A Geo-illustration Studies of Nagamangala, Mayasandra, Yediyur area of Chitradurga Schist belt, Dharwar Craton, Southern India

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***Abstract*: *In recent times the Precambrian shields of the world have became nerve centers of global research aimed mainly at decipher the early history of the Earth. Various agencies like the Geological Survey of India (GSI), Ministry of Mines (MoM), Ministry of Earth Sciences (MoES), research institutes and universities of not only India but from the other countries also are involved in this task. As such the craton portion of Karnataka has been gaining lot of importance in recent years on account of its unique geo-illustration. The present study area covers southern extensions of the Chitradurga schist belt, which includes the parts of Nagamangala, Mayasandra and Yadiyur schist belts and associated gneissic terrain with enclaves of mafic and ultramafic rocks exposed around Nagamangala town. Both the Nagamangala and Mayasandra schist belts are correlated to the Sargur Group (> 3400 my) while the Yadiyur schist belt to Dharwar Super Group. The present area is better suited for above mentioned studies as in this area the various litho units belonging to two stratigraphic units are well exposed and lie almost side by side. The present study of the area around the parts of Nagamangala, Mayasandra and Yadiyur dykes of Chitradurga schist belts of Dharwar Craton and is situated in Mandya and Tumkur district of Karnataka State. Sampling has been done so as to include all the noted variations in the field characters and to have a good geographic coverage. Satellite imagery has helped in picking up a number of major and minor lineaments cutting across the schist belts and gneisses. The geological map produced here has been prepared on the basis of the detailed observations in the field using Geoinformatics tools. The representative samples have been examined using geological microscope and the rocks have been classified on the basis of their mineral assemblages and textural features. The extensive igneous activity undergone by the study area is represented by the numerous dykes. A detailed geological characterization of the environs in the Nagamangala, Mayasandra and Yadiyur area on the basis of field observations has tried to give not only an unified illustration of the geology of the area but also has commented on the possible modes of advancement of the different necessary components like topography, climate, rainfall, drainage, soil and lithology of the study area.*

***Keywords*: lithology, schist belts, geoinformatics, lineaments, illustration.**

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I. INTRODUCTION

In recent times the Precambrian shields of the world have became nerve centers of global research aimed mainly at deciphering the early history of the Earth. Various agencies like the GSI, MoM, MoES, research institutes and universities of not only India but from the other countries also are involved in this task.

The Dharwar Craton has been critically investigated since [1] discovered these formations. This craton has been recognized as one of the most critical and key cratons. This can be judged by the fact that even after 120 years of research work and important contributions on its geology by [2 – 45] views regarding the geology of the craton are still highly controversial and debated.

Except for the brief traverses and preliminarily mapping have not much work has been done on the present study area. Recently [46 and 47] have reported komatities from Mayasandra and Nagamangala schist belts respectively. Information giving an overall picture of geology, petrology, mineralogy and petro chemistry of this area is lacking.

The present study area covers southern extensions of the Chitradurga schist belt, which includes the parts of Nagamangala, Mayasandra and Yadiyur schist belts and associated gneissic terrain with enclaves of mafic and ultramafic rocks exposed around Nagamangala town. Both the Nagamangala and Mayasandra schist belts are correlated to the Sargur Group (> 3400 my) while the Yadiyur schist belt to Dharwar Super Group (2800 to 3200 my [34]. This area has been so for investigated in detail by anyone on modern lines which can give an unified picture of the geology of area. The present investigations are aimed at to compare and contrast the Nagamangala. Mayasandra and Yadiyur schist belts and further to understand the initiation of the geological process: to study and infer the type of volcanism sedimentation and tectonic set up of that era. The present area is better suited for above mentioned studies as in this area the various lithounits belonging to two stratigraphic units are well exposed and lie almost side by side. This

different litho-stratigraphic units exhibit different field characters, structure and mineralogy which reflect not only range of metamorphic grades but also tell a long drawn history of metamorphism, deformation and volcanism. A fairly large number of outcrops of all rock types prevail hence the interrelationship of one rock type to other can be clearly seen especially in the newly excavated irrigation canals which cut across the schist belts. Hence the author of this thesis has carried out detailed geological mapping of the parts of Nagamangala Mayasandra and Yadiyur schist belts and the surrounding granitic area to define the granite-greenstone relationship and petrological mineralogical and petro chemical investigations. The results thus obtained are presented in this thesis systematically. Much of the data/information presented here is new to the area and should serve as an up to date contribution to our knowledge of the geology, petrology, mineralogy and petro chemistry of all the litho units of the area.

II. Location of the Study Area

The present study of the area around Chitradurga schist belt forms the parts of Nagamangala, Mayasandra and Yadiyur schist belts of Dharwar Craton shown in the Fig.1 and is situated in Mandya and Tumkur district of Karnataka State. The area is triangular in shape spread over for about 2803 km2 and extends between eastern longitude 76º 36' to 77º 6' and northern latitude between 13º 18' to 12º 42'. It covers parts of the toposheet number 57C/12, 57 D/9, 57 D/12 and 57 D/13 published by the Survey of India.

Nagamangala, Mayasandra and Yadiyur are a small towns situated on the Mysore – Tumkur state highway. These towns are located 68 km, 100 km, 95 km from Mysore and 88 km, 62 km and 65 km from Tumkur respectively. The area is well connected by roads.

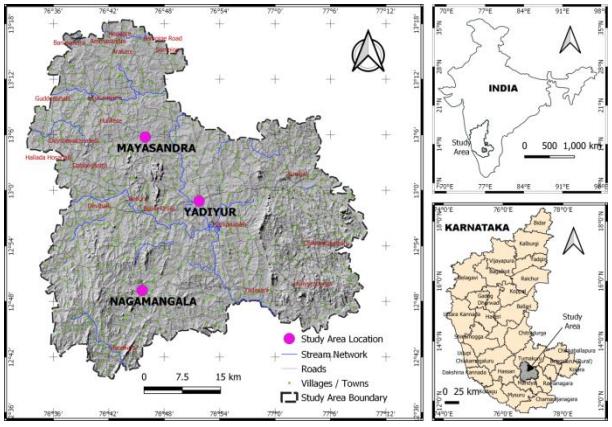

Fig. 1. Location map of the study are.

III. Methodology

A. Materials

The authors [48 – 53] are acknowledged using geoinformatics technology a geological map is the most fundamental prerequisite in any geological field studies. The study area is about 2803 km^2. A systematic geological mapping has been carried out using Geoinformatics tools such as open source QGIS, MapInfo Pro version, AutoCAD-MAP, Garmin GPS and SRTM satellite images. In additional to this, SRTM satellite image data is also used to delineate the regional lithology and lineaments of the study area. During geological mapping, a large number of fresh outcrop samples, ores were identified and collected from the in-situ outcrops and prepared various thematic maps for geological characterization study.

B. Topography of the area

The topography of the Nagamangala, Mayasandra and Yadiyur in essence, consists of hilly ridges representing erosional remains of an up lifted plateau. The ridges are mainly made up of metamorphosed schists. The altitude of the hill ranges vary from 648 m to 1119 m above MSL as shown in Fig.2. Topography is both structurally and lithologically controlled. The ridges correspond to synform which consists of metamorphic, except in the central part which are made up of granites.

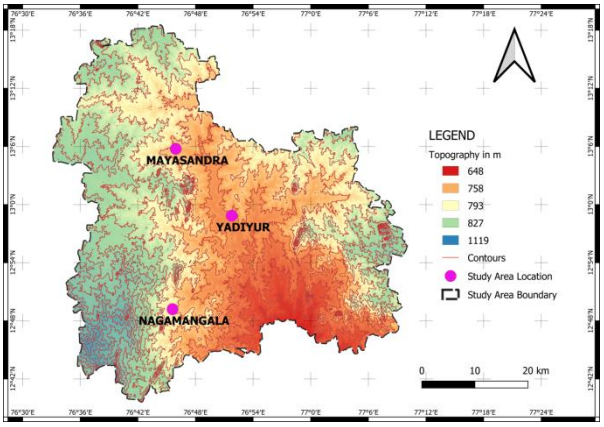

Fig. 2. Topography map of the study are.

C. Climate and Rainfall

The Similar to any other part of the Karnataka State this area also comes under the spell of three seasons namely, the summer, monsoon and winter. The summer season commences from the middle of February and lasts till end of May. The maximum temperature rises up to 38 ºC during April and May. The South-West monsoon season generally commences during second week of June and lasts till the end of September. The winter season extends between mid Novembers to mid February, during which the temperature reaches as low as 16 ºC. in general the area enjoys dry and equal climate for most part of the year. The average annual rainfall is around 600 mm, the bulk of which is received between the months of July and September.

D. Drainage

The area is not traversed by any perennial rivers of streams. However, a large number of nallas which originates from the hilly regions dissect the area. The overall drainage pattern in the area is dendritic shown in Fig.3. There are no natural lakes but many tanks have been constructed for the purpose of irrigation and domestic water supply.

E. Soil Cover

Most of the plains are usually covered over by thick uniformly spread clay, loamy, sandy soil of red colour as shown in Fig.4. Occurrence of black or reddish black soil is noticed in the vicinity of basic rocks, which are commonly covered with vegetation.

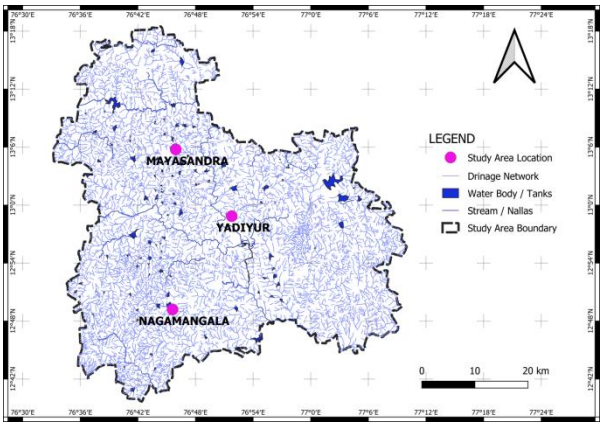

Fig. 3. Drainage density map of the study are.

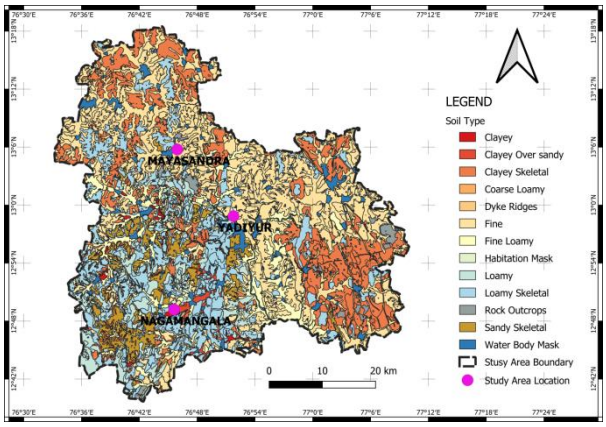

Fig. 4. Soil map of the study are.

IV. Results and Discussions

The study area covers the southern extensions and ribbons of the main Chitradurga schist belt, such as the parts of Nagamangala, Mayasandra and Yadiyur schist belts and surrounding gneissic terrain with the enclaves of moderate to mafic and ultramafic rocks

The geological map of the area prepared by the author of this idea which includes details of canal sections is given in Fig.5.

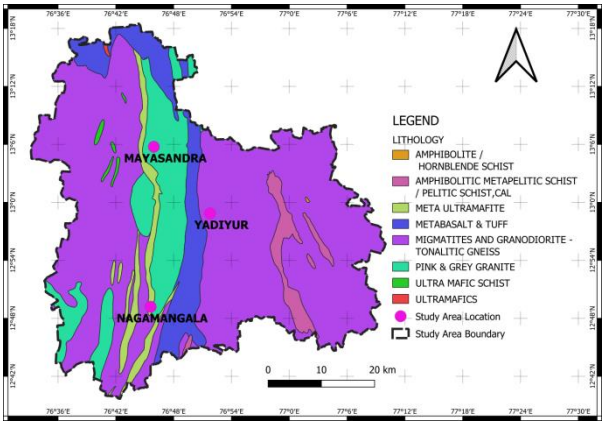

Fig. 5. Geology map of the study are.

The Nagamangala and Mayasandra schist belts run parallel to each other, linear and often they exhibit pinch and swell structure. The lithological units of the Nagamangala schist belt (NSB) the area are ultramafic schists, amphibolites, quartzites, BFQ's chlorite-magnet schists, dykes and gneisses. The fast unit surrounds the schist belt. Modal analysis and field data of the map shows that ultramafic schists are the most abundant rock type of the belt. The gneisses are post-greenstone in nature and exhibit clear cut intrusive connection.

The Mayasandra schist belt (MSB) is lithologically similar to NSB except for the occurrence of granites, which show intrusive relation with this belt especially in the NE part of Nagamangala town and Adhichunchanagiri area.

The Yadiyur schist belt (YSB) in the study area has greater width better exposure and easier accessibility. The area forms part of a linear N-S extending schist belt bounded by gneisses on either side and is in contact with the intrusive granites along its western margin. The lithological units of the schist belt are quartzites, amphibolites, politic schists and BFQ's. The intrusive granites disrupted the structures of the host rock and their stratigraphy, such structural disturbances and lack of marker horizons have created problems in understanding the structure and evolution of these rocks.

The lithological associations of the both the groups (younger-YSB and older NMSB) are in marked contrast particularly in the proporations of lithotypes. The Nagamangala and Mayasandra schist belts (NMSB) consists mainly of ultramafic schists with intercalats of amphibolites, whereas in YSB they are totally absent. BFQ's and quartzites are impersistently developed in NMSB, while they abound in the YSB. Thin lenses of chlorite-magnetite schists and glimmerite veins present in the NMSB have not counterparts in the YSB. Peninsular gneisses are intrusive into NMSB, whereas they forming basement to the YSB. The YSB consists of a large volume of amphibolites alternating with cross-bedded quartzites, which is a characteristic association of Bababudan group throughout are conspicuously developed in the YSB sequence. Younger granites are intruded into both the sequences. All the sequences in this area traversed by younger dolerite dyke

Among the principal rock types in the study area are untramafic schists amphibolites granitic rocks quartzites, politic schists BFQ's and dykes. The minor rock types are chlorite-magnetite schists glimmerite veins. Pegmatites and quartz veins.

Thin layers of greenish chlorite-magnetite schist containing porphyroblasts of magnetite occur in the NMSB. In this arrangement of projected crystals of magnetite occur as well developed octahedrons, tetrahedrons, deformed form of these twins group and aggregate. The size and distribution of the crystals is not identical throughout the outcrop. This rock gives a very pleasant outer shell with their projected crystals of magnetite in the greenish chlorite schist matrix. The magnetite crystals are dull brownish black in colour.

Thin veins of glimmerite less than a meter in width occur in the NMSB at the contacts of ultramafic schists with gneisses. These veins are brownish green to bottle green and are wholly made up of biotite. The flakes of biotite ranges in size from < 0.5 to 2 cm and are arranged radially.

Pegmatite veins pass through the area both parallel and oblique to the strike of foliation. These contain mostly feldspars, quartz and mica. Quartz veins also occur along the

schist belts. The quartz is colourless and translucent to milky white variety. Light bluish colour quartz veins noticed in the ultramafic schists of Honnabetta Range of NSB.

The geological set up of the parts on NMSB in Nagamanagala area on the whole is comparable to the Krishnrajpet schist belt which has been correlated to Sargur Group (> 3400 my) whereas YSB represents a slightly more metamorphosed equivalent of the Bababudan group (2800 to 3200 my)

V. Conclusion

It forms the southern extensions and ribbons of the Chitradurga Schist belt, such as parts of Nagamangala, Mayasandra and Yadiyur schists belts and surrounding gneissic terrain with the enclaves of mafic and ultramafic rocks. A detailed geological characterization of the environs in the Nagamangala, Mayasandra and Yadiyur area on the basis of field observations has tried to give not only an unified illustration of the geology of the area but also has commented on the possible modes of advancement of the different necessary components like topography, climate, rainfall, drainage, soil. The geological set up of the NMSB on the whole is comparable to the Krishnarajpet Schist belt which has been correlated to Sargur group, while the YSB represents a slightly more metamorphosed equivalent of the Bababudan group (Dharwar Super group). During this very early stage of crustal evolution, primitive subaqueous volcanism took place which is now represented by the ultra mafic schists and amphibolites. This observation is supported by the pillows and spinifex texture in ultra mafic schists of NMSB. After the development of YSB the area are seen in the form of granites which intruded along the weak zones along the contact between gneisses and YSB and also in NMSB. The present study the authors has tried to represent diagrammatically in topography (Figure 2), drainage (Figure 3), soil (Figure 4) and lithology (Figure 5) of field characteristics of the study area.

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