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Major lineament mapping of structural controlled mineralization of Baryte and Asbestos mines around Pulivendla and Lingala mandals of YSR District, AP, India.

Ramachandra.M & Dr.Raghu Babu.K
Corresponding author: dr.kraghu@gmail.com
[1] *Research Scholar, Dept.of Geology, Yogi Vemana University, Kadapa, Andhra Pradesh, India.*
[2]*Asst.Professor, Dept.of Geology, Yogi Vemana University, Kadapa, Andhra Pradesh, India.*

1. Abstract:

Accurate geological and lineament mapping is critical task for fault and fracture recognition aided mineral exploration. This study identified lineaments from satellite images, utilizing image processing techniques around Pulivendula and Lingala mandals of YSR District, Andhrapradesh, India, by enhancing the variations in spectral and spatial reflectivity. In term of Topographic Lineaments are emphasized common surface expressions of tectonic fractures and faults in the bedrock.Most of the mineral resources of igneous origin can be identified through remotely sensed data by identifiying and mapping these lineaments. Knowledge of fault and fracture locations can prevent unsuitable site selection for mineral exploration. Lineament patterns also give insight of mineral prapagation within earth's surface of the region.Hence it is an important consideration for various data sets, including multispectral satellite imagery (IRS P6 LISS III) as well as geological data describing fractures, faults that were used to map and validate the lineament distribution in the study area. Linear features were enhanced with tonal, topographic and textural changes by processing of the satellite imagery. Lineaments were then extracted manually using ArcMap (ArcGIS 9.2 – ESRI) longer and shorter lineaments were identified, digitized and stored in a geo-database together with attributes describing their length, orientation and other characteristics. Lineament categories included barytes and asbestos mine, lineaments in their corresponding orientation used to characterize the lineament distribution in each remotely sensed data set.The primary lineament orientations from satellite imagery are trending north-east and southeast forming a synoptic "V" shape in the study area of pulivendula and Lingala mandals of YSR district, Andhrapradesh India.

Keywords: Multispectral, LISS III, Satellite Imagery, SOI Topo Sheet, Remote Sensing and GIS.

2. Introduction:

Lineament map is one of the most effective Remote sensing methods for studying faults frame work and deep structures of a geological region. The present analysis is based on the identification of lineaments with diagnostic features. IRS P6 LISS-III satellite image is a useful interactive mapping tool that allows users to map the perspective view of the Earth's surface with traditional two dimensional map space (Peterson et. al 2012).Knowledge of geological structures and their

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topographical relationship (e.g., fault, folds, joints/shears, dykes fractures etc.) is important for a wide range of geoscience research and underground construction. Possibly the most basic data set used to capture information on geological structures are the geological maps. Geomorphological maps typically show the location, lineaments using Remote sensing technique tools of the proposed study area. Geological lineament are identified and delineated in the IRSP6 LISS-III data to assign orientation of the geological structures using data from geological geomorphological maps, prepared by satellite data and then import satellite image in the Remote Sensing tools, and verified with the actual data and interpret the lineament trend map.

3. Study Area:

The present study deals baryte and asbestos mineralisation of Cuddapah basin near Pulivendula and Lingala area. Asbestos is the fibrous form of serpentine group of minerals a rich source of chrysotile variety asbestos belt is under extraction in Bramhanpalle village near Pulivendla to velidendla village of Lingala mandal of Cuddapah district. The mineral is found to occur in the form of veins over a length of 24km between Brahmanapalli (14° 33' 30": 78° 03' 00") and Velidendla (14° 25' 15": 78° 12' 00"). The mineral is igneous in origin, hosted by dolerites. Baryte is also a vein type igneous mineral hosted by dolomites around Pulivendla mandal.

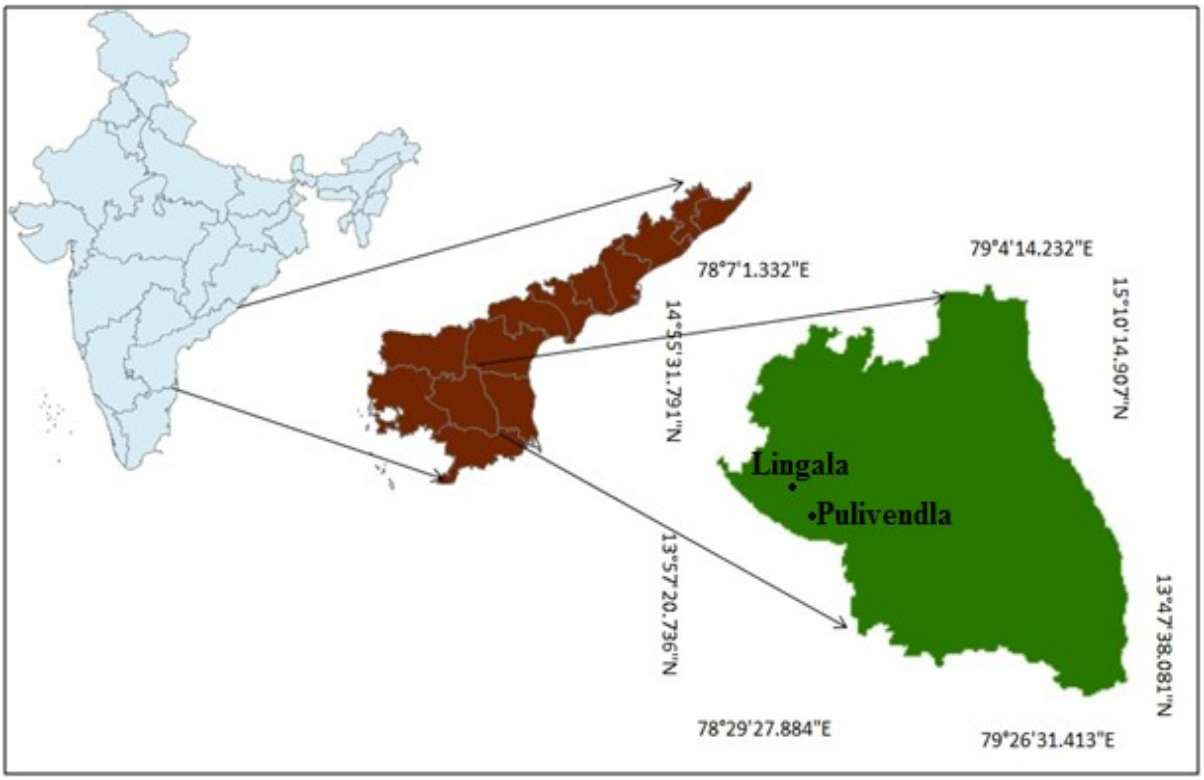


Fig. 1 Location map of the study area.

4. Methodology:

Availability of geological information and image enhancement techniques provide more flexible methods to analyze reliable lineament patterns in the study area. Methodology adopted in this paper for the identification lineaments with possible mineralization of structural origin (Sarra Ouerghi Hermi et.al 2017,). Is initially by edge enhancement technique through ERDAS Imagine software and then delineation of lineaments using Arc GIS 9.2. Lineament map is prepared by detecting lineaments from satellite imageries on the basis of visual interpretation aided digitization (Lillesand 1989; Drury 1990) and compared with geological maps of the study area. Then the lineaments have been eliminated after comparing the lineament map with the corresponding SOI Toposheets (57J/03) and field verification leaving the 'geologic lineaments are prepared by visual interpretation of the satellite imageries and field investigation.(Nag.SK. et.al 2011).

5. RESULTS AND DISCUSSION:

Lineament studies intended to mineral exploration often require mapping. The extraction of data from Remote Sensing images provides sufficient information about the probable lineament aided mineralization. The map of lineaments includes faults, fractures and joints which are important tools that may reveal points of mineral development. In particular, mineral formation either by igneous, metamorphic, or sedimentary is mainly controlled by the lineaments corresponding to fractures joints and faults (Pothiraj et al 2013). Satellite image provide synoptic view of geological geomorphological and lineaments and it is easy and reliable to map. In turn these maps are verified with field truth in study area. This will provide the access to the corresponding mapped geological lineaments. These lineaments derived from the images are perfectly relative to the structural features in the field.(Sarra Ouerghi Hermi et.al 2017) Implementation of edge enhancement technique for satellite image will readily expel geological lineaments in the study area.

5.1 Geology

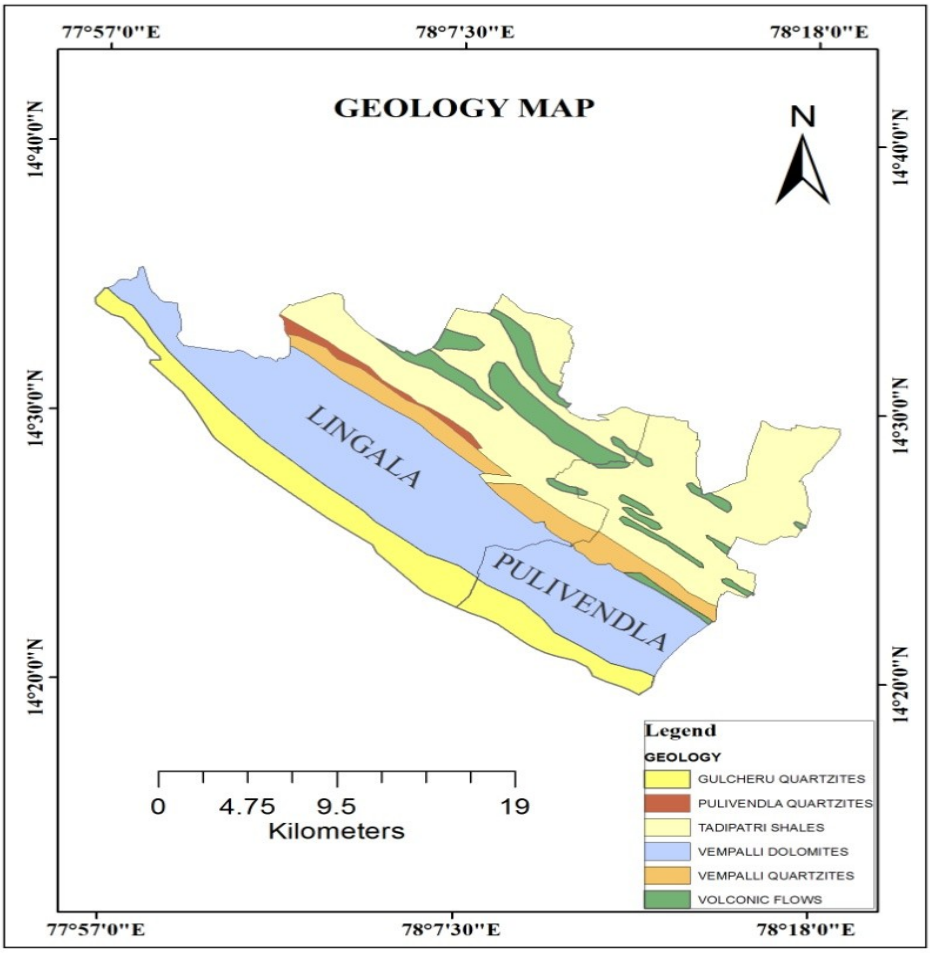
The geology of the study area comprises several lithounits of igneous, metamorphic, and sedimentary origin. The Archaean comprises the Peninsular Gneissic Complex (PGC) which are overlain by Cuddapah basin rocks, classified as Cuddapah Supergroup. An angular unconformity separates the PGC with the overlying Cuddapah Supergroup rocks. Lithologically this study are carbonate rock area has a series of alternate argillaceous arenaceousrocks,Igneous activity is seen between Vempalli-Pulivendla formations and below the Tadipatri shale formation Quartzite, dolomite and shale are the rocks occupy the study area along with basic Intrusive volcanic flows (Table 1). The lithounits in the study area belonging to the Cuddapah Supergroup are quartzites, dolomites of Gulcheru formation and quartzites of Pulivendla formation, shales of Tadipatri formation of Chitravati group (Nagaraja Rao et al., 1987). The major igneous minerals found are asbestos barytes. Asbestos of chrysotile variety occurs in

association with serpentine developed other the contact of basic intrusive and Vempalli dolomites. The minerals occur in the Brahmanapalli Lingala in Pulivendula mandal of the Cuddapah district. Serpentines and Proterozoic carbonate sediments of the Vempalle Formation, intruded by dolerite sills.

Table 1: Pulivendula and Lingala Formation

Formation	Lithology	Age
Tadipatri Fm	Shale/Tuff,Dolomite/Limestone Quartzite, Basic Sills.	Middle Proterozoic
Pulivedula Fm	Quartzite with Shale/Limestone Dolomite, Basic flows.	
Vempalle Fm	Dolomite/Chert/Mudstone/Quartzite.	
Gulcheru Fm	Quartzite/Conglomorate.	
Basement	Granite-Gneisses, Basic Dykes.	

Fig. 2 Geological map of the study area.



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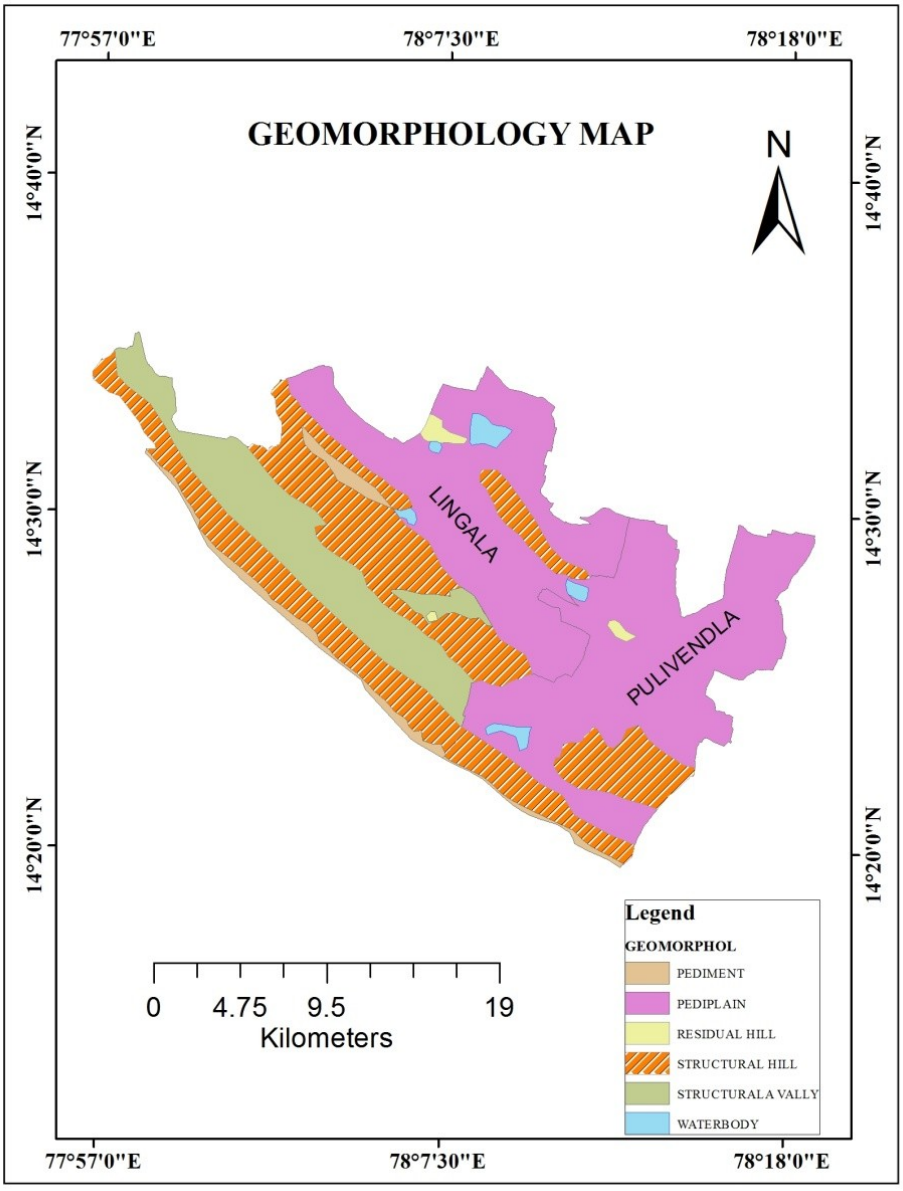
5.2 Geomorphology

Geomorphological features in the study area can be described as pediment, pediplain, residual hill, structural hill, structtural valley and water body Dolomite deposits in Lingala, Gunakanapalle, Chinnakuddala, Ippatla, Brahmanapalle, K.Velamavaripalle villages are present within structural hills and structural valleys. Quartzites of Gulcheru formation and Pulivendla formation are forming structural hills and Vempalli dolomites and Tadipatri shales are forming the structural valleys (Fig.3).

Fig. 3 Geomorphology map of the study area.



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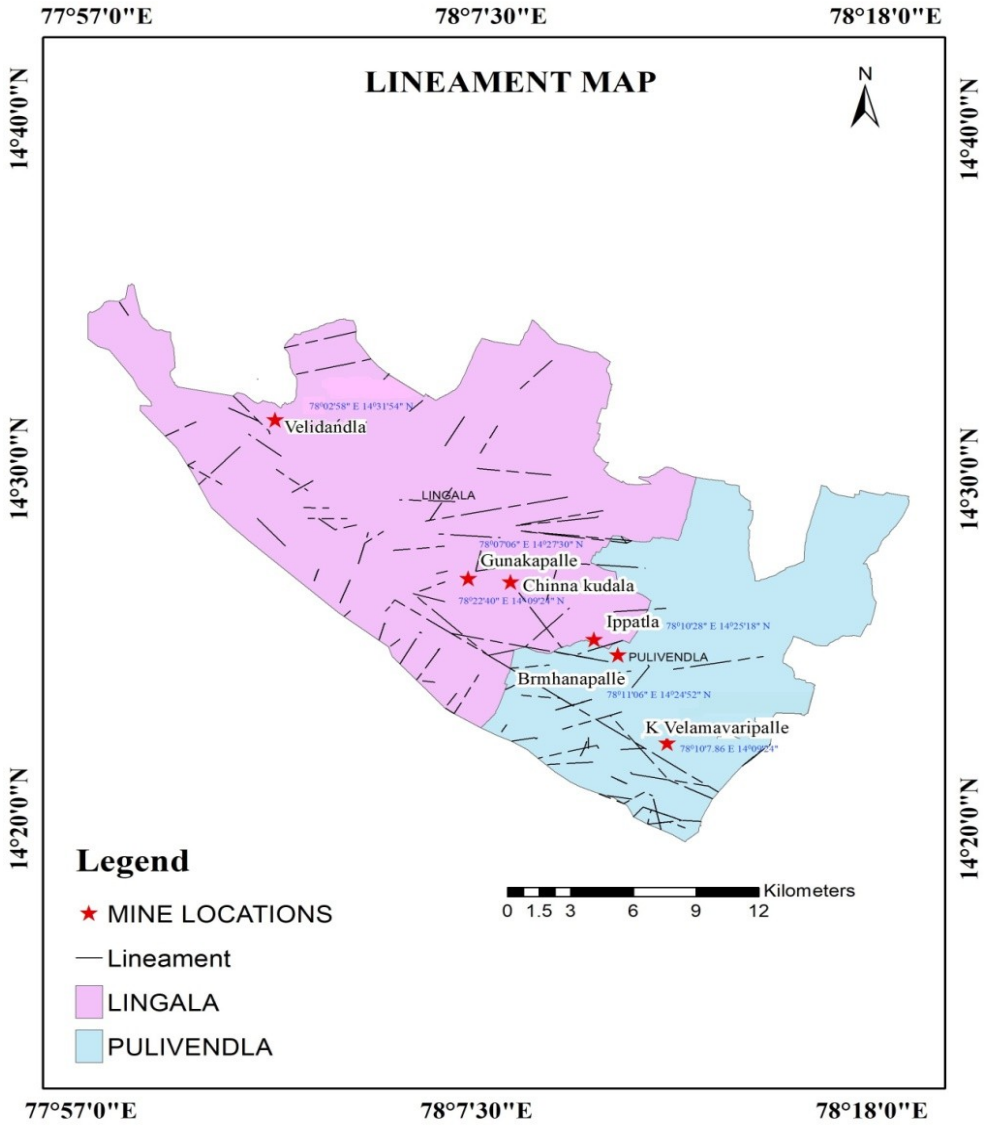
5.3 Lineament:

Lineaments are faults, fractures and joints that can be defined as probable surface features, which distinct from the patterns of adjacent features and presumably reflect subsurface phenomena (O'Leary et al. 1976). Satellite image data along with lineament information are widely used to extract different studies. The study of lineaments has been applied successfully in geological regime in the field of mineral exploration. The lineament map of the present study area show all the existing asbestos mines and barites mines are falling along the fault/fracture/joint planes (Fig.4). Such consequences reveal that this kind of thematic maps prepared in a location definitely supports the Mineral exploration.

Fig. 4 Lineament map of the study area



5.4 Extraction of Lineaments

Initially the visual interpretation technique is used to extract and map the lineaments. Later the digital interpretation is done by application of ERDAS Imagine and Arc GIS software. Primarily the satellite image of the study area is subjected to edge enhancement technique in ERDAS imagine. Then the resulting map is taken to the Arc GIS and the lineaments layer is prepared. This layer is projected over the location map of the study area, to show the lineaments.

6. Conclusion

Remote sensing data and Satellite image is an effective tool for lineament domain aided mineral exploration, the resultant lineament map of study area is compared with the other geological and geomorphology maps, and then with the ground truth. The lineament orientations of present study are as follows. NW–SW was the direction of most of the productive lineaments and striking towards E–W. N–S strike direction is less represented. Mapping of lineaments is a knowledge base preparation using Remote sensing GIS techniques. A methodology for lineament extraction and the design of a knowledge-based lineament identification system provides quite satisfactory results for geological aspects of any developmental activity the identification of features of geological origin. In the study results of lineament map fault areas are recognised where the mineral is present. Extracted lineaments can be applied to other regions of probable mineral occurrence. The lineaments in the Satellite images has been identified and recognized in the field as faults. The major part of the identified lineaments across the study area is related to deep faults in relation with the economic importance.

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