in the study area. Since minerals are mostly structurally controlled, the trend of structures (faults and veins) delineated on the second vertical derivative map may imply/ reflect the alignment of minerals like gold, tourmaline and tantalite around Shanga, Yelwa and Konkwesso.

The tilt derivative map revealed a more amplified image of the anomalous features (lineaments) in the study area. The map clearly shows that the area is fragmented by features such as outcrops, faults, cracks, fractures and joints. Hence the area may be a good site for mineral exploration target.

Conclusion

Qualitative and quantitative interpretation of aeromagnetic data over lower part of Sokoto basin was carried out with the aim of investigating mineral potential zones in the area. The residual map extracted from the total magnetic intensity (TMI) map was subjected to first and second vertical derivatives and tilt derivatives; the results unanimously led to delineation of NE-SW trending features such as fractures, faults and veins within which economic minerals mostly settle. It also revealed regions within the study area where such minerals can be located. The northeastern and southwestern parts of the study area corresponding to Shanga, Konkwesso and some parts of Yelwa which are occupied by basement complex may play host for economic minerals like Gold, Tourmaline, Tantalite, Gemstone, Granite e.t.c. confined in along the faults, fractures and veins identified.

References

[1]. Daniel, N.O., Mirianrita, N.O., & Emmanuel, O. (2015). A Case Study of Nsukka Area, Enugu State, Nigeria for Hydrocarbon Exploration. *International Journal of Physical Sciences,* 10(17): 503-519.
[2]. Obaje, N. G., Wehner, H., Scheeder, G., Abubakar, M. B. and A. Jauro. (2004). Hydrocarbon prospectivity of the Nigerian Inland basins: From the viewpoint of organic petrology and organic geochemistry. AAPG Bull. Vol. 88 (3), pp 325-353.
[3]. Muhammad, F. & Abdul-fatah (2010). Characterization of Gold Mineralization in Garin Auwal Area, Kebbi State, NW Nigeria using Remote Sensing. *Egyptian Journal of Remote Sensing and Space Science,* 13(2010):153-163.
[4]. Garba, I. (1994). Tourmalinization related to Late-Proterozoic-Early Paleozoic Lode Gold Mineralization in Birnin Yauri Area, Nigeria. *Mineralium Deposita,* 31(1994): 201-209.
[5]. Ministry of Mines and Steel Development, (2010). Gold Deposits: Exploration Opportunities in Nigeria. Research report.
[6]. Amuda, A.K., Danbatta, U.A., & Najime, T. (2013). Geology and Gold Mineralization around Kutcheri, northwestern Nigeria. Journal of Applied Geology and Geophysics, 1(6): 18-24.
[7]. Samson, A.O., Akinlolu, F.A., Dieter, R. (2014). Mineralogical and Geological Characterization of Gold Bearing Quartz Veins and Soils in parts of Maru Schist Belt Area, Northwestern Nigeria. An open Access Article by Creative Commons Attribution License. http://dx.doi.org/10.1155/2014.
[8]. Reeves, C.V. (2005). Aeromagnetic Surveys, Principles, Practice and Interpretation. Geosoft.
[9]. Labbo, A.Z., & Ugodulunwa, F.X.O. (2007). An Interpretation of Total Magnetic Intensity Aeromagnetic Map of part of Southern Sokoto Basin. *Journal of Engineering and Applied Sciences,* 3(2007):15-20.
[10]. Marwan, A.A., & Yahia, M.A. (2017). Using the Aeromagnetic Data for Mapping the Basement Depth and Contact Locations at Southern part of Tihamah Region, Yemen. Egyptian Journal of Petroleum. https://dx.doi.org/10.1016/j.ejpe.07.015.
[11]. Roest, W.R., Verhoef, J., & Pilkington, M. (1992). Magnetic interpretation using the 3-D analytical Signal. *Geophysics,* 57(6):116-125.
[12]. Hsu, S.K., Sibuet, J.C., & Shyu, C.T. (1996). High-resolution detection of geologic boundaries from potential- field anomalies: An enhanced analytic Signal technique. *Geophysics* 61(2): 373-386.
[13]. Ansari, A.H., & Alamder, K. (2009). Reduction to the Pole of Magnetic Anomalies using Analytic Signal. In Thabisani, N. (2015). Analytic Signal and Euler Depth Interpretation of Magnetic Anomalies: Applicability to the Beatrice Greenstone Belt. *Journal of Geography and Geology,* 7(4):108-112.
[14]. Thabisani, N., Mashingaidze, R.T., & Mpofu, P. (2015). Analytic Signal and Euler depth interpretation of magnetic anomalies: Applicability to the Beatrice Greenstone Belt. *Journal of Geography and Geology, 7(4):108-112.*
[15]. Adetona, A.A., udensi, E.E., & Ajelaga, A.G. (2007). Determination of depth to buried magnetic rocks under the lower Sokoto basin, Nigeria using aeromagnetic data. *Nigerian journal of Physics,* 19(2): 275-283.
[16]. Suleiman, T., Udensi, E.E., & Muhammad, S.B. (2014). Analysis of Aeromagnetic Data across Kebbi State, Nigeria. *International Journal of Marine Atmospheric and Earth sciences,* 2(1):41-51.
[17]. Bonde, D.S., Udensi, E.E., & Momoh, M. (2014).Delineation of Magnetic Zones of Sokoto Basin, in Northwestern Nigeria using Aeromagnetic Data. *International Journal of Engineering and Science,* 1(4):37-45.