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Emplacement of Lamproites in and around Ramadugu, Nalgonda District- ground Magnetic evidence

Ramadass.G[1]. Sri Ramulu.G[2] and UdayaLaxmi[3]

[123]Center of Exploration Geophysics, Osmania University, Hyderabad-500 007, India.

ABSTRACT

The total magnetic intensity data has been collected in and around Ramadugu Village in Eastern DharwarCraton to understand the magnetic evidence over the known Lamproites zones in conjunction with geology and geomorphology. Based on the magnetic, geological and geomorphological signatures observed from the known lamproites potential zones, new probable locations are identified in the study area. Nine magnetic lows and fourteen magnetic highs are traced, lows are representing the presence of Lamproites within the granite gneiss, and highs are observed over the presence of banded iron formations. The generated analytical (Horizontal, Vertical, Tilt, Analytical signal) maps from the total magnetic anomaly show the trends of the magnetic lineaments and trending in NW-SE, NE-SW &E-W direction.

The coefficient of variation (CV) of the magnetic data clearly identified four tectonic disturbed (A.B,C,D) zones, various faults and other lineaments/dykes and the intersection of lineaments, geological, morpho structural, tectonic aspects of reported occurrence of lamproites near Ramadugu and Vattikodu areas were found to be localized at surrounding of the domal peripherals. Using this criterion eight potential lamproites zones were delineated(2,3,4,5,8,9,10,11 and 13) in the study region.

The long normalized radial averaged power spectrum of the study area indicated that the depth to the granite gneiss basement is around 2 Km.The dyke configurations in the region was obtained via the inversion of magnetic profiles.

Key words:- Total magnetic intensity, Ramadugu, Lamproites, Analytical map and Power spectrum, Morpho- structural.

Introduction:-

Southern India Diamond Province (SIEP)perhaps the largest Kimberlite in the country is confirmed to the Dharwar Craton an ancient geological feature. Kimberlites/Lamproites rocks are transporters for the emplacement of diamonds from upper mantle to the crust. Lamproites are available in margins of Cratons or in Proterozoic mobile belts.The cratons include the Cuddapah Basin, the Pakhal Basin, and the Kurnool Basin. Kimberlites/Lamproites are occurred in all the continents in the world in different geological and tectonic settings and settled as volcanic pipes, Sills and Dykes (Jaques et al. 1984; Mirjenad and Bell, 2006; Davis et al. 2006; Chalapati Rao et al. 2004; Chalapati Rao et al. 2005; Prelevic et al. 2007).

In recent years, Geological survey of India (GSI) carried out systematic diamond exploration program (Alok Kumar et al 2013, Reddy et al 2003, Sridhar and Raju 2005 , Chalapathi Rao et al 2014 and 2004) in the Northwestern margin of the Cuddapah basin, Eastern Dharwarcraton (EDC) to identify the new zones of diamondiferous lamproites, which leads the delineation of cluster of Lamproites at west of Vattikod about 22 km from the Known Ramadugu and SomavarigudemLamporite Field, Nalgonda district, Telangana.(Joy et al. 2012; Kumar et al. 2013; Reddy et al. 2003;.Sridhar and Raju, 2005).

The present work was motivated by the need to obtain a clear perception of the structural configuration and depth estimations through qualitative and quantitative analysis of Total magnetic data in the Ramadugu lamproites field, Nalgonda district of Telangana State along the North Western margin of the Cuddapah basin, Eastern Dharwar craton.

2.0. Geology of the Study area:

The study area is located along the NW margin of the Cuddapah basin bounded by Longitudes 79°5′ to 79°25′and Latitudes 16°42′ to 16°58′(Fig. 1a). Geologically the area forms a part of the Eastern DharwarCraton (EDC) which is recognized for its emplacement of numerous lamproite bodies. The geological formations in the area (GSI,1999) include unclassified granites and gneisses of Archaean age, Cumbum shales, phyllites, Srisailam quartzites of the Cuddapah super group, and shales of the younger Kurnool group of rocks.The hornblende schist and amphibolites (Older Metamorphic) which are oldest rocks occur, as rafts, enclaves, and discontinuous linear bands, within the Peninsular Gneissic Complex. The district comprises migmatites, granites granodiorite, a tonalitic-trondhjemite suite of rocks and hornblende-biotite schist, meta-basalts, meta-rhyolite and banded hematite quartzite.

The Dharwar super group are exposed as linear belts near Peddavura on the Hyderabad-Nagarjuna sager road is trending in the NNW-SSE direction, is runs for about 20 km with a variable with of 500 m to 2 Km which extends partly beneath the Cuddapah basin. A number of dykes of dolerite, reefs of quartz and multiple fracture systems commonly trending N-S and ENW-WSE and NW-SE. The NW-SE trending dykes oldest followed by N-S and ENE –WSW trending dykes (Sridhar and Raju, 2005). These dykes run for tens of kilometers intermittently. The width of the dykes varies from the less than a meter to 20 meters. These dykes are massive and are mostly dolerite in composition, Quartz veins traverse the older rock unit and trend

N-S and N 30° E, S 30° W,N 60°E–S60° W and N 75° W and S75° E are common in the area.

3.0. Geomorphology of the study area:

Drainage density map of Ramadugu in and around region falls in toposheet N0s E44T1, E44T2 and E44T5) parts of Nalgonda district, Telangana State is shown in the Fig.1b. The area is drained by a number of streams joining the Peddavagu, Dindi, Musi, Aleru, Halia, Kanagallu and Palleru which form part of the Krishna River basin. The major drainage of the region is provided by the Halia river is tributaries of Krishna river. The well develop weather layer along with the fine drainage density gives rise to the numerous ponds in the region. From the relative relief in the Ramadugu region (156 m) and the dendritic to sub dendritic drainage, indicating a homogeneous nature of the area is controlled by joints, fractures, faults and dykes. Topographic highs are indicated by regions of a circular or radial alignment of the drainage (dome structures). Such dome structures taken in conjunction with faulted zones are potential lamproites indicators.

A morpho - structural criterion was deduced circular features (1 to 13) in Fig. 1b is a presence of major structural elements (faults, dykes, fractures, lineaments) for identified as the possible location for the occurrence of lamproites. However, three circular features (5, 8, 9 &11) have coincided with the already identified lamproites.

4.0. Magnetic data acquisition and analysis:

The Ramadugu study area(longitude 79°5′ to 79°25′and Latitudes 16°42′ to 16°58′) lies in Nalgonda district of State of Telangana, India. About 80 km south of Nalgonda town on the Nalgonda- NagarjunaSager road. Magnetic observations are taken using theModel-600 Proton precession Magnetometer, along all available approach roads and tracks in the region with a station interval of 200 m. to give a fairly even distribution of magnetic values for the entire region covering the total an area of 700 sq.km.The layout map of magnetic observations is shown in Fig.1a. Total 1280 stations are occupied in Nalgonda- Nagarjuna Sager road, south of Chandur to Kanagallu, Ramadugu in the Anumala mandal, Nalgonda district (Corresponding to the scale of 1:50,000). The N-S and E-W extend of this area that falls under Survey of India (SOI) Toposheet No. E44T1, E44T2, and E44T5. The position of the observation points was taken by using Global Position System (GPS) with an accuracy of 1m, to ensure reliability and accuracy of the radiometric and GPS elevation, location of geographic coordinates several observations (20 %) are repeated. The overall effective accuracy obtained for the magnetic data is ± 1nT.

In the Present study samples from all the important geological formations in the area were collected and their susceptibilities measures in the NGRI Laboratory. It is evident that the measured and average susceptibilities values vary over a significant range for the different geological formations 100- 400x10^{-6} CGS units for granites,81-1162x10^{-6} for peninsular gneisses,600-1800 x 10^{-6} cgs units for dolerite dykes and 58 to 91x10^{-6} cgs units for schist in the study area. These values agree fairly well with those reported earlier by Rama Rao et al,1991 granite gneisses 50-110x10^{-6} cgs, schist 120-400x10^{-6} cgs and dolerite 600-1800 x10^{-6} cgs units.

In the present ground magnetic survey and due to the relatively small spatial extent of the surveyed area. The co-ordinates for the each observation points for IGRF calculated. The geomagnetic field parameters were calculated for the study areas, using Oasis software and declination, varies from -1.27° to 3.0°, inclination vary from 21.24° to21.70° and the total magnetic field varies from 40210 to 42310 nT.

5. **Total Magnetic Intensity:**

The magnetic observations were subjected to diurnal variation and referenced to the base station at Hanuman Temple, Halia road, Peddavura artificial objects to were checked to remove any further effects due artificial objects. Fig.2 (a) shows the color shaded contour map of Total magnetic Intensity map of in and around Ramadugu region and the locations of villages also shown on it. The magnetic anomalies in the area range from 40676 nT in the northwestern side to about 42810nT in the northeastern side, with the general trend of the contours being NW-SE (Fig.1a). The conspicuous feature in this map is the NW-SE trend that corresponds with Peddavura schist belt and is characterized by steep magnetic gradients. Broadly, while magnetic highs are recorded over basic dolerite dyke and the correlation of lows over fracture zones is evident. The basic dyke is investigated and appears to be characterized by N-S,E-W, NE-SW and NW-SE trends, observed magnetic high/lows closures. The highest magnetic intensity values are observed at the northeast part of the study area might be of high magnetic susceptibility acting as the source of these intense variations in the magnetic intensity that varies from 40429 to 42810 nT can be attributed to the variation in susceptibility of rocks units in zones of fracturing/shearing/faulting or superposition by later metamorphic events. Thus, the flexures of linear second order anomaly trends reflect occurrences of dykes are later tectonic activity and so are important in the emplacement of lamproites.

6. Regional Magnetic Intensity:

The regional magnetic (IGRF calculated) intensity map of the study areas (Fig.2b.) presented, the regional magnetic to north indicating the thin flow of sediments in the southern part of the study area than the northern part of the study area. The trend of the Regional magnetic Intensity map of the study is in NW to SE direction.

7. **Reduction to the Pole:**

Reduction to the pole method transforms the observed magnetic anomaly into the anomaly that would have been measured if the magnetization and ambient field were both vertical as if the measurements were made at the magnetic pole.

To minimize the dipolar nature of the field, the reduced to- the pole (RTP) magnetic anomaly map is calculated for total intensity map of the study areas.A Geo-soft software is used. The study area under study and surrounding were subjected to various tectonic events along the geologic time. Each of these tectonic events has changed the structural setting of the area where these changes appeared on the RT magnetic contour map (Fig.2c) shows that the NW-SE, N-S and E-W are the main trends in the studied area where it represents lineament structures map of the area obtained through the interpretation of the total magnetic intensity (TMI) map.

This method requires knowledge of the direction of magnetization often assumed to be parallel to the ambient field, as would be the case of remnant magnetization is either negligible or aligned parallel to the ambient field, If such is not the case, the reduced – to –pole operation will yield unsatisfactory results**.**

8. **IGRF Corrected Total Magnetic Intensity(TMI):**

The International Geo-reference magnetic Reference Field (IGRF) of the study area was removed from the reduced to diurnal magnetic data. Figure 2d shows the IGRF corrected contour map of the total magnetic intensity of the Ramadugu region (contoured interval of 100 nT) along the locations of villages, shows the distinct pattern of highs (positive) and lows (negative) indicative of magnetic source are bipolar in nature . At some places, steep gradients between them are described as prominent magnetic lineaments, which are attributable to the complex assemblage of features of varied dimensions and directions from different phases of magmatic activity.

The (Fig.2d.) map shows an acute variation in the magnetic intensity indicating variations in the magnetic intensity. These variations are possibly related to the zones of structural variations based on the geological investigations. While the comparison of the magnetic signatures with the geology of the region not many inferences are made because the various forms of granites (migmatites, gneisses, pink/ grey granites and/or biotite granites) are magnetically not much distinctive. The magnetic highs and lows are in conjunction of subsurface faults in the granitic terrain. Not with the composition of the granites, the study area covers various forms of granites along with little Peddavuraschist. A few basic/ ultrabasic dykes are available as intrusive rocks. An NW-SE trend to NE-SW trends fault axis is evident in highs and lows in Fig.2d. Two other trends of magnetic high responses are also running in the same direction.

Broadly eleven magnetic high trends H1(running in between Ghanpuram to Mailapura), H2 (South of Teppalamadugu trending in the NW-SE direction and abrupt changes in direction East to West), H3 (trends situated in between Anumala –Halia striking NE-SW direction, H4 also trending NW-SE direction at east of Nidamanur which is indicating broad highs in the study region. Whereas H5,H6 trending small pockets of high, H7 is situated at the west of Vattikod, H8 runs in a zigzag manner at the west of Yacharam. All isolated highs closures are observed over the iron-banded formation over the isolated signatures and also highs are observed over dykes in the eastern side of the study region. The highs may be due to the upwards in the upper crustal layer and consequent thinning of the peninsular Gneissic layer. The isolated magnetic highs (H7,H8 to H11) closures probably represent relict schistose associated iron - banded formation or older metamorphic rocks within the granitic rocks. H9 is situated at east of Kanagallu, H10 falls at west of Kotayagudem in the N-S direction and H11 is trending in the NE-SW direction.

Also observed in fig 2d. seven magnetic lows L1(trending NW-SE direction lies in between Ghanapuram to Kacharam), L2 (East of Peddavura), L3 (NE-SW in between malepalem to Kottlapur), L4 (lies in the eastern part of the study region running in the direction of NW-SE continued up to Marepally east. Then the direction changes abruptly changing North- South. L5 is a small negative closure in the east - west direction, locate west of Marepally. L6 running from Chepur to Gurrampod in the direction of NW-SE, L7 falls northern part of the study region and east of the Kottayagudem runs NS direction. These prominent magnetic lows are indicating there are relatively deep and or/non - magnetic source/or basement with a slope directed towards west. The alignment of closures from Ramadugu, magnetic lows are significant forlamproites exploration smaller off-shoot of larger intrusions migrates up through fault system in the form of pipes and deposit lamproites. Though it is very difficult to arrive at any pattern to the occurrence of Kimberlite/Lamproites deposits. However, in general, the intersection of linear trends, bulging of contours, low second order magnetic anomalies, contact between dykes and gneisses(shear zones) are the favorable indicators (Ramachandran et al. 1999) search for Kimberlite/Lamproites.

The magnetic lows in the study area appear to be associated with lamproites pipes at Ramadugu and occur in the form of small pockets in the central and northeastern part of the region at the intersection of various contour trends and have zigzag and actuate shapes. The existence of the inferred faults associated with these trend pattern in the radiant Peddavura-Ramadugu region are also likely to be associated with lamproites, might be confined to Archean and Proterozoic cratons are linked to upwelling mantle due to drifting or a mantle plume (Kullerud et al 2011). However, the geochemistry and petrogenetic modeling of RLF samples (ChalapathiRao et al 2014) suggest a predominant contribution of sub-continental lithosphere mantle to their magmas, with a limited contribution from connecting (asthenospheric) components.

9. **Low - Pass Filtered Magnetic Intensity Map:**

With the view to eliminating the high - frequency noise, a low - pass filter (cut off frequency 0.003cyles/se.) was applied to data. Fig.2e. shows the color shaded contour map of the low pass flittered output of the total Magnetic Intensity in the study area. It is similar to the IGRF corrected and Low pass filtered output. The lows are obtained over the absence of Iron banded formations. Further, even the older metamorphic, basic intrusive and younger granites are associated with feeble magnetic signatures in the study area.

Fig.2e the distinct pattern of highs and lows and the steep gradients belts then at places that describe prominent magnetic linear are attributable to the complex assemblage of features of varied dimensions and direction resulting from different phases of magmatic activity, some of the features are associated with basic intrusive dykes that indicated zones of magnetic permeability.

9. **Residual Magnetic Intensity Map:**

Fig.2f is the residual magnetic Intensity map of the study area obtained from the total magnetic intensity map. The magnetic intensity values vary from -580 nT, to 359 nT. interestingly number of negative closures are surrounded by magnetic high closures reflecting as circular features.

10. **Derivatives of Total Magnetic Intensity:**

In order to qualitative interpretation of magnetic data such as estimation of the structural depth to the magnetic sources, analytical techniques like,horizontal, vertical derivative, analytical signal and tilt derivatives techniques were used in the present analysis.

1. Horizontal derivative:

Total magnetic data are often useful in defining the lateral and vertical extent and geological contacts more sharply contour maps as also give an estimate of the depth of the source body and the location and dip of its edges. Horizontal gradients of magnetic anomalies are clearly noticed over edges of tabular bodies. For near surface bodies with near-vertical contacts, the maximum horizontal gradient of magnetic as measured along the profile will occur nearly over the contact (Dobrin and Savit, 1988). From the fact that the horizontal gradient in the x & y direction (Fig.3a and 3b) it can be inferred that though Peddavura schist belt trending in the NW-SE direction, it occurs as the discontinuous body. However, in the study region shows varying trends NW-SE, NE-SW and E-W.

2. Vertical derivative:

The first vertical derivative is theoretically equivalent to observing the vertical gradient directly with a magnetic gradiometer. A vertical derivative map enhances the response from shallow sources, suppressing deeper ones by enhancing high wave number components of the spectrum. Thus, closely spaced sources can be better differentiated on derivative thus helping in the identification of more geological features.

Vertical derivatives, on the other hand, are based on the concept that the rate of change of magnetic field is much more sensitive. Therefore, such maps constitute a useful technique for demarcation of geological boundaries, details of which are obscured in the original map. Fig.3c is a plot of the vertical derivative of the total magnetic intensity of the study region. This map is dominated by essentially NW-SE and NE-SW striking anomalies. Most of the high - frequency anomalies are seen in the vertical derivative map.

c) Analytical signal:

The analytical signal (Total gradient) (Fig.3c) gives finer resolutions of magnetic anomaly trends and locations and disposition of causatives(Ramadass et al 1986) the anomaly square root of the(Nabhigain,1972) sum of squares of the horizontal (X and Y) and vertical derivatives (Z) along the orthogonal axes of the anomaly resolves the anomaly maps. It encompasses information of the magnetic field variation along the orthogonal axes completely defining it. Consequently, structural features and boundaries of causative sources can be determined more accurately.

From the analytical signal map of the magnetic in the signal shaded anomaly map of the study area is represented in Fig.3e of the study region is reflecting similar trends observed in total magnetic intensity map, which suggests that the magnetic basement occurs at shallow depth.

d) Tilt Derivative:

In general, the tilt derivative enhances the high frequencies relative to low frequencies and eliminates the long wavelength regional component and effectively resolves the adjacent anomalies. Miller and Singh (1994) introduced the tilt angle method for one-dimensional magnetic data and Veroduzco et al (2004) extended it to two - dimensional gridded data.Orcu and Keskinsezer (2008) proved that tilt angle technique is applicable to map the linear geological features from magnetic gradient data. Subtle anomalies attenuated in dynamic range due to the presence of high amplitude magnetic anomalies. Continuity of individual bodies features lateral changes in susceptibility and/ or depth of burial and. Edges of structures by adequately accounting for the nature of the rock magnetization. Rock magnetization is a vector quantity that consist of both remnant and geomagnetically induced components. The remnant component can affect the shape of the magnetic field response and results in spurious derivatives.

Oruc (2010) introduced the new edge detection technique based on the first vertical gradient of the magnetic anomaly. The tilt angle is the ratio of the vertical derivative to the absolute amplitude of the total horizontal derivative. Also, it produces positive and zero values over as well as the edge of the source region respectively whereas negative values outside the source region.

The vertical gradient (Fig.3c) and tilt derivative (Fig.3d) maps are similar with closures at the same locations, it can be inferred that though the BIF exhibits irregular trends with small closures, occurs as discontinues body. The correlation between magnetic trends, horizontal & vertical gradients, analytical signal, tilt derivative and structure of the Ramadugu region (Fig.3b) are brought out both on the general trends as well as geomorphology.

11.Coefficient of Variation:-

The coefficient of variation (CV) is calculated using following formula (Himbindu and Ramadass 2001)

$$C.V = \frac{\sigma}{X} \times 100$$

where σ is the standard deviation and x is average value of window.

We have chosen five point segment of the magnetic observations for calculating the CV. This technique immensely helps for picking up the geological contacts, tectonically disturbed zones, faults, surface bodies, structurally disturbed zone.

Fig.3 f shows the profile and contour color image map of the coefficient of variation of the magnetic anomalies in the study area indicatingfour broad zones A, B, C & D. These are tectonically disturbed zones might be identified potential lamproite zones consisted of examining the association of reported lamproites at Vattikugu(D) &Ramadugu (C), whereas A and B zones merit for further detailed investigations for possible mineralization.

For comparative analysis, structural features inferred from the Total magnetic anomaly (TMI) analytical techniques (horizontal, vertical, analytical and tilt gradient) shown in Fig. 4. Some of these lineaments correlate/or are coincident with the mapped structures such as faults, shear zones and dykes and a total ten (F1-F10) fault are mapped (Fig 4). The fault/lineament F1 is observed is located in the south western part of the study area which is the contact zone between the younger/ homophorous granites and granite. The fault F2 indicate the contact between the western and eastern margin of Peddavura schist and granite, F3 observed near Teppalamadugu is trending in the North south to North west direction. The fault F4 is trending in E-W direction from North of Teppalamadugu to Anumala. The fault F5 (NW-SE) running from Anumala to Ramadugu, Marepalle beyond trending from Haliya to Ramadugu East and F6 (NE-SW) are the important tectonic lineaments/fault zones in the study area which are highly disturbed nature. The emplacement of lamporites near Somvarigudem, Marepalli, Yacharam and Ramadugu regions are associated within fault/shear environment of F5 & F6. The F7 fault trending in the NE-SW direction from east of Kanagal. F8 separate the Lamporites of Vattikod from

GudrapalliLamporites running in the NW-SW direction. The observed total magnetic intensity over the Gudrapalli, Vattikod Lamporites and Somavarigudem lamproites recorded with high magnetic intensity might be due the association with the homophorous granite. F9 fault is situated at extremely west of Gurrampod to further north and F10 fault falls western part of the study region near east of Kalwapalli.

Sridhar and Rau (2005) recorded a total of 10 NW-SE trending lamproite dykes are found over an area of 25Km^2 in three different clusters in the Ramadugu area namely, five near Ramadugu, two near Yacharam and three near SomavarigudemVillage. These lamproites occur as dykes and trend essentially NW-SE as discontinuous isolated outcrops associated with intrusive contact with the basement granitoid (Chalapathi Rao et al 2014). Lamproites in the study area are emplaced along NE-SW directions; parallel to oblique to the foliation, joint, dyke and regional fault/fracture trends. Ramaudgu and Yacharam lamproites are emplaced along the contact zone between the dyke environment and granitie gneisses and imply the involvement of distinct deep-seated faults/fractures in controlling their emplacement. Likewise, while the Ramadugu lamproites occur as dykes. Lamproites at Somavarigudem occur in close association with dolerite dykes and fault contact environment is observed in lamproite emplacement in the study area. At Vattikod, most of the lamproites are emplaced at the contact zone between the Alkali Feldspar granite and biotite gneiss granitic –gneiss basement and in dolerite dykes. Also along WNE-ESE to NW-SE trending fractures.

From observed surface correlation of reported lamproites occurrences with intersecting lineaments/faults within region of domel peripheries, using this observation as criterion, nine potential lamproites zone were delineated at 4, 5,8,9,10,11 and 13 domal peripheries intersection with faults (F). However the prospects are not bounded to the limits of these three areas shown here, but due to occurrences of known lamproites, surrounding area can also be consideredRamadugu lamproites clusters occur as isolated dykes and trending NW-SE direction. These are covered by top soil, lamproites near Yacharam and Somivarigudem showing intrusive contact with granitoid (Chalapathi Rao et al 2014). The available EDC lamproite radiometric age and radiogenic isotope data (Anil Kumar et al 2001,Chalapathi Rao et al 2004) of Krishna lamproite field, Ramadugu lamproite field and Cuddapah lamproites were emplaced between 1225 Ma and 1450 Ma.

12. **Quantitative Analysis:**

12. Analysis of Radial Power Spectrum of the Magnetic Data:

Log - normalized radially averaged power spectrum is computed for the entire magnetic data to estimate the basement depth. The radially averaged power spectrum of ground/aeromagnetic data generally gives the depths of the different magnetic horizons (Spector and Grant, 1979; Naidu, 1970). Fig. 5. Shows the power spectrum of the study area, the power spectrum shows one straight line segment. The depth is computed from slope of straight line segment by using the formula:

$$\text{Depth} = 1/4\pi * (\Delta E/\Delta N).$$

Where $\Delta E/\Delta N$ is the slope of each segment.

ΔE is the log energy.

ΔN is the wave number increment.

The average depth computed from the power spectrum analysis is 2 km, this depth may represent the depth to the magnetic basement/granite gneiss basement in the Ramadugu study area.

In the present analysis, we have taken thirteen principal magnetic profiles for quantitative estimates for the geological bodies. To interpreted the magnetic profiles we used the MAGMOD software of Paterson, Grant and Watson, Ltd., Canada (PGW, 1982). We assumed two- dimensional infinite dyke models for the quantitative analysis, the obtained shape and size parameters of the interpreted thirteen profiles shown in Table 1 & Fig.6. However, the susceptibility values vary from 28 $X10^{-3}$ to $148X10^{-3}$ for low susceptibility bodies and $51X10^{-3}$ to $998X10^{-3}$for high susceptibility bodies. Close examination of the depth of the bodies indicated that high magnetic zones reflecting deeper penetration of dykes, whereas low magnetic anomalies having the shallow depths. The observed magnetic anomalies over magnetic highs represent, which are not expected at this latitude. The interpretation of these high also shows the inclination of 60˚. It is clearly understood that the bodies which are below the magnetic highs are remanently magnetized. These highs are agreed with the variation of susceptibly of Banded Iron Formation (BIF) or Schist formation. The Pedduvuru schist belt the magnetic anomalies absent might be dominated by amphibolies and other schistose rock instead of iron formations (Rama Rao et al.1991). The low magnetic zones falling over the lamproite identified zones. The tabular bodies having a width varies from 1600 m to 2600 m with the remnant magnetization of -20 degrees and also study area fallows 20 latitudes that may be the reason low susceptibility values are reported.

13. Structural Implications for Lamproite Emplacement:

There are no characteristics structural patterns for Kimberlite/lamproites occurrences. However, total magnetic Intensity surveys bring out complex patterns of highs and lows suggestive of close association with structural features such as shear zones, faults, fractures and contact between dykes and granites etc. They also aid in the determination of the disposition of utrabasic intrusions and doleritic dyke clusters. .These inferences, intern may have a bearing on Lamproite emplacement. Furthermore, smaller off-shoots of larger intrusions migrate up through fault system s in the form of pipes and deposit diamonds. Thus, intersection of linear trends, bulging of contours, low magnetic anomalies are favorable indicators in their search (Ramachandran et al 1999)

Interestingly, the magnetic anomalies in the Ramadugu region (Fig. 2d) occur at the intersection of various contour trends as bipolar features having zigzag and actuate shapes any may have some bearing on lamproite emplacement. Reported lamproites occur at west of Vattikod about 22 km from the Known Ramadugu and Somavarigudem Lamporite Field, (Joy et al. 2012; Kumar et al. 2013; Reddy et al. 2003;.Sridhar and Raju, 2005) revealed that they are associated with an E-W trending strike-slip faults with associated NE-SW resultant fractures domain in Ramadugu area and Somavariguda and Vattikod regions are predominantly NNW-SSE trending. From similarity of characteristic magnetic anomaly patterns (lows) associated with these lamproites with those in the rest of the study area.

Morpho - structural features have a strong affinity into kimberlite / lamproites emplacement at various locations in the cratonic shields of the world. Ramadugu study region also constitutes such favorable morphostructural features are favorable for lamproites emplacements. Integrated studies magnetic (analytical techniques) lineament patterns are lamproites occurrences may reveal further investigations in the vicinity of defined morph structural features (1 to 13) at intersections of lineaments and in surroundings of the domal peripheries (2,3,4,5,8,9,10,11and 13) and in conjunction with faulted zones,will probably favorable zones for lamproites locations are showing in Fig.4.

14. Summary and Conclusion:

Analysis of the Total ground magnetic data and Analytical maps of the Ramdugu area, EDC has been carried out to understand the nature of the magnetic anomalies over the know lamproite fields. Correlation of the geological, hydrological and geomorphological information with the and in conground magnetic data has yielded.

1. Morpho - structural features (marked as circles in Fig.1b) are identified in presence of major structural features such as faults, dykes, fractures/lineaments and in conjunction with the faults have coincided with the known lamproites.

2. The trends(NW-SE, NE-SW, and E-W) of the magnetic lineaments are deduced from the analytical maps such as Horizontal X & Y, Tilt, Vertical, and a derivative and analytical signal of the magnetic anomaly.

3. The Coefficient of Variation (CV) of the magnetic anomaly delineated structurally tectonic four zones of A,B,C and D. are delineated.

4. 2D radially averaged Power spectrum is indicated that depth to the granite gneiss basement near Ramadugu is around 2 km on mineralization takes place.

5. Nine magnetic low zones and four magnetic highs are modeled for quantitative estimations, the average depth of the bodies is varying from 700mtr to 5.8 which is correlated with depth computed from the spectrum analysis.

6. It is clearly understand from these studies emplacement of lamproites near Ramdugu village, Nalgonda, EDC is structurally controlled by a NW-SE, NE-SW, and E-W lineaments/faults/shear/fractures/zones and having a low magnetic nature.

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*Ta*ble.1. Body parameters of profiles inferred from inversion modeling of Magnetic Data

Sl.No.	*Profile No.*	*Depth (m)*	*Half Width (m)*	*Dip (Degrees)*	*Position (m)*	*Dip Direction (Degrees)*	*Inclination (Degrees)*	*Susceptibility (CGS units)*
1.	*L1*	*770*	*815*	*85*	*3140*	*270*	*-20*	*40.4 $X10^{-3}$*
2.	*L2*	*1310*	*1010*	*74*	*3165*	*60*	*0*	*148 $X10^{-3}$*
3	*L3*	*960*	*790*	*66*	*2790*	*20*	*-20*	*28 X10-3*
4.	*L4*	*1335*	*930*	*65*	*3000*	*350*	*20*	*32 $X10^{-3}$*
5.	*L5*	*1690*	*1080*	*90*	*4000*	*50*	*-20*	*78 $X10^{-3}$*
6.	*L6*	*1030*	*870*	*88*	*4500*	*240*	*-20*	*55 $X10^{-3}$*
7.	*L7*	*1860*	*927*	*89*	*2994*	*250*	*0*	*225 $X10^{-3}$*
8.	*L8*	*1845*	*530*	*50*	*2500*	*60*	*0*	*262 $X10^{-3}$*
9.	*L9*	*1410*	*978*	*54*	*2715*	*230*	*20*	*49 $X10^{-3}$*
10.	*H1*	*5820*	*1300*	*74*	*4956*	*50*	*60*	*117 $X10^{-3}$*
11.	*H2*	*5467*	*1914*	*55*	*3940*	*0*	*60*	*90 $X10^{-3}$*
12.	*H3*	*4336*	*1129*	*10*	*3014*	*30*	*60*	*998 $X10^{-3}$*
13.	*H4*	*3685*	*648*	*75*	*5898*	*210*	*60*	*51 $X10^{-3}$*
	Average Depth	*2400*						

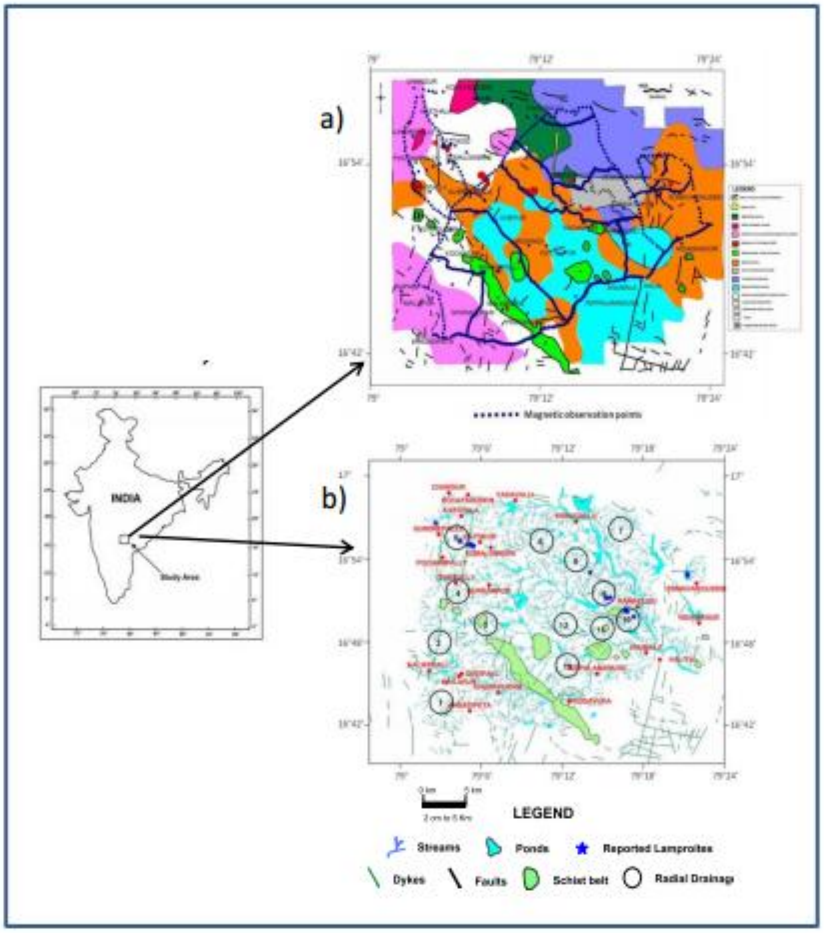

***Figure 1:** - (a) Geological(Sriramulu et al 2016) and Magnetic layout map of the study area in and aroundRamadugu, Nalgonda District.T.S, (b) Geomorphology of the study*

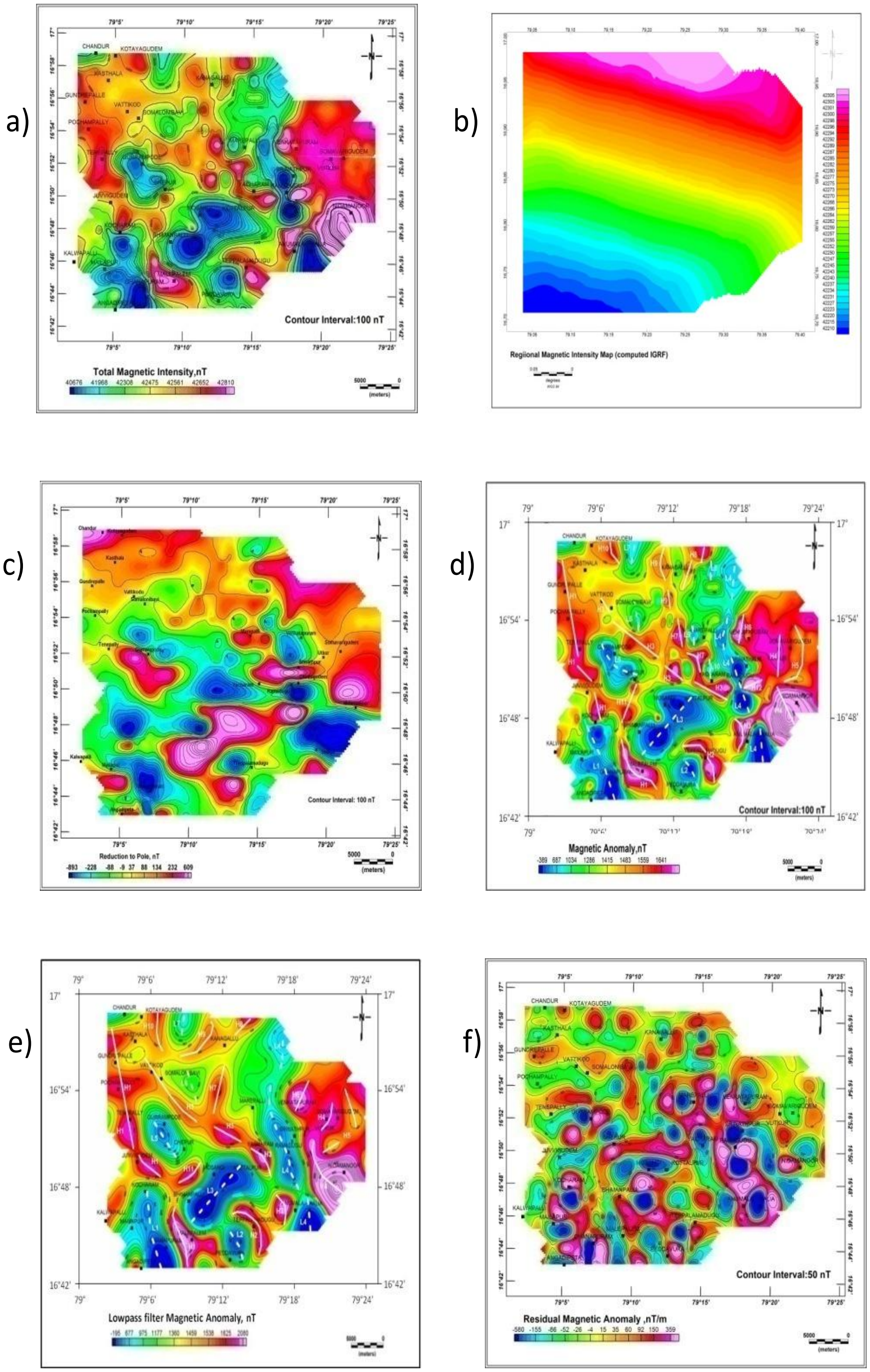

Figure 2:- *(a) Total magnetic Intensity of the study area, b) IGRF calculated map, c) Reduction to Pole Magnetic anomaly Map, (d) IGRF of corrected magnetic anomaly of the study area, (e) Lowpass filter magnetic Anomaly map, (f)Residual magnetic map of the study area.*

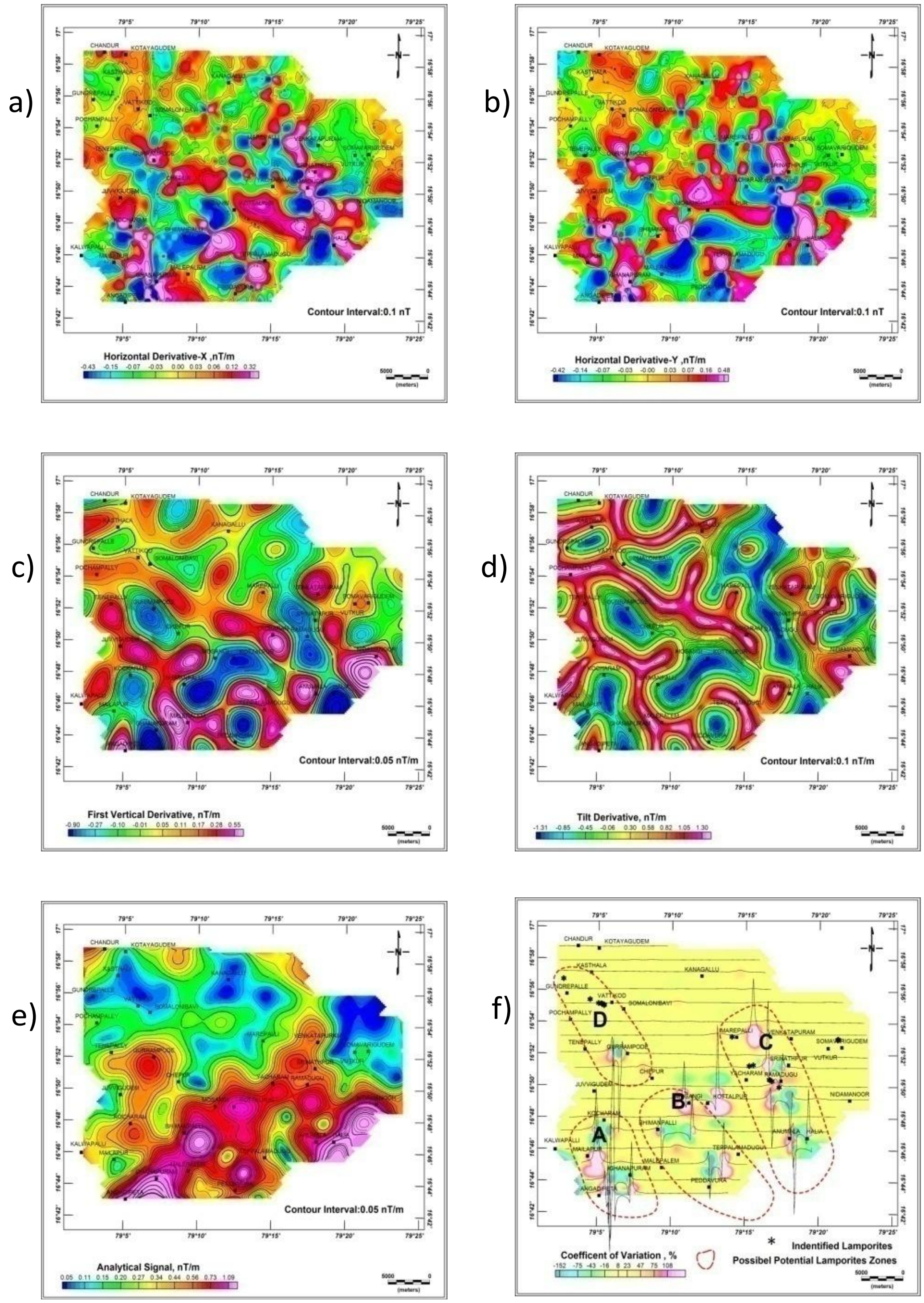

Figure 3:- *(a) Horizontal derivative of the magnetic anomaly in X direction, (b) Horizontal derivative of the magnetic anomaly in Y direction, (c) Vertical derivative of the magnetic anomaly with identified*

Lamproites, d) Analytical Signal of the magnetic anomaly with identified Lamproites, (e) Tilt derivative of the magnetic anomaly, (f) profile and contour color image map of the coefficient of variation

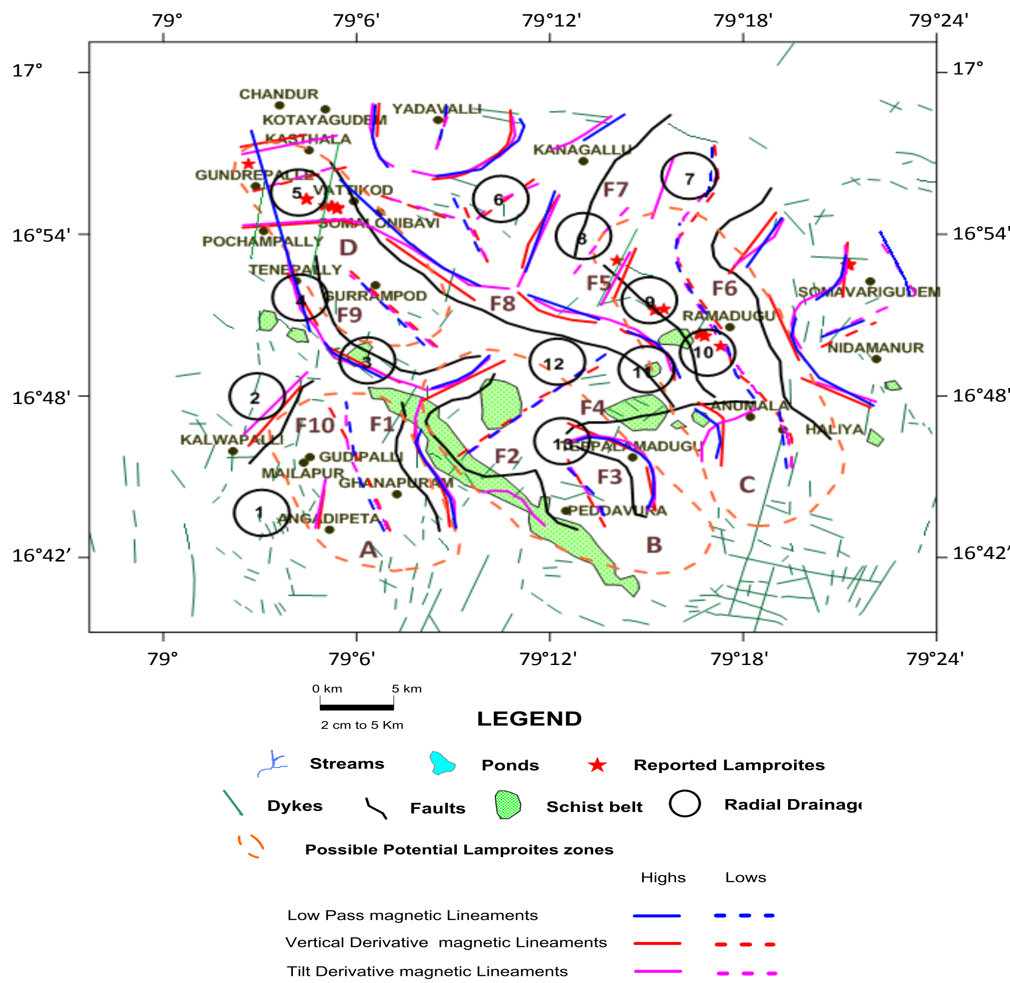

Figure 4.Structural map of the study region in and around Ramadugu, T.S., India, as inferred from Total magnetic Intensity data analysis.

Coefficient of Variation profiles magnetic anomaly and image of the study area with probable mineralized zones (A, B, C & D).

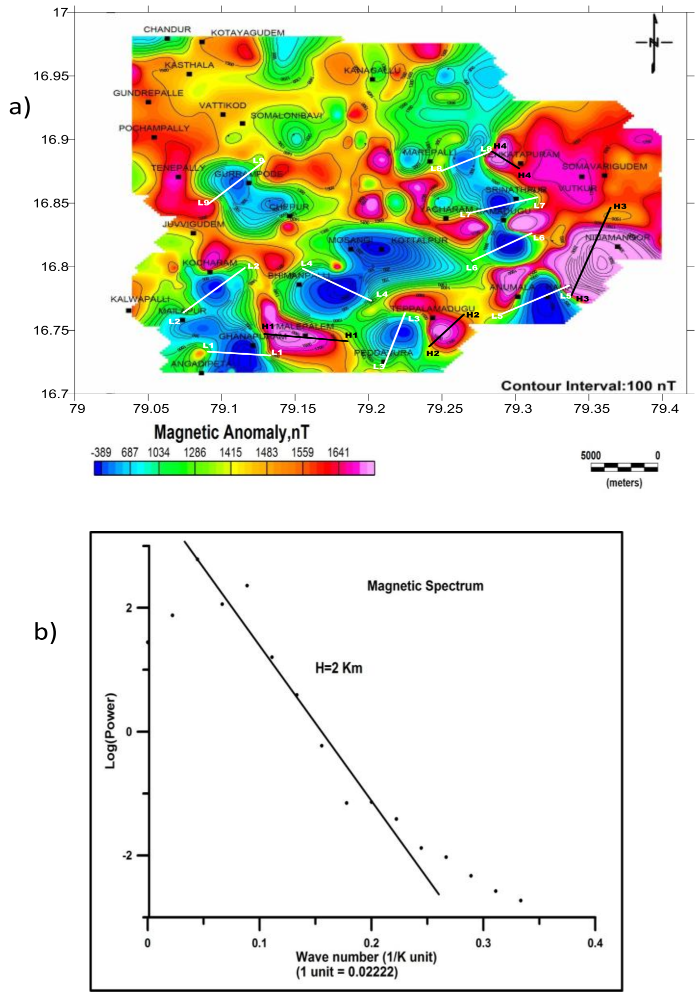

Figure 5:- *a) Locations of the Interpreted magnetic profiles shows the nine profiles (L1-L9) and (H1- H4),* ***b)****Radially averaged power spectrum of the magnetic anomaly of the study area.*

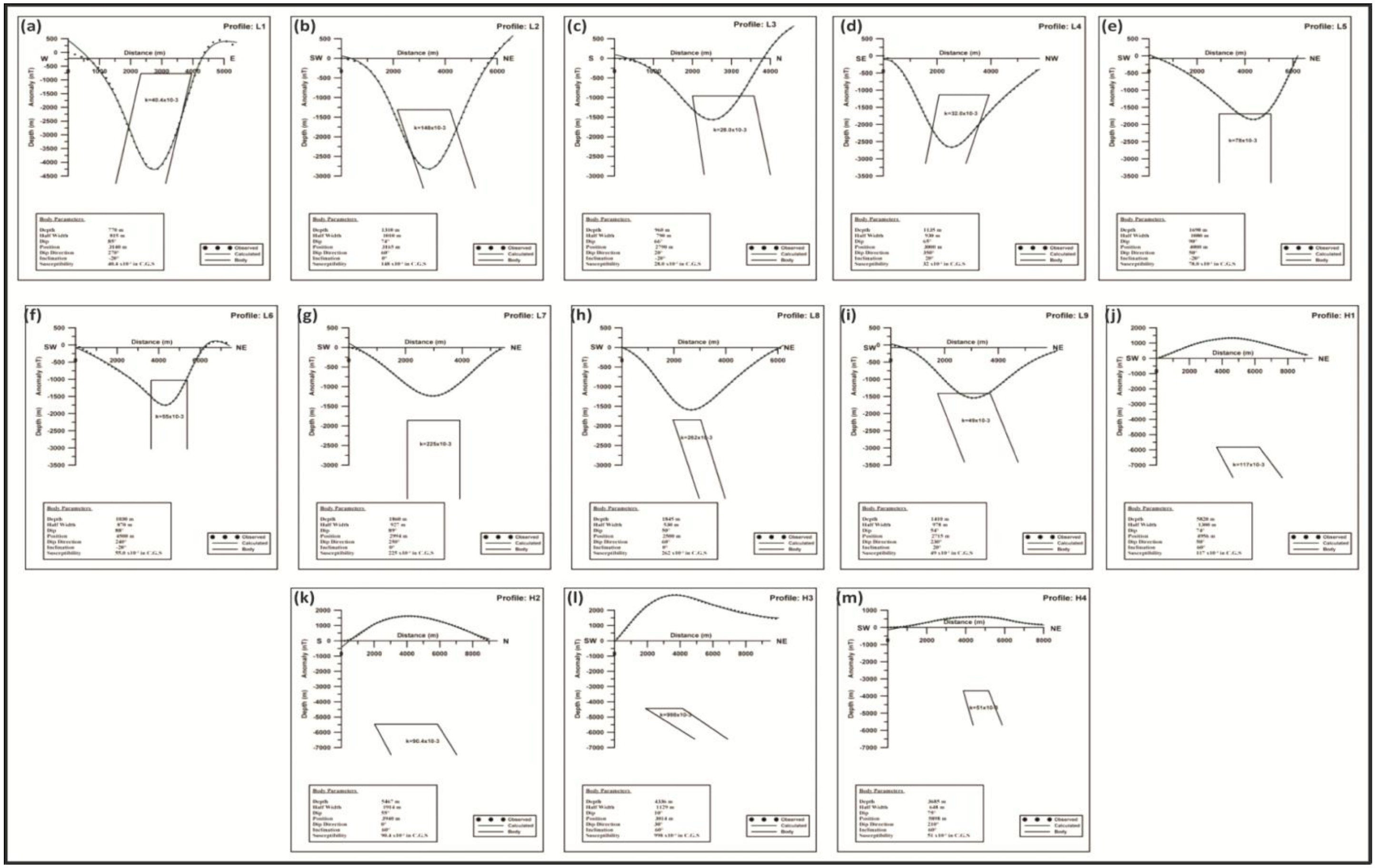

Figure 6:- Interpretation of magnetic anomalies along the profile L1-L9 and H1-H4 show the shape and size parameters