Abstract: The scope of the current work is confined to an area that is located inside and immediately adjacent to the Amangal Mahabubnagar Districts. The field season program’s objectives were to provide a characterization of the granitic terrain and investigate shear zones, faults, and pegmatite veins to determine the role that each had in the formation of the Au-Cu-Mo mineralization. The primary objective of this research is to characterize the granitoids by analyzing their petrography, mineral chemistry, shear zones, faults, and pegmatite veins. This will allow the researchers to determine whether or not these features have any influence on the mineralization of Au, Cu, and Mo, as well as fluorite and REE. “Specialized Thematic Mapping” was carried out on a scale of 1:25,000 across an area that was around 70 km² in size (Toposheet No. 56L/9).

Keywords: Megascopic, granitoids, mineralization, shear zones and rocks.

I. INTRODUCTION

Studies of the granitoid suite of rocks were conducted in the Amangal region and the surrounding area in the Mahabubnagar district of Telangana. It is included in toposheet number 56 L/9 of the Survey of India [1]. The region was predominately covered by two different forms of granitoids, namely tonalite and granodiorite. Rocks belonging to the suites of Monzogranite (TGM), Monzosyenite, and Syenogranite. Granitoid or granitic rock is a kind of coarse-grained plutonic rock that is very similar to granite in terms of its mineralogy and composition. Feldspar and quartz make up the majorities. These anorogenic granitoids might be the deep origins for rift volcanism that have been revealed in the areas where erosion has eliminated the volcanic rocks and other signs of rifting. It's possible that hotspots or mantle plumes were responsible for the formation of these A-type granitoids [8-9].

II. LOCATION AND ACCESSIBILITY

Telangana State's Mahabubnagar district is partially comprised under the scope of this research project. Kalwakurthy is the town that is most immediately adjacent to Amangal. The Amangal region may be reached quickly and simply by road, and its distance from the metropolis of Hyderabad in the southern direction is sixty kilometres [10-12]. The area is traversed by the Srisailam state highway, also known as SH-5. About 35 kilometres to the north-northwest of this Amangal hamlet is Rajiv Gandhi International Airport. The Hyderabad train station is the one that is the most convenient [13-14]. The routine that runs between Hyderabad and Nagarjun Sagar connects the villages of Mall, Chintapalle, and Mallepalle (SH-19). Nagarjun Sagar is 40km SE from Mallepalle village. In addition to this, there are a number of forest roads, metalled and unmetalled roads, and paths that give communication to the communities located further within the region. To connect the various parts of the region, there is a system of post offices, telephone and telegraph offices. The hamlet of Karthal serves as the northern boundary and also serves as the boundary between the Rangareddy district and the Mahabubnagar district [15-17].

III. PHYSIOGRAPHY AND DRAINAGE

The geography of the region is characterized by gentle undulations and a few solitary hillocks. The region's geomorphology and drainage are largely determined by the lithology of the area. Granitoids can be recognized by their distinct hillocky appearance [18-19]. The Mudhivenu reserve forest in the northern section of the area is home to the region’s highest point, which is 723 meters above sea level (TS No. 56L/9). Around Ghatla Mallepalle, the region has an average elevation of 333 meters above mean sea level (MSL). In the area under investigation, hill ranges generally trend in a northwest-southeast and east-west orientation. Granitoids can be found...
in some locations as exposures that seem like sheets. The most notable erosional landforms in the region are granite tors, knolls, mounds, and inselbergs, as well as linear ridges constructed of dolerite dyke and quartz reef. All of these landforms were formed by erosion [20-22].

Peddavagu and Bhimanpalle Vagu, both of which are tributaries of the Krishna River and run in a southeasterly direction, drain the majority of the region. The drainage system is dendritic to sub-dendritic in kind, and it consists of a number of perennial monsoon streams and nalas draining into Peddavagu towards the west and Chennavagu towards the southwest, which eventually unite to form a minor tributary named Bhimanpalle Vagu. The Krishna River is fed in part by a several smaller rivers, including the Vagus. The lithology and the structures work together to determine the drainage (TS No. 56L/9) [23-25]. The Halia River is located in the north-eastern region of the study area and flows in the direction of the east. There are two significant vagus there; one can be found to the north of Vinjamur, while the other can be found to the south of Chintapally, which is a tributary of the Bhimnapalle vagu. Both are moving in a southeasterly direction and are parallel to one another. There are a number of perennial monsoon streams and nalas that flow into Peddavagu and Bhimnapalle vagu. The drainage pattern is dendritic to sub-dendritic and parallel in kind [26-28].

IV. CLIMATE
The climate is characterized by a predominance of arid conditions. During the summer, temperatures may reach up to 46 degrees Celsius, while during the winter, they can drop as low as 12 degrees Celsius. 45 centimeters of rain fall each year on average. Because of the southwest monsoon, rainfall is sparse and unpredictable, especially during the months of June through September [29-30].

V. FLORA AND FAUNA
The region is characterized by a limited vegetative cover due to the fact that the forest has been denuded, resulting in isolated areas of dry deciduous flora. The area is home to a variety of animals. The primary types of plants that make up vegetation include xerophytes, shrubs, and grasses. The region is home to a variety of small thorny plants and trees, the most of which being Tamarindus indicus, Azadirachta indica, Acacia arabica, and Phoenix dactylifera. The majority of the land is used for agricultural purposes, and some of the products farmed here include grains, pulses, groundnuts, sunflowers, cotton, chilli peppers, and maize. The area is home to a relatively limited number of species of birds and mammals, such as hares, black bugs, wild boars, foxes, jackals, and snakes. There are also extremely few species of hares and black bugs [31-33].

VI. GEOLOGY OF THE REGION
The region under investigation is located within the Eastern Dharwar Craton and is characterized by granite and greenstone terrain. The Dharwar Craton was separated into the Western Block and the Eastern Blocks [34-35]. The Chitradurga shear zone, also known as the Chitradurga ductile shear zone, is a regional scale ductile shear zone that is identified as running all along and closer to the eastern edge of the Chitradurga Schist Belt. This zone is thought to represent the separation boundary between the two blocks [36-37].
The Western Divide Craton is made up of many older tonalite-trondhjemite-granodiorite gneisses that date back to around 3300–3580 Ma [38–41]. These older gneisses and granodiorites along with interspersed older, medium to high grade supracrustals, named as the Sargur Group of approximately 3100-3300 million years ago, form basement to low grade volcano sedimentary sequences of the Late Archean Dharwar Supergroup of approximately 2600-2900 million years ago, which are located in India [42–44]. The newer granitoid group within WDC is composed of calc-alkaline to high potassic granitoids and dates back to around 2500-2600 million years ago [45]. This group contains the Closepet granite [47]. Late Archean juvenile and anatetic calc-alkaline granitoid complexes predominate in the EDC. These complexes are interfaced by schist belts that are lithologically comparable to the Dharwar Supergroup in the WDC [48]. Due to their strong lithological similarities, structural coherence, and shared emplacement age of around 2700-2510 Ma, Chadwick et al. (1997) collectively referred to the granitoid complexes as the Dharwar batholith [47, 49-52]. In comparison to those in the WDC, the age restrictions on the greenstone belts in the EDC are only known from a few sites, and all of them appear to be of Neoarchaean age [51]. Based on the lithology, field relations, and emplacement characteristics, the gneiss-granite terrane of the southern portion of EDC that surrounds the green stone belts of Gadwal, Jonagiri Ramagiri, Kadiri, Tsundupalli, and Veligallu has been delineated into four spatial associations of granitoid suites [53].

EDC is made up of a conglomerated and accretionary linear array of north-south to northwest-southeast trending series of parallel greenstone belts (inner arc basins) and calc-alkaline granitoid belts [54-55]. These belts are separated by shear zones (transpressive) and together make up the "Dharwar Batholith" [50]. The Peddavura shear zone serves as the dividing line, and to the east of it, the enderbite-mangerite suite of rocks and granulites are increasingly exposed while moving towards the northeastern edge of the craton [56-57].

These magmatic suites are comparable to those that are connected with the Abitibi greenstone belt [58]. The granitoid suites were identified as tonalite-granodiorite-monzogranite (TGM) suite and monzogranite syenogranite suite (MS suite). The formation of the TGM suite is thought to have been caused by the concomitant mingling and mixing of contemporaneous mafic and felsic magmas in a calc-alkaline arc environment, as well as fractional crystallisation processes [59-61].

VII. GRANITOID SUITE

Separate descriptions are provided for the distribution, general characteristics, and enclave types of the several granitoids that make up each suite. The granitoids that were examined in this research have a variety of different types of constituents. Granitoids belonging to the TGM suite are distinguished by the textures they exhibit as well as the broad range of modal contents of the various mineral elements they include. Granitoids belonging to the TGM suite are composed of varying quantities of the mineral’s plagioclase feldspar, k-feldspar, quartz, hornblende, and biotite. Zircon, sphene, opaque minerals, and apatite are the accessory phases, and their abundances decrease from most abundant to least abundant. Quartz, potash feldspar, and plagioclase feldspar are the key minerals that make up the MS suite. Biotite is an important accessory mineral, but hornblende is an extremely uncommon mineral. Magnetite, sphene, zircon, apatite, and opaque are the other components of the accessories [62-63].

VIII. MONZOGRAVITE-SYENOGRAVITE SUITE (MS)

The Monzogranite-Syenogranite Suite (MS) appears as enormous hills or boulder outcrops and is widespread throughout the majority of the studied region. The difference in composition between monzogranite and syenogranite is so subtle that it can only be described as gradational. The MS suite contains pegmatite and aplites of varying size in several different locations. Gradational interaction is there between the MS suite and the TGM suite [64-65].

IX. MONZOGRAVITE

The grain size of monzogranite ranges from medium to coarse, it is pink in colour, holocrystalline, and it is huge. It has a granular texture with hypidiomorphic characteristics. Quartz, plagioclase, and k-feldspar make up the majority of the rock’s composition. Orthoclase is the other k-feldspar present; however, microcline is the most abundant one. The minor mafic ingredient is biotite, and hornblende is quite uncommon. Zircon, titanite, ilmenite, sphene, and opaque are the minerals that are considered to be accessory minerals. Despite the fact that the compositional range of monzogranite is rather limited, it does define a differentiation trend that is mostly determined by the fractionation of biotite and plagioclase. In general, the texture is comparable to that of granodiorites,
characterised by the presence of subhedral plagioclase, euhedral microcline, and quartz. Microcline, on the other hand, is frequently perthitic and contains fine-grained plagioclase and quartz. The deformation that was observed led to a number of textural changes, including the generation of sub grains, the recovery and recrystallization of quartz grains, the peripheral granulation of mineral grains, and the development of myrmekite along the feldspar borders [66-67].

X. SYENOGRAINE

Pink, leucocratic syenogranite with medium to extremely coarse grains is characteristic of the MS suite of granites. Quartz, k-feldspar, plagioclase feldspar, biotite, and hornblende are the minerals that make up the rocks. In most cases, the rock has a porphyritic structure, and the majority of its phenocrysts are composed of alkali feldspar. Granophyre-like texture can be seen in some locations. It reveals a hypidiomorphic granular texture when seen via a microscope. Feldspars are medium-sized minerals that have a subhedral crystal structure. Interstitial K-feldspar can be found. When seen with a microscope, the replacement perthitic texture may be seen. This granite has a significant amount of perthite. Plagioclase can sometimes be seen to be slightly sericitized and to have a look that is a little bit tarnished. The most abundant mafic mineral is biotite, followed by amphibole and chlorite in decreasing abundance. In addition, zircon is a component of the accessory phases. When seen using a microscope, syenogranite exhibits evidence of sub grain quartz production [58, 68].

XI. STRUCTURES

A stretching lineation is seen in the mylonite close to Murtuzapalle, and the orientation of the stretching lineation is 250 kilometres from the southern end on the N-S plane. In Murtuzapalle in addition to this, shear folds can be seen, the axial plane of which is gradually orientated along the C plane. According to an interpretation that was made based on the sheared granite found in the Murtuzapalle area, this litho unit underwent two distinct stages of deformation. Brittle deformation came after the ductile deformation that had previously occurred. At a more profound level, the rock has undergone ductile deformation, whereas at a more superficial level, the rock has undergone brittle deformation. Crushing, granulation, and the creation of angular grains are all indications that the material has a brittle deformation. Every single angular grain displays well developed foliation, which is indication that the grain has undergone ductile deformation [69-71].

XII. ROCKS

The term "Rock" refers to the material that makes up the outermost layer of the Earth's crust. This layer is composed of various mineral aggregates. Marble, for example, is a mono-mineral rock, whereas granite, on the other hand, is a poly-mineral rock. The make-up of a rock's minerals is nearly always the same, but the chemical make-up of a rock is determined by the sorts of component minerals. Therefore, it is impossible to represent it using a formula since the amount of various minerals present varies. Every kind of rock is characterised by its own unique set of physical characteristics, which may include colour, density, mechanical strengths, fusibility, and so on [72-73]. Rock is an aggregate of mineral grains that are more or less consistent numerically or qualitatively and differ from one another in specific textural traits, physical attributes, and the geological conditions under which they are generated. The rock is generated under certain geological conditions, and these conditions have a significant influence on the manner in which its component minerals exist, as well as the nature of those relationships. All rocks may be classified into one of these three primary categories according on their point of origin [74-76]:

i. Igneous: Relating to or originating from magmatic processes
ii. Sedimentary: Relating to an external process.
iii. Metamorphic rocks: Formed as a consequence of the change of sedimentary and igneous rocks.

There is no pattern to the distribution of these rocks. The lithosphere is composed almost entirely of rocks that are igneous and metamorphic, with only 5% of its total mass consisting of sedimentary rocks. Crust and a section of the upper mantle are both included in the lithosphere. On time scales of thousands of years or more, the lithosphere acts elastically [77-79]. The nature of the rock mass is that it is a naturally existing prestressed medium that is discontinuous, anisotropic, and inhomogeneous. The existence of faults, joints, shear planes, bedding plane cleavage, and schistosity all contribute to the fact that rock mass is a discontinuous medium [80].
XIII. MEGASCOPIC CHARACTERISTICS OF ROCKS

Field petrographic investigations conducted on the granitoids found in the Amangal region were the impetus for the formation of the Eastern Dharwar Craton. In the eastern part of the Dharwar craton, the granitic rocks that are being looked into encompass an area that is ten kilometres squared. Alkali feldspar, plagioclase feldspar, granodiorite, monzogranite, quartzmonzonite, and syenogranite make up the area. The principal minerals responsible for the formation of rocks include K-feldspar, quartz, plagioclase, biotite, and hornblende. Zircon and biotite are both considered to be accessories. The IUGS categorization states that the majority of the granitoids that make up the TGM suite are magnesian in composition, range from calc-alkalic to alkali-calcic, and are metaluminous to weakly peraluminous. Including all megascopic properties and including all samples (i.e., L0, L1, L2, L3, L4 etc..) of field photographs rock types, colour, crystallinity and fabric was found as Plutonic, Mesocratic, Holocrystalline and Equigranularity respectively [82]

Table 1: Megascopic Properties of various samples

<table>
<thead>
<tr>
<th>Sample code</th>
<th>Name</th>
<th>Texture</th>
<th>Megascopic Properties</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Grain size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L0</td>
<td>Monzonite</td>
<td>Coarse grained</td>
<td>K-Feldspar and</td>
<td>Formed in greater depths, under high pressure by slow cooling of magma.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>plagioclase feldspar</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Epidote and hornblende</td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Diorite</td>
<td>Medium to</td>
<td>Biotite, mostly</td>
<td>Formed in intermediate depths, under medium pressure and medium temperature by moderate cooling of magma.</td>
</tr>
<tr>
<td>L2</td>
<td>Granodiorite</td>
<td>coarse grained</td>
<td>dominated by hornblende</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Monzogranite</td>
<td>Medium to coarse grained</td>
<td>Biotite, Muscovite, Apatite Hornblende</td>
<td></td>
</tr>
<tr>
<td>L4</td>
<td>Syenogranite</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Megascopic Properties of various samples

Fig. 4 Field photographs with sample Numbers (i.e., L0, L1, L2, L3, L4)
XIV. CONCLUSION

In addition, the chemistry of the major elements in the granitoids that were created in a convergent environment in the Cordillera is very similar to the chemistry of the principal elements in the granitoids that were generated in the region. It has been determined, on the basis of mineralogy and texture, in addition to the field relationships, that the following order represents the sequence of parental magma differentiation for granitoids that can be found in Amangal rocks. This sequence was arrived at by considering both the field relationships and the mineralogy.

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