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Inferences from Satellite Images for Locating Kimberlite: Mahabubnagar Area, Telangana, South India

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ABSTRACT

Remote sensing data is used for mapping on regional scale and to delineate the structure of various tectonic belts, lineaments and fracture patterns. Lineaments and their intersections and contacts are favourable sites for localization of Kimberlite bodies, which are the main host rocks of Diamonds. The Eastern Dharwar Craton(EDC) is known for its Kimberilte pipes around Wajrakarur, Raichur, Maddur, Narayanpet etc. An IRS LISS-III image covering an area of 1440 sq.km west of Mahabubnagar town, which is located south east of Narayanpet Kimberlite field was processed and interpreted to bring out possible emplacement of Kimberlites. Kimberlite of Narayanpet is associated with ENE-WSW and E-W lineaments. By analyzing structure, geomorphology, drainage patterns derived from satellite imageries, structural zones favourable zones for Kimberlite rocks are demarcated.

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Introduction

It is known that remote sensing is a useful aid to geological mapping and has been in practice for the last several decades (Griffiths et al. 1987; Abdelhamid & Rabba 1994). Computer enhanced multi-spectral digital images provide an excellent means for mapping the distribution and geometrical patterns of lithologic units that commonly reveal the tectonic setting and local fold and fault structures (Watson & Knepper 1994), which often constitute the structural controls of mineralization and also possible emplacement of kimberlites/lamproites.

The occurrence of kimberlite has been considered to be restricted to rigid cratonic nuclei of very old age of 2Ga (Clifford, 1966). Modern genetic model of kimberlite / lamproite (K/L) (Haggerty, 1992,2004) envisages its origin through plume interaction with fertile asthenosphere, depleted lithosphere and metasomatically enriched mantle. The Haggerty model further highlights the fact that diamondiferous kimberlites / lamproites are related to deep cratonic root zones. The granite-greenstone terrain of Eastern Dharwar Craton (EDC) shows effects of three phases of deformation. While the earlier two deformations gave rise to the NNW-SSE to NW-SE trending penetrative fabric marked by the general schistosity / gneissosity and major faults and shears parallel to it, the third produced broad warps along E-W to ENE-WSW trending axes. The NNW-SSE to NW-SE trend is intersected by major ENE-WSW to E-W and NE-SW trending faults/lineaments which are associated with Kimberlite. (Nayak et al.,1998). Based on the structural interpretation of the Bourger gravity (Ramachandran et al., 1999) it is proved that the Wajrakarur and Narayanpet kimberlite pipes are all located within the NNW-SSE to NW-SE trending sets of contiguous fault / fracture. So it is well established that the Kimberlites of EDC are structurally controlled and emplaced through weak zones.

An IRS LISS-III image covering an area of 1440 sq.km west of Mahabubnagar town (Fig: 1), covering parts of Toposheet nos. 56H/10 & 56H/14 falling within 16° 30″; 77° 30″ and 16° 45″ 78° 00″ processed and interpreted to bring out possible emplacement of Kimberlites. The area is located south east of Narayanpet Kimberlite field (toposheet no. 56H/9).

Geological Setting: Geologically the area forms a part of the Eastern Dharwar Craton (EDC) which is recognized for its emplacement of numerous kimberlite and lamproite bodies (Fig:1).The area is occupied by rocks of the Peninsular Gneissic Complex, which comprises granodiorite and granite. The mutual field relationships supported that the Tonalite-Trondhjemite Gneiss (TTG) suite is the oldest among the three (Tonalite-Trondhjemite Gneiss, Tonalite-Granodiorite- Adamellite(TGA) & Adamellite- Granite(AG) and successively followed by the intrusion of pluton of TGA and AG suites (Gopal Reddy *et al* (1991). A range of microgranitoid dykes, together with xenoliths of microgranitoids, ultramafic, mafic and doleritic rocks occur in combination with TGA suite. The post tectonic acid and basic intrusive cut across all the units are quartz reefs and dolerite/gabbro/ pyroxenite dykes respectively..

Image interpretation techniques

Multispectral remote sensing data has shown tremendous potential for application in various branches of geology like delineation of lithology, structure, geomorphology and geoenvironmental studies. Type and composition of minerals determine the spectral response of the rock type (Singer 1980; Miller & Pearson 1971, Price 1995). Pandey(1987) summarized the signatures of various types on remotely sensed images. Since the development of image processing and remote sensing technology, mapping procedures have undergone drastic changes. Detailed explanations of digital-image-processing techniques in geology are described, among others, in Colwell (1983), Campbell (1987), Lillesand and Kiefer (1993).

The Geo-coded IRS P6 LISS III data set acquired on 6th Oct, 2005 ,Path 99 R 61, (Fig:2) has been used to derive various litho units, geomorphology, drainage and Lineaments in the area of study. The IRS P6 LISS III has four spectral bands with a spatial resolution of 23.5m. The spectral channel includes three visible bands (B1-B3) between 0.52 and 0.86µm and one shortwave infrared (SWIR) band (B4) between 1.55 and 1.70

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mm. The data was processed with ERDAS 2010 software and FCC of Band 321 was generated for the whole study area. The FCC was used to generate lithology, geomorphological Landforms and Lineament of the study area. The satellite data interpretation of remote sensing images for extracting various Geomorphological, Structures and geological information in an effective way was done by using several basic interpretation keys or elements.

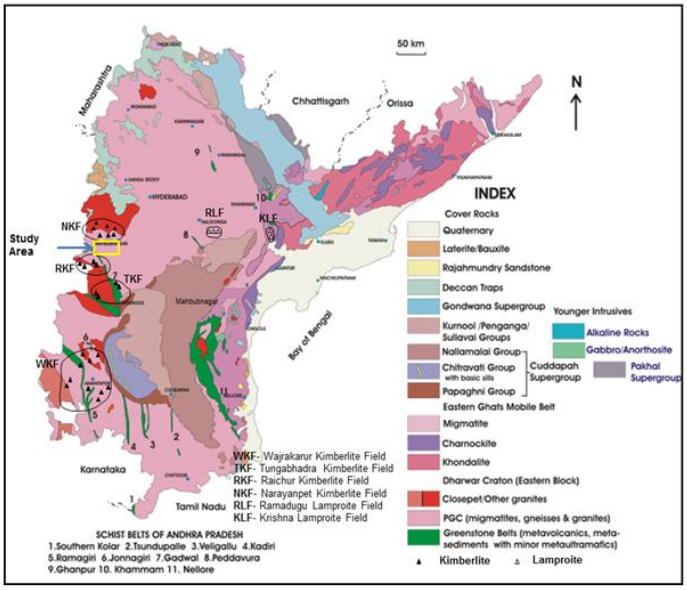

Fig 1. Locational map of the study area

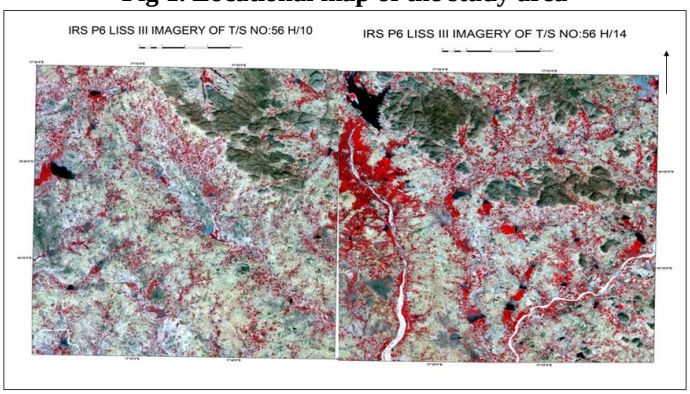

Fig 2. Satellite Imagery(IRS LISS-III) of Toposheet no. 56H/10 & 56H/14.(data source: PGRS Division, SR, GSI, Hyderabad

Geomorphology

Geomorphology is one of the critical theme information for all the application projects. Geomorphology plays an important role in various field of geology. In diamond exploration the understanding of surface/subsurface geology is a primary requirement for planning exploration and exploitation strategies. Structure plays an important role for reducing the resistance of rock which manifests itself in different geomorphic forms. Area selection for the diamondiferous Kimberlite and lamporite search can be improved by paying attention to the geotectonic controls of diamond formation and preservation (Helmstaedt & Gurney,1995).

Kimberlite and olivine lamproite are often pervasively serpentinized, making outcrops the exception rather than the rule. In many cases, geomorphic expressions of pipes are subtle to unrecognizable. The Kimberley pipe in South Africa was expressed as a slight mound, but nearby pipes (i.e., Wesselton pipe) were expressed as subtle depressions. Others produced subtle modifications of drainage patterns (Mannard 1968). In the semi-arid region of Wyoming and Colorado, a few kimberlites are expressed as slight depressions, but most blend into the surrounding surrounding topography and may or may not have a subtle vegetation anomaly. Brown, et al., (2013), studied more than 900 kimberlite bodies from 12 kimberlite fields eroded to depths of between 0 m and >1200 m, suggesting that the erosion level of a region could be used to predict the maximum potential size of a pipe where it intersects the surface.

Thick development of Calcrete is a characterisitic feature a few Kimberlite pipes of Mahabubnagar district near Kotakonda (Ravi, 2010), The two kimberlite bodies (CGK-1 & CGK-2) located close to Chagapuram village (T.S.No.56H/16) at the contact of the Peninsular Gneissic Complex (PGC) with the Gadwal Schist Belt (GSB) occur in a peneplained terrain (~330m above msl), capped by ~1-3m thick brown /black soil. Of the two bodies, CGK-1 is exposed in a well section with ~ 6m thick calcrete. The CGK-2 is not exposed but capped by thick kimberlitic calcrete. The kimberlites are highly weathered and carbonated. Three kimberlite bodies. WNW of Kalyandurg town (Toposheet no57E/2), Anantapur district viz., KL-1, KL-2 and KL-3 (Nayak et.al, 1999) located about 15 km, is covered with thick alluvium and calcrete.

Landforms of denudational origin

Landform of denudational origin is formed where the denudation process dominates over the other process. Most of the landform resulting due to this process is the combined effect of mechanical and chemical weathering. Denudation is the process of removal of material by erosion and weathering. This has direct influence on the relief of the area especially in the reduction of relief to the base level.

In the present study the various geomorphological features (Fig:2&3) were interpreted and studied from Satellite Imageries, Topographic maps and verified by field traverses. The various geomorphological features such as Structural Hills- Moderately Dissected Hills and Valleys, Homocline, Residual hills, Tor, Residual mound, Pediment, Pediplain, Gullied Land, Valley fill were marked. Among which, pediment and pediplain which is an erosional features as well as dissected hills and valleys are important for Kimberlite exploration.

Pediment: A broad, flat or gently sloping, rock floored erosion surface or plain of low relief, typically developed by sub-aerial agents (including running water) in an arid or semiarid region at the base of an abrupt and receding mountain from or plateau escarpment, and underlain by bedrock (occasionally by older alluvial deposits) that may be bare but more often partly mantled with a and discontinuous veneer of alluvium derived form the upland masses and in transit across the surface. These features are observed immediately along the foot hills forming an outer margin of the hills. Development of thick pediments are observed west of Pulimamidi, Jajapur and along the border of Koilkonda reserve forest, from east of Devarkadra to the west of Janampet. In the southern part it extendsfrom Gudibanda to Kandur and in the central part from Devarkadra to Puttapalli.

Pediplain: This is an important geomorphic feature in respect to Kimberlite exploration. An extensive, multi-concave, rock cut erosion surface formed by the coalescence of two or more adjacent pediments and occasional desert domes, and representing the end result (the pediplain) of the mature stage of the erosion cycle. They extend from Vutkur in the southwest to Singaram in the north mainly falling over the banks of Malavagu river. Also observed from Dhanwada in the south to Ammiredipalli in the north covering the banks of Mannuvagu river and its tributaries, banks of Peddavagu, Devarkadra Vagu. South of Devarkadra vagu up to Kavkuntla in the south.

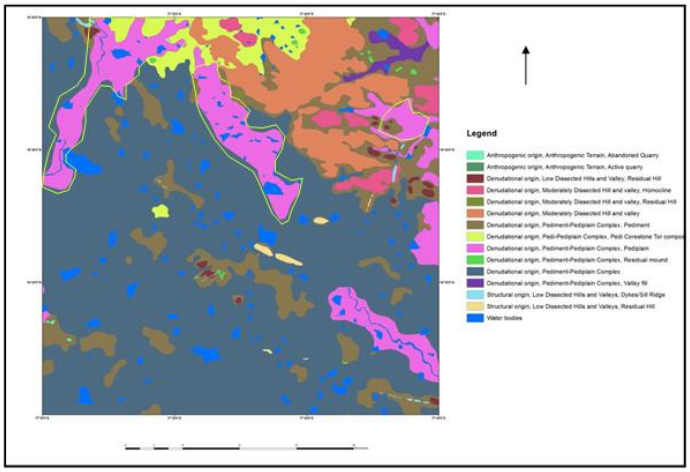

Fig 3. Geomorphology of the study area Toposheet no. 56H/10

Dissected Structural Hills and Valleys : Hills and Valleys, which are originated due to tectonic process and are highly dissected by the drainage lines. This can be further classified as highly, moderately and low dissection depending on the density of joints and drainage. These features were observed in the northern part of the study area as well as in the central part (Koilkonda Reserve forest). Mainly composed of granite gneiss, leuco granite with numerous basic dykes criss crossing the above lithology with moderate forest cover.

Landforms of Structural origin

Geomorphic landform of structural origin is related to structural aspect of the area. Most of the landforms under this class has genesis related to underlying structure. The mega scale forms have a dramatic effect on the genesis of landforms and hence mapping of such forms indirectly indicates the structural set up of the area.

Dyke and Sill Ridge: Intrusive features that are emplaced within the pre-existing fractures or where the fluid pressure is great enough for them to form their own fracture during emplacements. They are discordant bodies. The concordant equivalents are sill and mostly form sheet like plutons. North of Madaram over prominent dolerite dyke running up to 20kms. The cross cutting of dykes are considered to the weak zones and favorable for Kimberlite emplacement.

Based on the geomorphological features of the area a total of six area which are marked in yellow in Fig: 3& 4 are delineated.

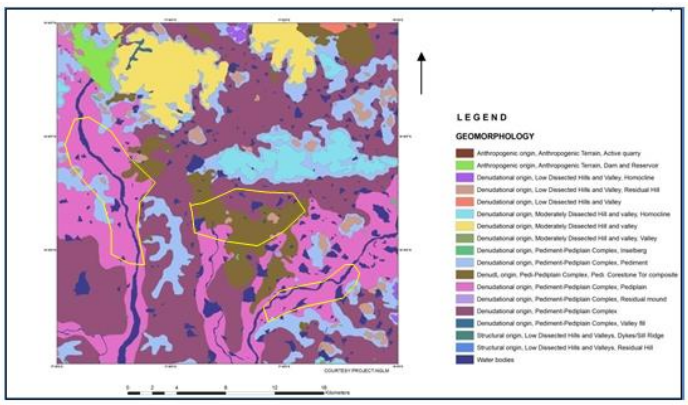

Fig 4. Geomorphological map of Toposheet no 56H/14

Drainage pattern

The drainage map for the study area (Fig. 5) was derived from the Digital elevation model of SRTM data and cross checked with Survey of India Toposheet. The basement structure highs manifest itself on the surface as geomorphic anomaly like annular drainage pattern, radial pattern, sudden change in the river course etc. The major stream is the Peddavagu which runs N-S in the central part of the study area originating from koil sagar reserviour. This is has numerous tributaries originating from the hillocks. One of the main tributary is Mane vagu which originates from the western of the study area and Devarkadra vagu in the east central part of the area. These streams are fed by numerous first and second order streams which are mainly rain fed, therefore only seasonal and remain dry for the most part of the year. The drainage pattern is *dendritic* to *sub – dendritic* controlled by joints, fractures and faults, where integrated drainage patterns consisting of small branch channels join, usually at acute angles, to feed a trunk channel. They show no preferred orientation, and are typical of areas where the underlying rock is more or less homogeneous. The area is under active canal cultivation, supported by well-connected irrigation tanks cutting across across major streams, which has resulted in the reclaiming of the most of the streambeds upto 3rd and 4th order .The streams of the area in the rainy season are all active and water logged due to the supply of water through the above networks of canals and tanks. Sudden change of stream course is an indication of structural disturbances which are favourable for Kimberlite emplacement. The areas marked in red are favourable zones.

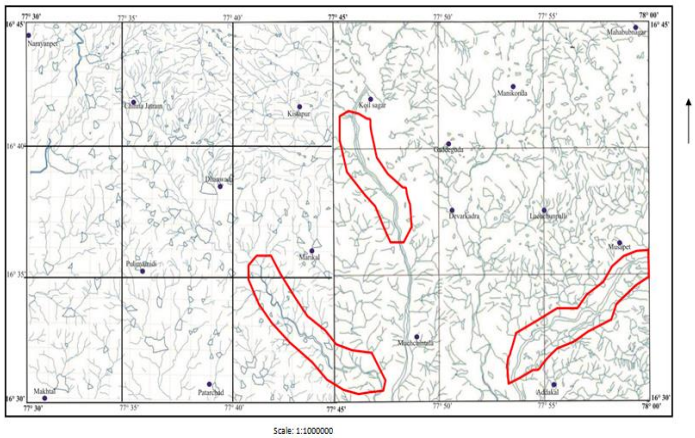

Fig 5. Drainage map of the study area. The areas marked as red are favourable for emplacement of Kimberlite

Lineaments

Lineaments are surface manifestations of linear features of both local and regional nature which may represent bedding planes, foliation, fault plane, joint, fold axes, lithological contacts and dykes (O' Leary et al, 1976, Archarya et al 2007, Rahim and Pettinga 2008, Kazemi et al, 2009). Similarly, the significance of lineament, which reveals the hidden architecture of the rock basement has been recognized only recently with the advancement in geologic remote sensing. Lineaments from remote sensing data can be identified mainly based on their linear nature, presence of moisture, alignment of vegetation, alignment of ponds, straight stream segments etc. The main criteria for the area selection of the present study area is the presence of Maddur and Narayanpet kimberlite field in the north and eastern part of the area where in the kimberlite had emplaced within the structural weak zones i.e the cross cutting and intersection points of NE-SW and NW-SE fractures and lineaments. The region around Narayanpet- Maddur field is characterized by good structural locales (Ramachandran et.al,1999) for potential Kimberlite occurrences. Lineament identification mainly involves recognition of diagnostic morphological features, texture and tone of the images.

Table 1. Location of Block Areas Demarcated For Detailed Exploration For Kimberlite

Block no	Location			Area (sq.km)	PROMINENT FEATURES
	Toposheet	Lat & Long	village		
1.	56H/14	16° 44′ 58″;77° 55′ 25.6″ to 16° 44′ 58.3″;77° 57′ 38.5″ &16° 43′ 2.8″; 77° 55′ 29.6″ to 16° 43′ 03″ ; 77° 57′ 38.1″	West of Mahabubnagar	13.65	Cross-cutting of lineaments. NW-SE & E-W. Dissected hills and valleys.
2.	56H/14	16° 43′ 34.9″; 77° 50′ 42.5″ to 16° 43′ 31.1″;77° 52′ 56.2″ & 16° 41′ 46.8″;77° 50′ 47.4″ to 16° 41′ 40.9″; 77 52′ 54.5″	Manikonda	12.21	Cross-cutting of lineaments. NNE-SSW & NW-SE. Dissected hills and valleys
3.	56H/14	16° 44′ 24.1″; 77° 47′ 58.5″ to 16° 44′ 27.8″ ; 77° 49′ 46.2″ & 16° 42′ 24.5″; 77° 47′ 56.7″ to 16° 42′ 23.9″ to 77° 49′ 47.7″	east of Koilsagar	12.5	Cross-cutting of three lineaments NW-SE & NNE-SSW & NE-SW. Dissected hills and valleys.
4.	56H/14	16°41′16″; 77° 41′ 16.2″ to 16°41′ 13.9″ ; 77° 50′ 1.2″ & 16°39′ 34.5″; 77° 49′ 15.9″ to 16°39′ 35.3″; 77° 49′ 59.8″	Gaddeguda	4.7	Cross-cutting two of lineaments. NW-SE & NE-NW. Dissected hills and valleys, Pedilplain.
5.	56H/14	16° 39′ 11.2″; 77° 51′ 48″ to 16° 39′ 6.1″ ; 77° 53’ 24.9″ & 16° 37′ 46.4″; 77° 51′ 43.3″ to 16° 37′ 42.8; 77° 53′ 23.6″	North east of Lachun palli	7.3	Cross-cutting two of lineaments. NW-SE & NE-NW. Dissected hills and valleys. Pediment
	56H/14	16° 40′ 16.8″; 77° 55′ 13.1″ to 16° 40′ 15.9 ″; 77° 57′ 23.4″ & 16° 38′ 17″; 77° 55′ 11.5″ to 16° 38′ 20.3″; 77° 57′ 25″	North west of Lachun palli	14.3	Cross-cutting three of lineaments. NW-SE & NE-NW & NNE-SSW. Dissected hills and valleys, Pediment, pediplain.
7.	56H/14	16° 34′ 44.4″; 77° 49′ 15.9″ to 16° 34′ 26.9″; 77° 50′ 28.4″ & 16° 33′ 25.7″; 77° 48′ 44.1″ to 16° 33′ 15.3″; 77° 50′ 2.2″	East of Lalkota	5.3	Cross-cutting two of lineaments, NW-SE & NNE-NNW. Pediplain
8.	56H/14	16° 32′ 32.5″; 77° 56′ 13.6″ to 16° 32′ 34.8″ ; 77° 57′ 35.5″ & 16° 31′ 26.9″; 77 56′ 13.6″ to 16° 31′ 24.7″ ; 77° 57′ 37.1″	North of Addakal	4.6	Cross-cutting two of lineaments and basic dyke NW-SE & NE-NW & N-S trending joint/ fracture
9.	56H/14	16° 31′ 53.9 ″;77° 46′ 30.9″ to 16° 31′ 52.6″; 77° 48′ 48.1″ & 16° 30′ 21.4″; 77° 46′ 28.6 to 16° 30′ 20″; 77° 48′ 55″	Sitarampeta	11.5	Cross-cutting of two lineaments. NW-SE & EE-SSW. Pediplain
10	56H/10	16° 43′ 9.9″ ; 77° 39′ 46.6″ to 16° 44′ 17.6″; 71° 41′ 19.8″ & 16° 41′ 21.7″; 77° 42′ 4.4″ to 16° 42′ 12.5″ ; 77° 43′ 22.3″	West of Kistapur	17	Cross-cutting of two lineaments. NW-SE & NE-NW. Dissected hills and valley, pediment.
11	56H/10	16° 43′ 43.7″; 77° 35′ 20.2″ to 16° 44′ 55.3″; 7°7 37′ 22.5″ & 16° 41′ 16.6″; 77° 37′ 49.5″ to 16° 42′ 39.7″; 77° 37′ 57.5″	Ayyavaripalli	31.9	Cross-cutting three of lineaments. NW-SE & NE-NW & NNE-SSW. Dissected hills and valley, pediment.
12	56H/10	16° 45′ 00″ ; 77° 31′ 19.2″ to 16° 45′ 00″; 77° 33′ 17.2″ & 1°6 42′ 43.3″; 77° 32′ 57.8″ to 16° 43′ 8.9″; 77° 34′ 28.9″	Singaram	14.3	Cross-cutting of two lineaments. NW-SE & NE-NW. Dissected hills and valley, pediment.
13	56H/10	16° 40′ 34.8″; 77° 38′ 58.7″ to 16° 42′ 0.6″; 77° 40′ 31.6″ & 16° 38′ 36.5″; 77° 40′ 56.7″ to 16° 40′ 14.3″ to 77° 42′ 54.1″	North of Dhanwada	21.7	Cross-cutting of two lineaments. NW-SE & NNE-SSW. Pediment. Pediplain
14	56H/10	16° 36′ 59.8″; 77° 41′ 54.1″ to 16° 38′ 48.3″; 77° 43′ 21.1″ & 16° 36′ 15.7″; 77° 43′ 9.5″ to 16° 38′ 15.8″; 77° 44′ 30.6″	North of Marikal	10.5	Cross-cutting of dykes and lineaments. NW-SE & NE-NW & NNE-SSW. Pediment. Pediplain.
15	56H/10	16° 35′ 55.3″; 77° 36′ 9.3″ to 16° 38′ 22.1″; 77° 37′ 52.2″ & 16° 34′ 37.4″; 77° 38′ 10.9″ to 16° 36′ 57.3″; 77° 39′ 51.4″	North east of Pulimamidi	24.8	Cross-cutting of ridge parallel structural lineaments. NW-SE & NE-NW. Pediment. Pediplain

Lineaments interpreted for this study include mostly the tectonic lineaments such as fracture-alligned streams, linear litho contacts and linear tectonic features (fault/shear).From the structural interpretation through the geological map and field checks it is obvious that the same sets up of fracture domains of Maddur-kotakonda-Narayanpet area are found in the study area. The regional around Maddur, a rich Kimberlite field is characterized by intersection of a few major and several major tectonic movement. (Nayak et al,1988, Babu Rao et.al,1992, Sreerama Murthy et.al, 1997,1999) A two–fold classification has been adopted for lineaments based on their length and genesis. Based on their length lineaments have been classified into Mega lineaments and Micro lineaments(Fig 6).

Mega and Micro Lineaments

Large linear features which are adjacent to or coincide with regional trends/ structural features. They cut across various geomorphic units both in time and space. Lineaments more than 3 km long is classified as mega lineaments. Micro lineaments are very small (magnitude) linear features of length < 3 km. They correspond to minor faults, fractures, joints and foliation traces in the rock. Relatively smaller lineaments exhibiting high frequency of occurrence in varied azimuths within a geological type are inferred as fractures and joints (Veeriah, et.al,2006)

Based on the aerial photo interpretation and field checks, two major sets of lineaments trending WNW-ESE to E-W and NW-SE are recognized in the area. Besides, an intermediate lineament along NE-SW direction is traced. The WNW-ESE lineament is occupied by the major quartz reef of the area while the basic dykes have been emplaced along the NW-SE, NE-SW and E-W lineaments. Among these, the E-W lineaments are the oldest cut across by the NW-SE and in turn off set by the NE-SW lineaments which are the youngest, as observed in the field.

Structural lineaments

The structural lineaments are classified as two i. Fault (F)ii. Joint/Fracture (J/F0. The structural control of emplacement should be favourable for the emplacement of kimberlites and lamproites which act as carriers of diamonds. Structural features like domal upwarps, domal closures, major fractures/faults, intersection points of orthogonal fault/fractures, have a significant role to play in the emplacement of kimberlite clan rocks by acting as conduits for the up surging magma. Rao (1996) opines that the regional trend of Kimberlite rocks in the Dharwar craton is possibly related to crustal wrapping and closely related deep penetrating faults. The structural analysis of the known Wajrakarur and Narayanpet Kimberlite Fields reveals that a majority of the kimberlite bodies are confined either along the major fractures trending ENE-WSW/WNW-ESE/E-W or at the intersection points of these fractures with the orthogonal NNW-SSE/NW-SE trending faults or fractures.

The study area is characterized by two main fracture domains E-W trending strike slip faults with associated NE-SW resultant fractures domain in Maddur-Kotakonda area and predominantly NNW-SSE and also E-W trending strike slip fault domain west of Narayanpet (Sridhar et,al,2004). Strike slip faults and tear faults associated with ductile and brittle type of shear movements, trending NW-SE and younger (reactivated) E-W faults characterize the Narayanpet area. The emplacement of the kimberlites in the NKF is controlled by the major E-W trending strike slip fault and their intersection with NW-SE faults and NE-SW trending minor tensional fractures.

Three Kimberlite bodies located earlier near Undralladoddi, Mettimalkapur and Meliabad villages (SOI toposheet no.56H/8) in the adjoining Raichur area, Karnataka (Shivanna, et al.,2002) are emplaced along the major WNW-ESE fractures.

In the study area major dykes occur as linear ridges and running up to several kilometers and are observed south of Acharyapur trending NW-SE. Minor structural dykes are observed north of Adakal in the south eastern part of the study area and also observed to the north of Singaram trending NE-SW, north of Ayyavaripalli trending N-S, east and north of Pulimamaidi, east of Gudigandla trending NE-SW, south of Jinnaram trending NW-SE.

Two prominent structural of major joint/ fracture category is observed NW-SE trending lineaments of one extending from NW of koilsagar to the southeast of Devarkadra and another trending E-W from west of Devarkadra to the east of Janampet. North of Ajalapur a cluster of NE-SW, NW-SE, E-W fracture/ joints cut across. North of Narsupalli over the granitic hill range again a cluster of joints and fractures cut across N-S, NE-SW, NW-SE. To the North of Kollamapalli, around Kistapur, Koilkonda reserve forest three sets of joints/ fractures were observed trending NW-SE, NE-SW and E-W. Few joints and fractures were delineated in the south eastern part but they are of less significant.

Fifty four zones(Fig:6) favourable for emplacement of kimberlite are delineated with the help of lineament studies.

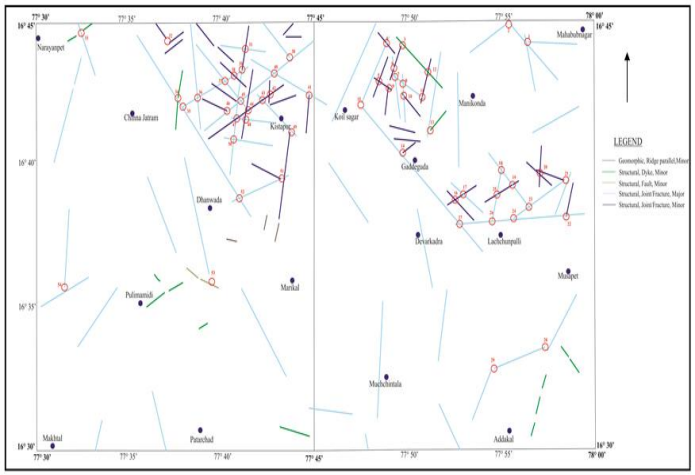

Fig 6. Lineaments derived from the satellite imagery. The red circles indicate favourable zones of emplacement of Kimberlites

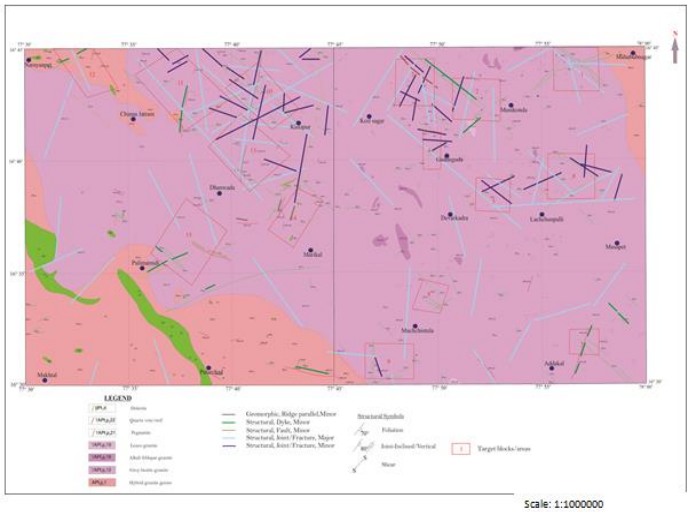

Fig 7. Target Blocks demarcated for detailed Kimberlite exploration

Based on the above features of geomorphology, drainage patterns, lineaments, structural pattern etc the following areas/blocks were delineated(Fig:8) which have the potential of

emplacement of kimberlites which were taken up for detailed field study are tabulated in Table no.1

Conclusion

An IRS LISS-III satellite image An area of 1440 sq.km was taken west of Mahabubnagar town, Telangana, covering parts of Survey of India Toposheet nos. 56H/10 & 56H/14 was digitally processed and visually interpreted to elucidate the structural fabric of the region comprising the geology, geomorphology, drainage, structure . Observed linear features were classified into four categories – faults, fractures/joints, lineaments and dykes. two major sets of lineaments trending WNW-ESE to E-W and NW-SE are recognized in the area. Besides, an intermediate lineament along NE-SW direction is traced. The WNW-ESE lineament is occupied by the major quartz reef of the area while the basic dykes have been emplaced along the NW-SE, NE-SW and E-W lineaments. Based on the known occurrence of Kimberlites in the adjoining areas, associated with NE-SW & NW-SE lineaments, fifty four intersection zones were marked. Geomporphology reflects the structure of the area, peneplain, pediments dissected hills and valley features were found suitable and six areas for emplacement of Kimberlites were demarcated. Drainage patterns indicate the structural disturbances of the area, and based on the change in flow pattern three areas have been demarcated. After analyzing the geomorphology, drainage, lineament fifteen zones were demarcated for locating the Kimberlite bodies.

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