



GOA UNIVERSITY
गोवा विद्यापीठ

2022-2023

AGTC-408

GEOLOGICAL FIELD MAPPING

GEOLOGY FIELD REPORT

BAGALKOT, KARNATAKA

Name:- Meldrin Titan Afonso

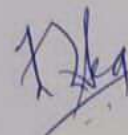
MSC PART 1

ROLL NO. -

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Dr. Anthony Viegas
Vice Dean (Academic),
School of Earth, Ocean
& Atmospheric Sciences,
Goa University,
Goa - 403 206.







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INTRODUCTION

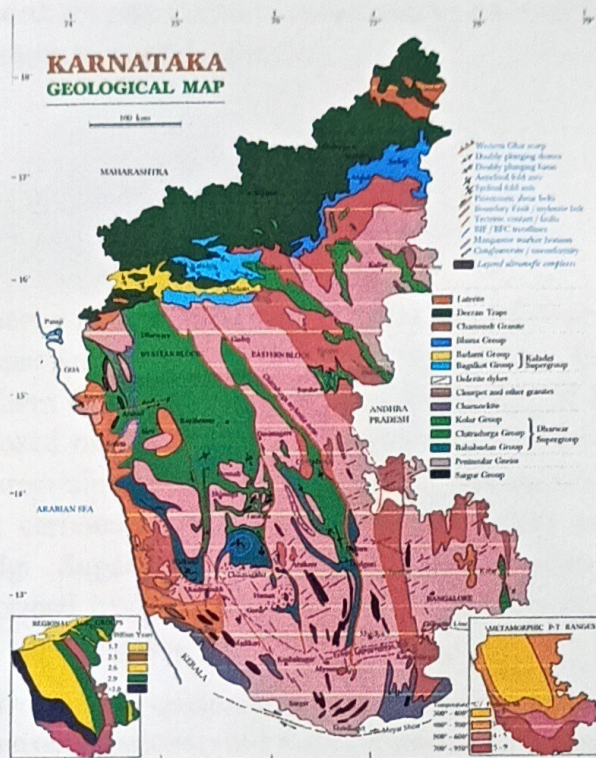
ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude towards the efforts put by my professors, HOD Dr. Anthony Viegas, Dr. Poornima Sawant, and Dr. Nicole Siqueira for sharing their geological field knowledge and for helping us in all ways possible and for cooperating with us. I would also like to thank all my friends for the constant support, also my parents for providing financial and moral support. This field trip got us with a lot of scientific knowledge about Geology.

INTRODUCTION

Geology of Karnataka

Karnataka forms the west-central part of Peninsular India between North Latitudes 11° 35'30" and 18° 25'30" and East Longitudes 74° 06'00" and 78° 35'30". It occupies an area of 1,91,792 sq. km of which 1,86,792 sq. km are covered by hard rocks consisting of crystalline and older sedimentary and a narrow coastal strip of about 5,000 sq. km of Tertiary and Quaternary sediments. Karnataka can be divided into three well-defined geomorphic regions viz., (1) the coastal plains on the west bordering the Arabian Sea, (2) the Malnad or mountainous region Geological Survey of India 2 comprising the Western Ghat and (3) the plateau region on the east.



Kaladgi basin is a part of the geology of Karnataka and it comes under the Puranas. The Puranas in Indian stratigraphy include almost undeformed and unmetamorphosed Proterozoic supracrustal sediments. They occupy more than 20% of the area of Precambrian exposures in the Indian peninsular Shield, occurring in seven independent basins, the Vindhyan, Cuddapah, Chattisgarh, Bastar, Pannhita-Godavari, Bhima and Kaladgi basins. The individual sequences vary in thickness from less than 200 m to over 10,000 m and contain predominantly orthoquartzite-shale-carbonate suites. Each basin has a different position relative to the craton nuclei of the peninsular Shield, each of which has an individual Archaean history.

Karnataka forming a part of the Indian Shield is constituted of rock formations ranging in age from 3300 million years to 5 million years. The narrow coastal strip of about 5000 sq. km of Tertiary and Quaternary sediments and another 31,250 sq. km of Deccan basalts, the remaining area is dominated by Archaean-Proterozoic rocks. Mysore Plateau geologically constituted of Dharwar Craton comprises greenstone-granite belts, gneisses, and granulites. Greenstone belts essentially consist of meta-volcano sedimentary sequences, surrounded and dissected by Peninsular Gneiss. At the southern end of the craton, these give way to a

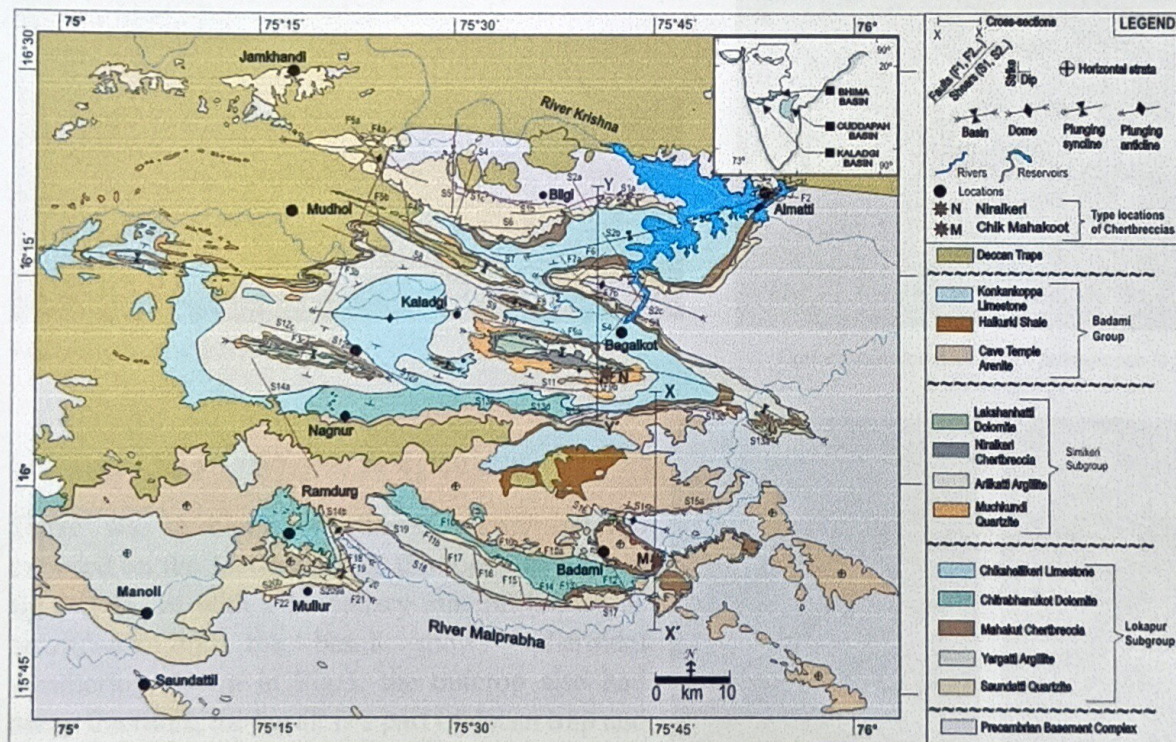
granulite suite of rocks. The craton preserves a billion-year orogenic history from 3400 m.a. to 2400 m.a. Intracratonic sedimentary basins called Purana Basins to occupy the northern segment of the craton whose northern part in turn is concealed by Deccan basalts. Thus younging of with sequence from south to north is evident.

Geology of Kaladgi basin

The Kaladgi Basin is considered a supracrustal basin in peninsular India that evolved under an extensional regime (Kale & Phansalker, 1991). The sediments of the Kaladgi Supergroup were deposited on the northern fringes of the Dharwar Craton marked by the Eparchaeon unconformity and are exposed on the southern fringes of the Deccan Trap Province. Shallow marine sediments comprising orthoquartzites (quartz-rich sandstones), argillites (mudstones and shales) and carbonates (limestones and dolomites) are the principal constituents of the Kaladgi Supergroup. This sequence is practically unmetamorphosed but extensively deformed resulting in identifiable two main types of tectonic deformation, viz. inherited and superimposed.

The original classification scheme by Foote (1876) has undergone several modifications. Jayaprakash et al. (1987) accorded the status of the Supergroup to this sequence and divided it into the lower Bagalkot and upper Badami Groups. The former was divided into the Lokapur and the Simikeri Subgroups on the basis of a succession of strata and an intervening disconformity between them. The lithological contents of both these subgroups are identical, although the latter is restricted to narrow basinal structures, while the Lokapur Subgroup is exposed throughout the Kaladgi Basin. Some doubts have been expressed about whether the two subgroups represent two separate cycles of transgressive sedimentation or not (Kale & Phansalkar, 1991; Kale et al., 1999).

The oldest sequence of the basin, the Bagalkot Group, represents a transgressive suit of the shoreline siliciclastics which grades laterally and vertically into tidal-flat carbonates which are interbedded with washed, silicified products of syn-sedimentary deformation structures. The carbonate sequence occurs as thinly bedded, flaggy, and wave and tidally influenced mud and carbonate flats and as reefs. The distinctive organosedimentary structures (stromatolites) from the carbonates in the Bagalkot Group are the only reliable and definite evidence of the biogenic activity, and tool for estimating the age and biostratigraphy of this sequence. The previous records of microbial remains obtained from macerations were not reproducible in subsequent studies, rendering them rather unreliable for biostratigraphic evaluations. The isotopic studies of the carbonate formations of the Kaladgi Supergroup are commonly interpreted them as members of a genetically related (Sathyanarayan et al., 1987). Various named Ghatprabha and Vidyanagar Dolomite contain algal mats which are indicative of intertidal to subtidal facies. Collectively, the Kaladgi Basin carbonates were considered to have deposited between 2.0 to 1.0 Ga periods. A significant trend has been noted in the concentration of Sr values in the Gaddankeri Limestone which scatter between 200 and 300 ppm whereas they decrease to 50 ppm in dolomitic lithologies in response to progressive dolomitization.



map showing the Badami group and Simikeri and Lokapur sub group

DAY:-1

Location 1 N15°52'55.0 , 74°41'41.8''E

The area is a semi-arid region with a gentle slope the rock is exposed on the slope with a trend of N280°, the vegetation in this region consists of tony bushes, grass, and shrubs. the exposed outcrop is on the roadside. The clast in the rock in fig:1 is 1.5 cm and the composition of the clast is milky quartz, the matrix is about 60% to 70%. In Fig.2 the conglomerate rock 2mt above the fig1 rock, conglomerate consists of a 2-2.7cm clast of feldspar and quartz and consist of a ferruginous layer. From the observation done on the field the clast size increase from down to the top of the ridge and as we move on top the matrix percentage changes along with the composition of the matrix changes from silicic to ferruginous.



Figure 1 Beinmatii conglomerate

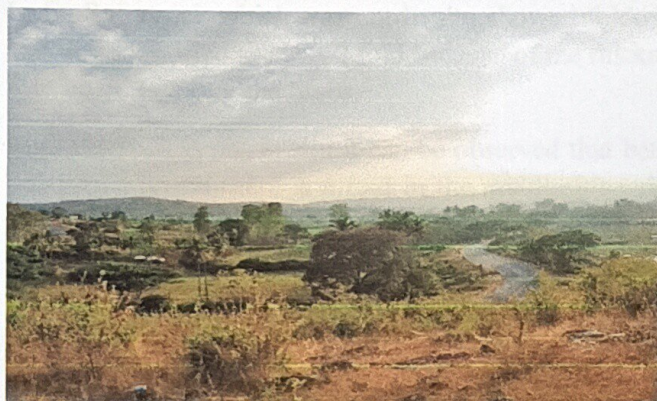


Figure 3 wide view of the spot 1



Figure 2 conglomerate with ferruginous layer

Location 2 N15°52'37.3'', 74°41'49.1''E

There was a highly weathered clayey outcrop exposed on the foothill beside the road, the rock in fig.4 is basalt with a secondary mineral known as amygdalae and the basalt shows spheroidal weathering shown in Fig.5. the outcrop also had many fractures, the basalt is a part of decan trap and is 66ma years old.

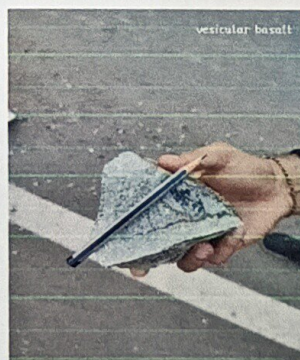


Figure 4 Basalt rock

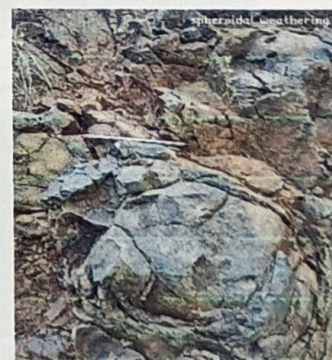


Figure 5 rock showing spheroidal whetherring

Day:2 11/12/22

Location 1 N16°05'09.4" , 75°52'30.2"E

Name of the Location:- Ramtal

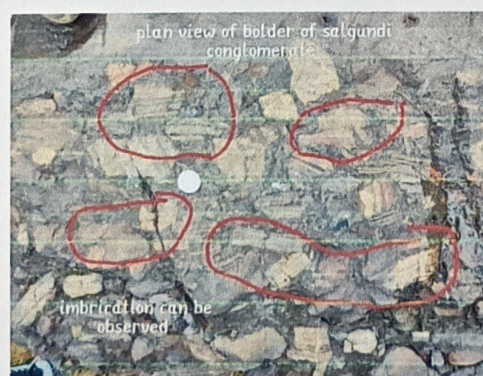
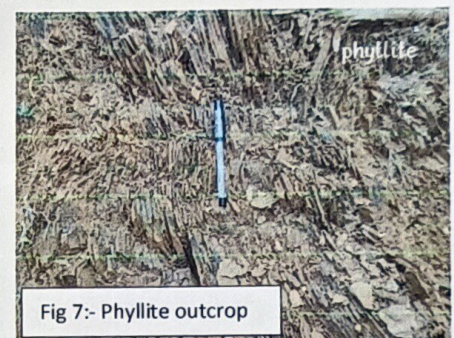
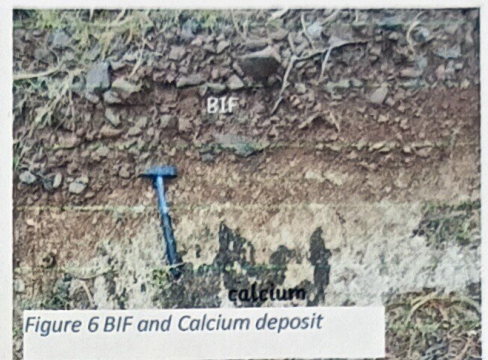
The rocks are exposed on the slope of the hill, the slope is moderate, the vegetation was the same as in location 1, and the area is the basement of Kaladgi, the rocks outcrop exposed are Metasediment, greywackes, BIF, mega volcanoes, and ultramafic. all this belongs to the Hunkung schist belt. The age of these rocks is mostly archaean

The outcrop shown in fig.6 is the boundary of BIF and calcium deposit. Calcium deposit was confirmed by adding a few drops of acids which led to the effervescence.

In fig 8 the rock which was not In situ showed folded structure and was identified as class 2 fold because of the thickness of the fold changes along the limbs.

Fig9 the rock is not in situ it can be observed that between two continued layers there is a fold in the middle it's said to be an intrafolial fold. the layers are parallel to the axial plane of the fold so the axial plane is Sn and the layers are Sn+1.

Fig 10 is a plan view of the bolder of Salgundi conglomerate which consists of Jesper grain 4.5 cm in size and BIF 13cm to 17cm in size the grains/clast show imbrication indicating paleocurrent direction



Location 2 :- N 16°04'52.6" , 75°52'30.3" E

An exposed outcrop near the road the outcrop is off-white in color and was overlain by brown debris the calcic deposit showed effervescences on pouring of HCL acid indicating the presence of CaCO₃.

Location 3, :- N16°04'50.5" , 75°52'11.4"E

The outcrop was exposed near the roadside alternating vertical beds of BHQ and Phyllite structural readings were taken with the help of a clinometer and Brunton compass.

Strike	Dip D	Dip Amount
334	NE	76
325	NE	65
326	NE	80
332	NE	86
338	SW	80

Fig;13 fold was observed in the outcrop and the folded layers are BIF the structural data of the fold is noted as

strike	Dip D	Dip Amount
40	NE	34
306	NE	40
320	NE	74

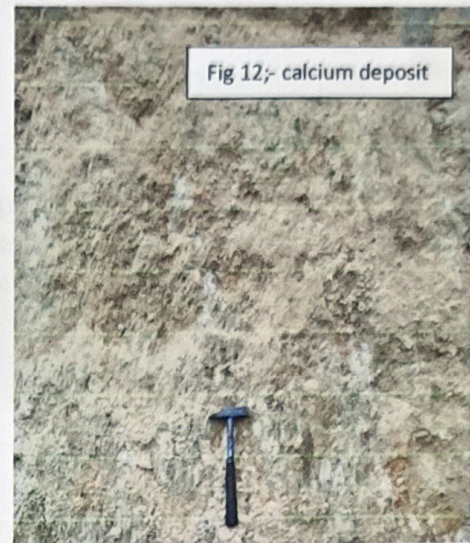


Fig 12;- calcium deposit

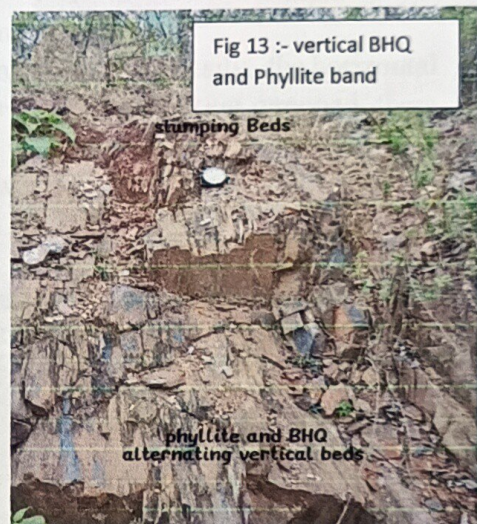


Fig 13 :- vertical BHQ and Phyllite band



Fig 13 :- Fold

Day 3 12/12/22

Location 1 :- $N15^{\circ}44'23''$, $75^{\circ}22'28''E$

The outcrop is just below the ridge in somapur. the outcrop exposed is Phyllite intercalated with BIF where there is the presence of a foliation plane .reading along the fotiation plane was taken along the outcrop

strike	Dip D	Dip Amount
150	SW	76
148	SW	79
168	SW	85

The change in the strike indicated that there is a broad wop in the foliation plane. in fig 15, the foliation plane is the S_n and can be identified easily, the horizontal line which is the spaced fabric is the S_{n+1} and because of S_{n+1} , the S_n is getting wrapped. there is intrafolial fold which is S_{n-1} its allergy got deformed and is rare to identify. There is also a quartz vein which is parallel to the foliation plane, as the rock was getting deformed same time the quartz vein was intruded.

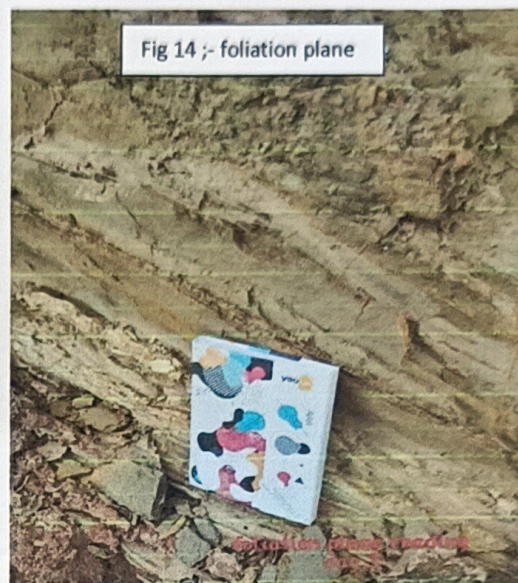


Fig 17 shows an angular unconformity and below there is the steeper plane, the soil was formed here during recent times or there might be a horizontal bed that was fully weathered.

As we moved on top of the ridge the area was very windy with no vegetation and also there were 9 windmills present on top of the ridge the rock type changed to quartzite which was reddish in color indicating that the parent rock was ferruginous sandstone seen in Fig 18. Also, the presence of a joint plane was observed along with sedimentary structures like ripple marks and herringbone structures. The bedding plane reading are:-

strike	Dip D	Dip Amount
142	SW	10
133	SW	11
184	SW	6



Fig 17 Angular unconformity



Fig 18 red quartzite



Fig 19 windmills

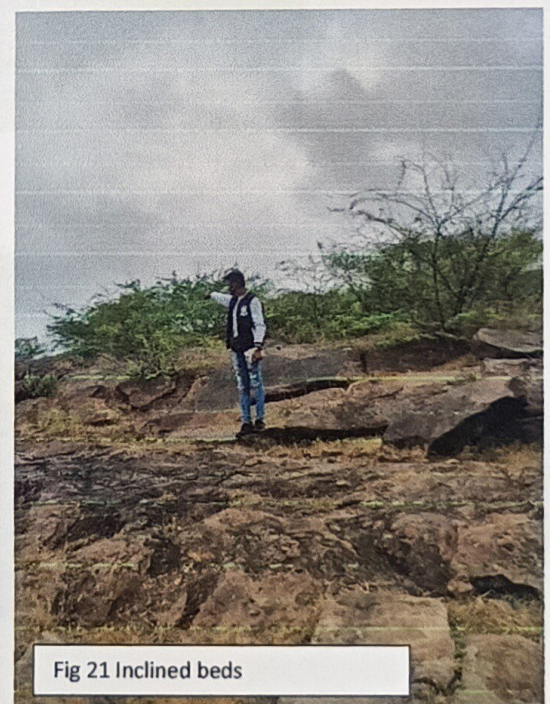
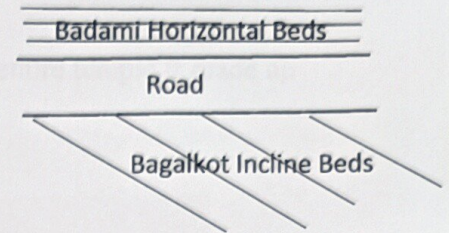
Day 4 13/12/22

Location:-

1Km from Heritage temple

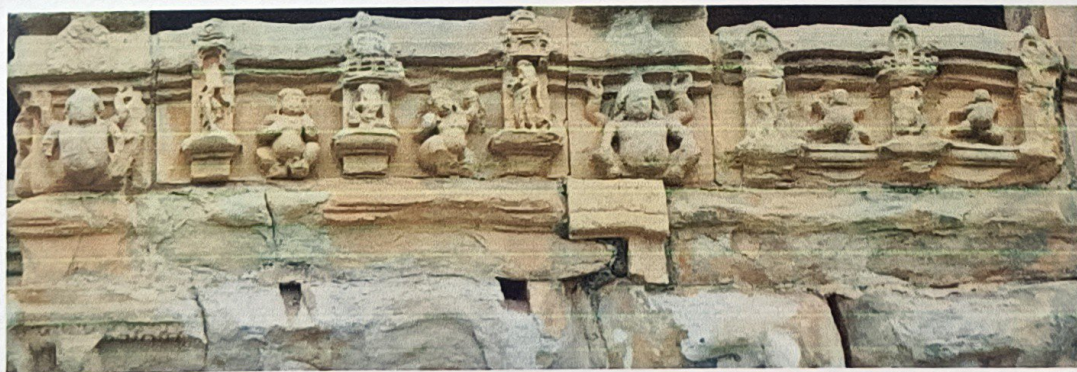
In the outcrop at the south side of the road in Aiholle there are inclined beds which are massive rocks of pink color, the rock contains clast of quartz, BIF, Chert, Agate, and also intercalation of breccia which also has clast of BIF. The dip of the bed is towards SW and consists of the alternate color of lamination. The structural reading are as follows:-

strike	Dip D	Dip Amount
120	SW	38
132	SW	43
112	SW	34



Location 2 Durga Temple, Aihole

We visited the Durga temple which was built in the early 8th century, the entire temple is made up of sandstone.



Fig;-24 – images of Durga temple

Day 5 14/12/22

Location 1;- N 16°3'22", 75°57'7" E

Name of Location:- Rakkasagi

The outcrop observed is granite (Closepet Granite)fig:- 25 the granite is pinkish in color, the grain size is coarse grain, and has minerals such as feldspar and quartz, the feldspar is pink in color. the rock had not gone through any deformation so there is no foliation in the rock. The age of the rock is 2.5Ga. there is the presence of xenolith size of the xenolith is 7-5cm and there is a mafic mineral present in it which shows some alignment of minerals. The xenolith can be a part of the supra-crustal basement.

A few steps on top you get an outcrop fig:- 26 of the same granite which shows some alignment of mineral grains along with joint sets. Reading shows the trend of 145° and joint sets at N 17° same as the Hunkung schist belt.

Location 2 :-N 16° 3' 32" 75° 56' 55" E

Found an outcrop which was a contact and on top there was conglomerate intercalated with quartz clast and is rich in BIF



Fig:-28



Fig:-25- xenolith in closepet granite

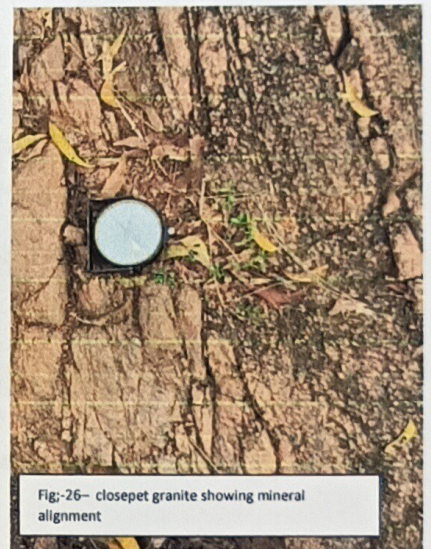


Fig:-26- closepet granite showing mineral alignment

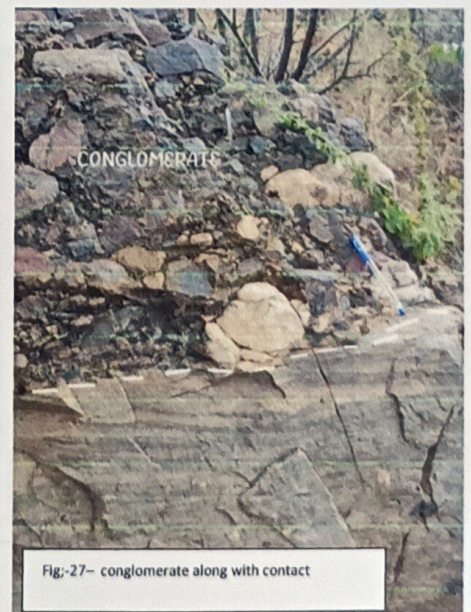


Fig:-27- conglomerate along with contact

Location 3:- N 16° 4' 8" 76° 3' 33" E

Name of the location:- Hungund Rural behind the school

Hungund schist belt is exposed behind the school which had BIF present as the iron concentration is much more. reading of the foliation plane was taken with the strike as 125° direction for a dip is NNE and the dip amount is 73. There was a quartz vein that was cross-cutting the rock indicating there are younger than the rock.

in fig :- 31 and 30 Between two phyllite planes strike 125° you get a shear lence in the middle which has a trend of 145°. There is the presence of BHQ inside and many folds are formed. The beds in the shear lence are not deformed and the beds around it have deformed.

Also observed a recumbent fold fig:- 32

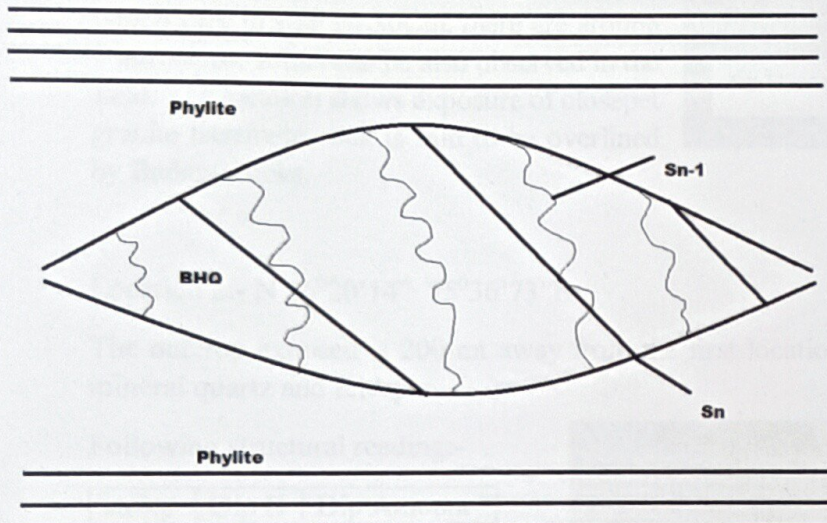
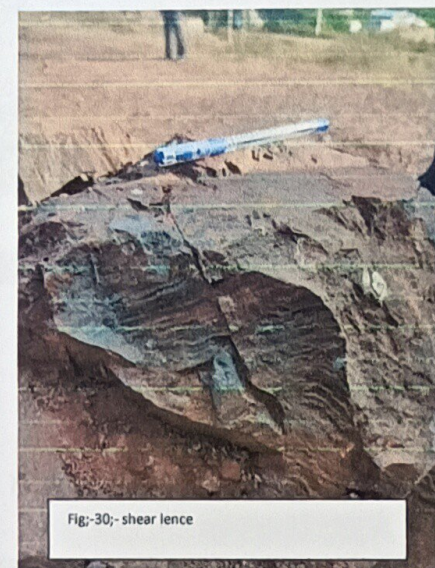
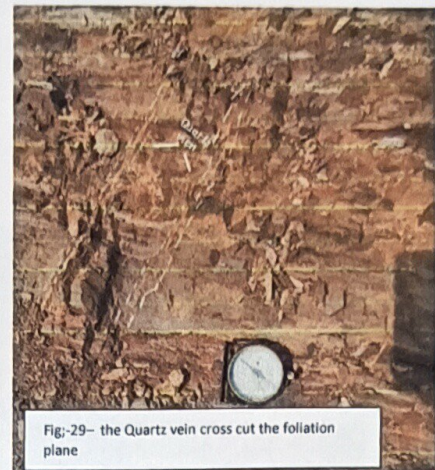


Fig:-31 shear lence diagram



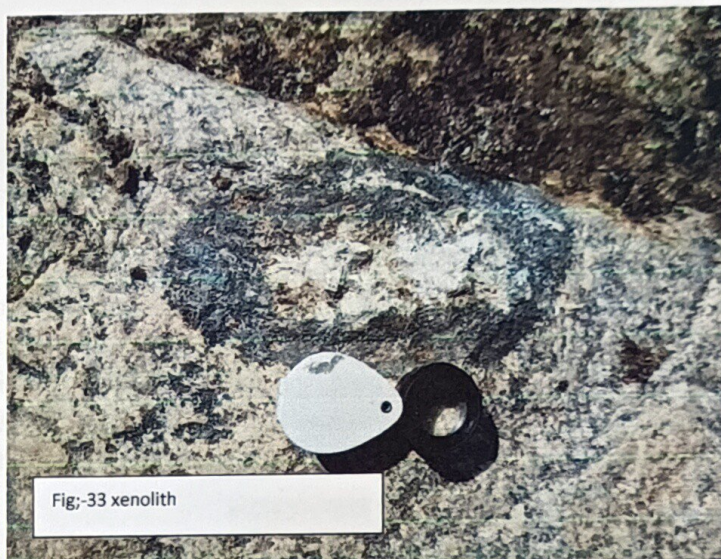
Day:- 6 -15/12/22

Location 1:- N16° 11' 17" 75° 36' 43"

Name of the location :- Bajpi

There was a massive outcrop exposed right side of the road the outcrop was weathered having mineral constituents such as quartz and feldspar. The rock has xenolith present which is of ultramafic composition and also has quartz, feldspar, and hornblende present in it. The rock is said to be grey granite

There are many mafic intrusions observed which vary in size 10-30Cm, there are around 7 intrusions. Joints can be also observed in the field. The location shows exposure of closepet granite basement rock is said to be overlined by Badami rocks.

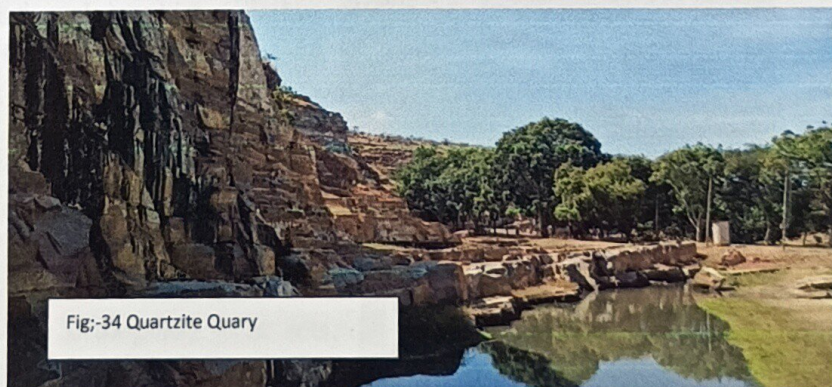


Location 2:- N 16°20'14" 75°36'73"E

The outcrop exposed is 200 mt away from the first location a huge outcrop of quartzite having mineral quartz and feldspar.

Following structural reading:-

strike	Dip D	Dip Amount
88	NS	11
114	NS	6
110	NS	3



Day:- 7 -16/12/22

Location:- N16°5'47" 75°48'7"E

Name of the Location:-Shirur

The area we visited is affected by a fault zone the rocks over here are highly fractured, all the joints a fracture, and few joint sets continue not all .there are also short joint sets that don't penetrate. there as quartz vein present which took the advantage of the joint set and intruded and the vein has a different structure than the other vein because its coarse grain and is elongated in nature and look like teeth these veins are called Gossan vein, now these veins have space in between and are growing perpendicular to the vein wall. Fluids are important in fault zones as they crystals and for veins and the fluids were taking advantage of veins..

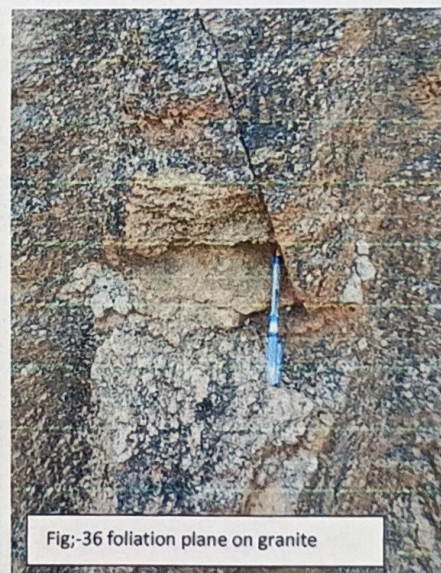


Fig;-35 Gossan vein

Location 2:- N16°5'8" 75°48'48"E

Name of the Location:- Honnakatti

The exposed rock was a pink granite which was a coarse grain rock reading taken on the foliation plane of granite as strike 100, dip direction NNE, and dip amount 43. just a few meters away you get pink granite introducing the black rock in which foliation can be seen, and the black rock is said to be xenolith.



Fig;-36 foliation plane on granite

Location 3:- N16°2' 6" 75° 45' 26" E

Name of the Location:- Murudi

A massive outcrop of sandstone was exposed which consists of intraformational conglomerate, and some orthogonal joint sets, sandstone is said to be made up of pure quartz and is fully white in color.



Fig;-37 Black xenolith

Location 4;- N $16^{\circ} 4' 7''$ $75^{\circ} 41' 34''$ E

Location name:- Kelawadi

Phyllites are exposed at the roadside which shows some amazing folds. Reading of the folds is given as:-

strike	Dip D	Dip Amount
104	SW	28
90	S	11
60	SE	10
102	SW	42
103	NE	12
166	SW	22
215	NW	19
257	NW	5
275	NE	11



Fig:-39 folds

Location 5:- N $16^{\circ} 5' 1''$ $75^{\circ} 42' 4''$ E

A visit to a Dolomite Mine in Bagalkot

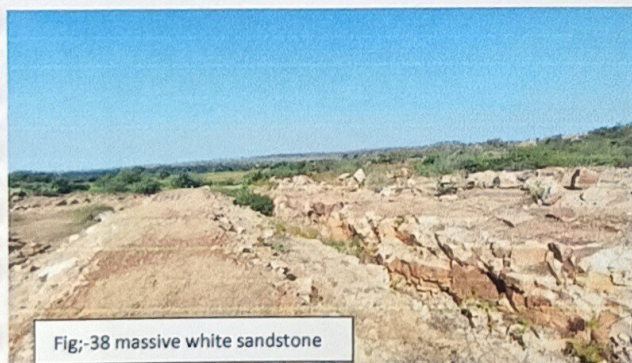


Fig:-38 massive white sandstone

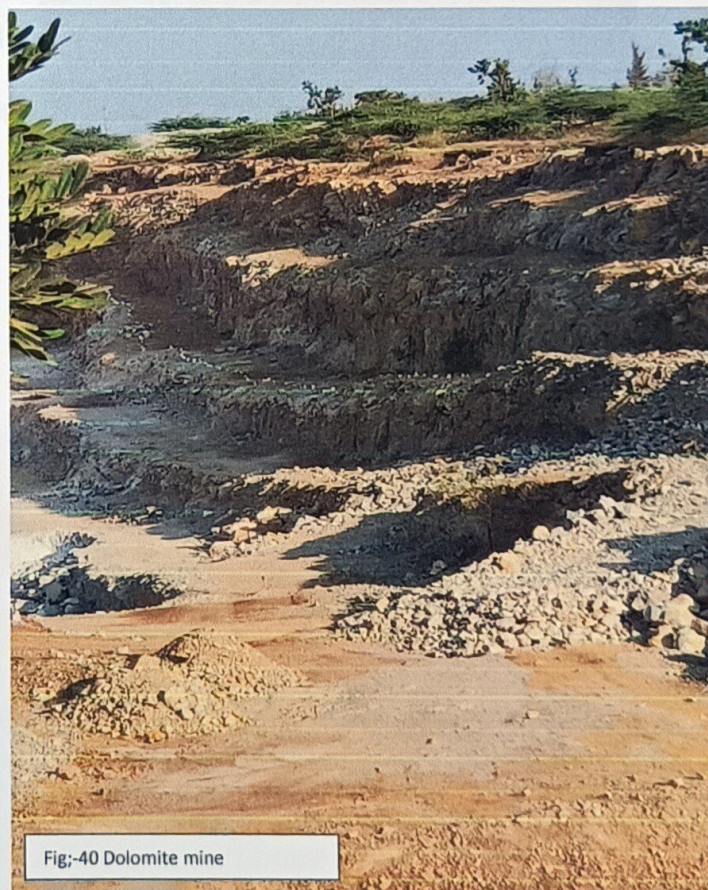


Fig:-40 Dolomite mine

Day 8:- 17/12/22

Location 1:- N 16° 6' 51" 75° 38' 24" E

Name of the location:- Kagalcom

the location of exposed quartz is on top of the ridge showing a trend of 100, there are some quartz veins showing comb structures formed because of tensional forces, also these veins have some of well-developed crystals.

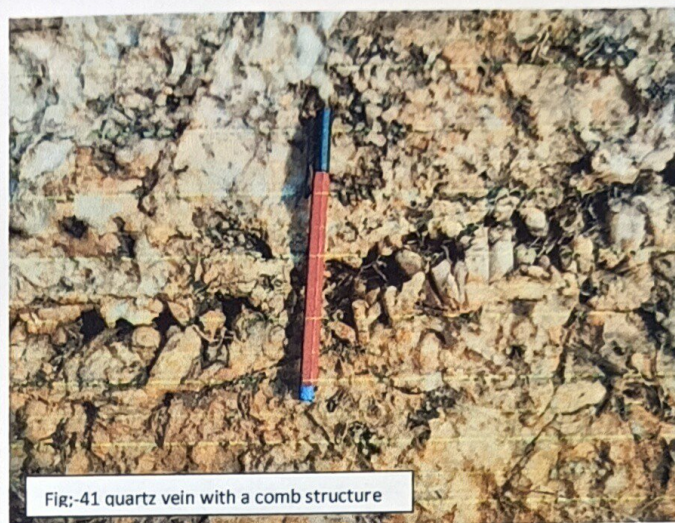


Fig:-41 quartz vein with a comb structure

Location 2:- N16° 6' 46" 75° 38' 21"

Just below the ridge exposed are moderately inclined dolomite beds, they have strikes of 103 – 106 and dipping in SW with a dip amount of 44-44.

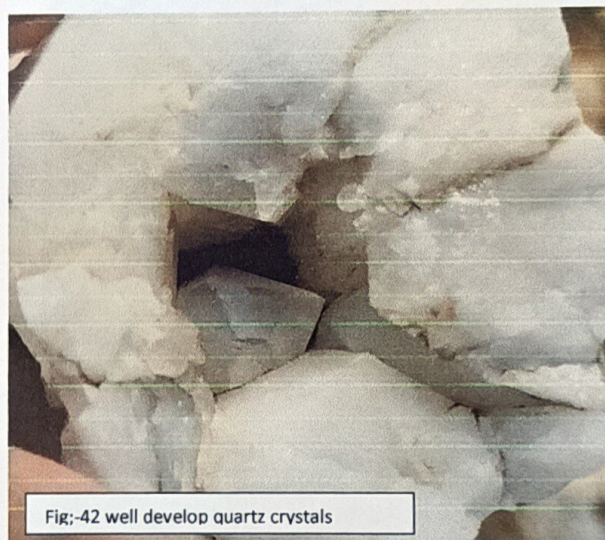


Fig:-42 well develop quartz crystals



Fig:-43 inclined dolomite beds

Location 3:- N 16° 6' 33" 75° 38' 47"

Location name;- Sulikeri

Dolomite mine



Fig;- 44 Dolomite mine

Location 3;- N 16° 03' 19" 75° 38' 45" E

The exposed rock was Konkanpapa limestone. showed effervescences on pouring of HCL acid.

strike	Dip D	Dip Amount
104	SSW	4
86	SSW	4
81	SSW	4



Fig;-45 Konkanpapa limestone

Location 4:- N 16° 1' 13" 75° 38' 57" E

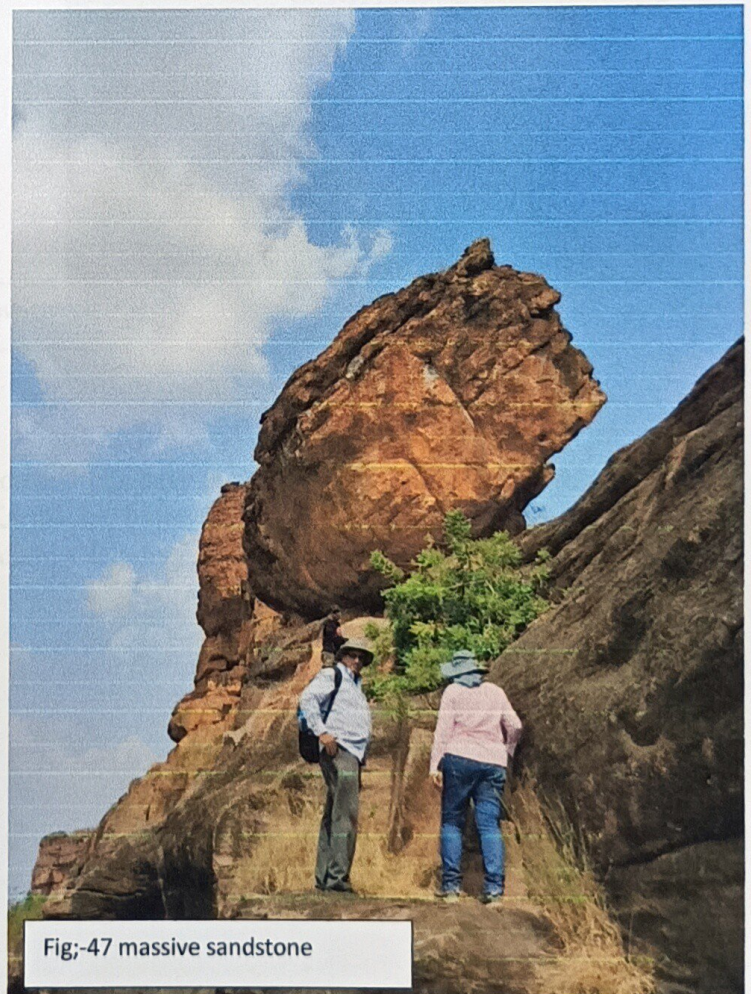
Location name:- Halakurki

The rock was exposed below the bridge and the exposed rock is Ferro- shale. The rock shows strike between 120- 125, dipping in SSE and dip amount between 3-6.

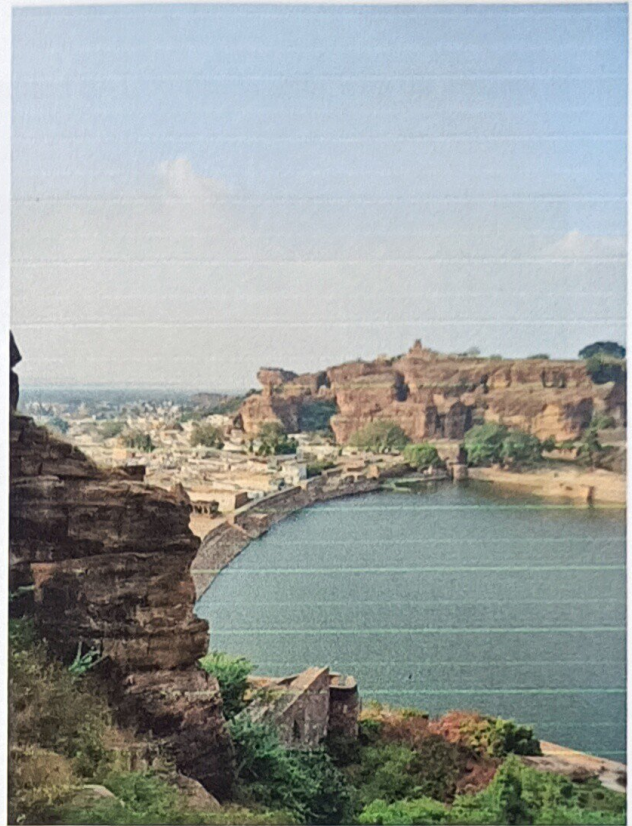
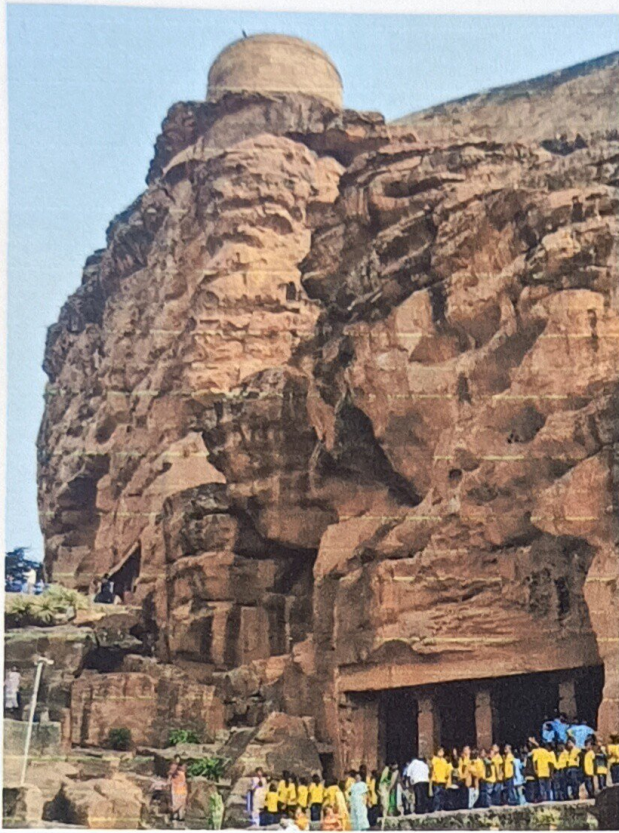


Location 5:-

The massive outcrop was of sandstone with a cross-bedding structure that contains Quartz, orthoclase, and white cementing material



A visit to Badami Cave Temples.



Fig;-48 Cave temples

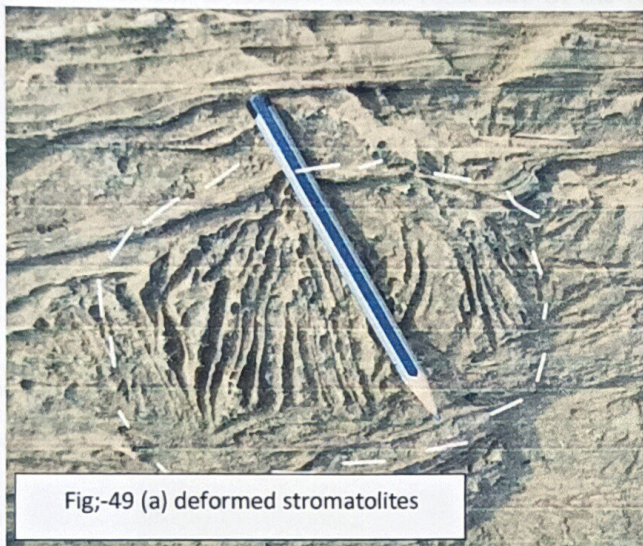
The Badami cave temples are a complex of Hindu and Jain cave temples located in Badami, a town in the Bagalkot district in the northern part of Karnataka, India. The caves are important examples of Indian rock-cut architecture, especially Badami Chalukya architecture, and the earliest date from the 6th century.

Day 9 – 18/12/22

Location 1:- N 16° 10' 4" 75° 21' 3" E

Name of the location:- Lokapur

The outcrop shows foliation in the rock reading is strike 120-125, dips in SSW with the amount of 71 – 75. Also, there is deformed stromatolites.

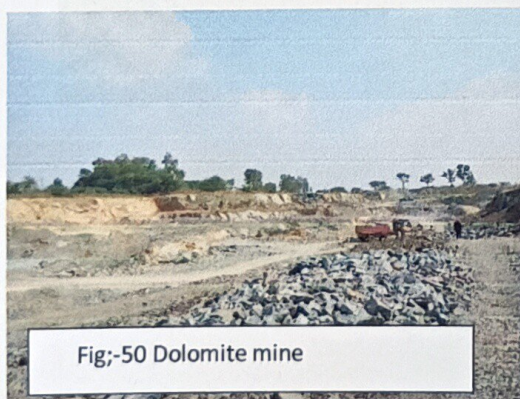


Fig;-49 (a) deformed stromatolites



Fig;-49 (b) deformed stromatolites

Location 2:- visit to dolomite mine



Fig;-50 Dolomite mine



Fig;- 51 Calcite

Day 10 -19/12/22

Location 1:- Almatti Dam

It is the upper Krishna Project. The Lal Bahadur Shastri Dam is also known as Almatti Dam. It is a multi-purpose hydroelectric project on the Krishna River in North Karnataka, India which was completed in July 2005. The target annual electric output of the dam is 560 MU (or GWh). The Almatti Dam is the main reservoir of the Upper Krishna Irrigation Project; the 290 MW power station is located on the right side of the Almatti Dam. Water is released in to the Narayanpur reservoir after using for power generation to serve the downstream irrigation needs. The irrigation purpose project provides water for industrial purpose, drinking as well as for power generation. The full reservoir level of Almatti dam was originally 160 meters MSL but then the Krishna River conflict between Andhra Pradesh, Karnataka, and Maharashtra was resolved by the Brijesh Kumar Tribunal and the dam was authorized to be raised to the height of 524 meters MSL with nearly 200 TMC gross storage capacity 26 different Radial spillway gates are housed in the Dam. Water spread is 927km. Dam top is 528mts and depth of river bed is 27mts. Total of 26 gates are present. The dam contributes 60% of irrigation area.



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