



SCHOOL OF EARTH, OCEAN AND ATMOSPHERIC SCIENCES
GOA UNIVERSITY

Exam:

Roll No: 22P0450002

LABORATORY CERTIFICATE

This is to certify that Mr. /Ms. ADITI R. KHORJUVEKAR

has satisfactorily completed the course of practical for M.Sc in Applied Geology.

Experiments conducted are pertaining to paper FIELD MAPPING (AGTC-407)

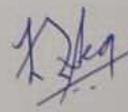
Practicals prescribed by the University for MSc PART I class, during
the academic year 2022-2023

DEAN
SEOAS

Faculty member in-charge

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


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

Acknowledgement

To my teachers who joined us on our fieldwork, I would like to express my profound gratitude. In charge teachers Dr. Anthony Viegas, department director, Dr. Poornima Sawant, and Dr. Nicole Sequeria are thanked for all they have done to help us learn and comprehend things better as well as for guiding us during the fieldwork. A special thanks goes out to Dr. Niyati Kalangutkar and Miss Pooja Gadi for imparting their knowledge during the lessons. I want to express my gratitude to all of my colleagues for their unwavering assistance and support during the fieldwork.

Geology of Karnataka

INTRODUCTION

The State of 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 crystallines and older sedimentaries and a narrow coastal strip of about 5,000 sq.km of Tertiary and Quaternary sediments.

The earliest account of the geology of parts now included within Karnataka were given by Christie and Capt. Newbold of the British East India Company. Robert Bruce Foote of the Geological Survey of India was the first to make a regional study. Geological mapping in most of the area of Mysore and Hyderabad states was carried out prior to 1950.

Systematic geological surveys and studies in the erstwhile Princely State of Mysore, now forming the southern part of Karnataka were initiated as early as 1898, under the aegis of the Mysore Geological Department by V.S.Sambasiva Iyer, B.Jayaram, P.Sampath Iyengar, W.F.Smeeth, J.M.Maclaren, E.W.Wetherall and was continued by B.Rama Rao, C.S.Pitchamuthu, B.P.Radhakrishna and others. Investigations by these workers dealt with various aspects of classification of the schistose rocks and the granitoids, their mutual relationship vis-à-vis the gneisses.

Geology

Karnataka forming a part of the Indian Shield is constituted of rock formations ranging in age from 3300 m.y. to 5 m.y. Barring a 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 of 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 granulite suite of rocks. The craton preserves a billion year orogenic history from 3400 m.a. to 2400 m.a. Epicratonic or intracratonic sedimentary basins called Purana Basins occupy the northern segment of the craton whose northern part in turn is concealed by Deccan basalts. Thus younging of lithosequence from south to north is evident

Physiography :

Karnataka can be divided into three well defined geomorphic regions viz., the coastal plains on the west bordering the Arabian Sea the Malnad or mountainous region comprising the Western Ghat and the plateau region on the east. The coast line is straight and is about 400 km long. The coastal plains rarely exceed 30 km in width. To the east of the coastal plain, the Western Ghats forming the sub-continental water

divide rise precipitously in a series of scarps and terraces towering more than 1000 m above m.s.l. within a short distance from the coastal plain. The Western Ghats trend NNW-SSE parallel to the west coast and have an average width of about 40 km. They are dotted with high peaks, viz., Kudremukh (1884 m) and Mulaingiri (1912 m) in the Bababudan hills. The Western Ghats grade into the plateau region towards east. This plateau is the southern extension of the Deccan Plateau with an average elevation of about 650 m with a series of narrow, linear ridges and hill ranges of schistose rocks and bouldery granitoid hills. The state is drained by three major easterly flowing river systems. These are:

- Manjira River of the Godavari basin in the north,
- Krishna with its tributaries, Tungabhadra, Ghataprabha, Malaprabha, Bhima and Vedavati draining the northern and central part and
- Cauvery with its tributaries, Kabini, Hemavathi, Simsha and Arkavati draining the southern part. Besides the easterly flowing river systems, there are several westerly flowing streams with short, straight and steep courses.

The most prominent of them are Kalinadi, Sharavati and Netravati. Most of the river courses are principally aligned in two directions:

- ENE-WSW to WNW-ESE,
- north-south to NNW-SSE and correspond to the major lineaments, faults, shear zones and joints.

Many of the major rivers, particularly the west flowing rivers and some sections of all the east flowing rivers have straight courses and sharp turns suggestive of strong structural control on the drainage pattern. There are a number of rapids, cascades and waterfalls along the major rivers. The well known among them, are the Jog Falls on the Sharavati River and the Sivasamudram Falls on the Cauvery River. The state experiences humid Tropical to Semi – Arid climate for most part of the year. The annual rainfall is about 300 to 500 cm in the coastal plains and the Western Ghats and about 80 cm on the eastern plateau. The Western Ghats are thickly forested. The plateau is generally devoid of dense forest.

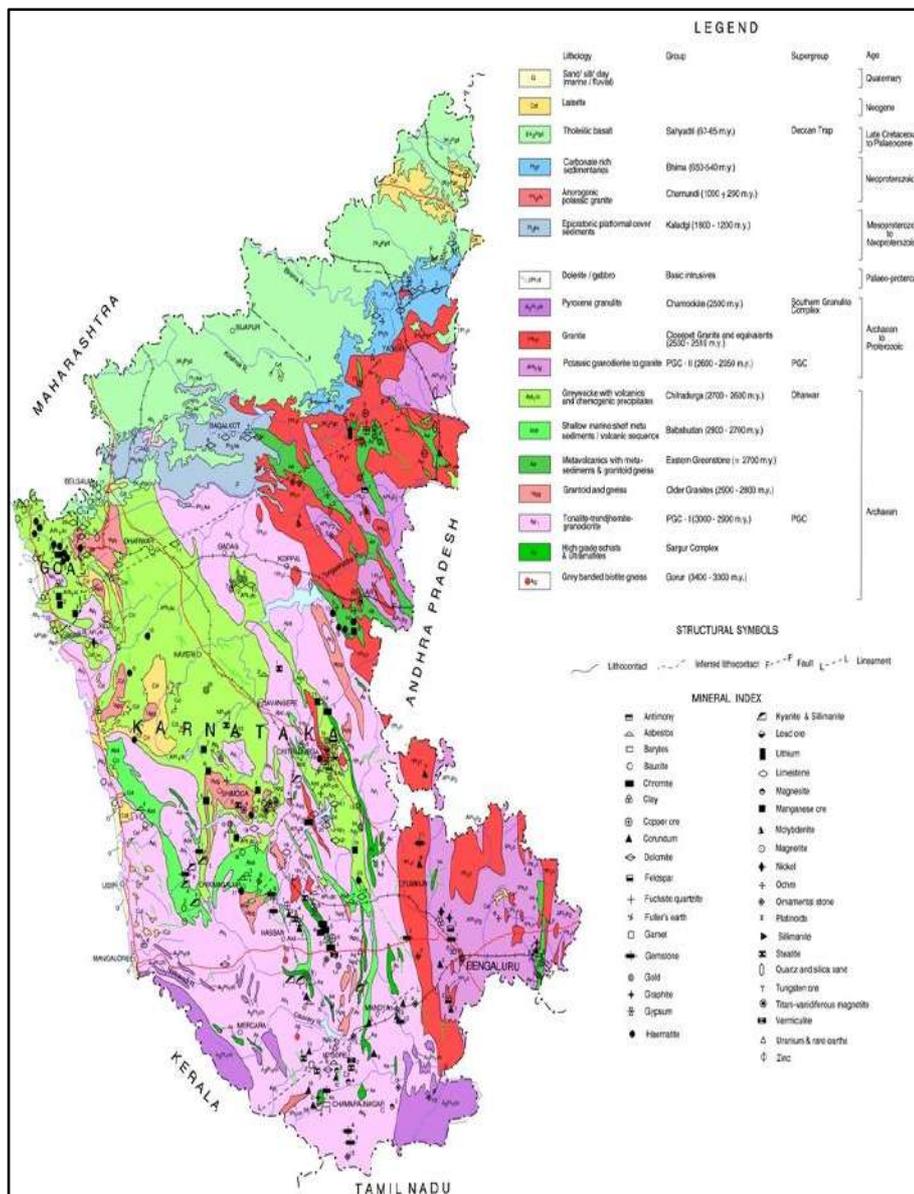


Fig: Geological Map of Karnataka

Proterozoic (Purana) Basins

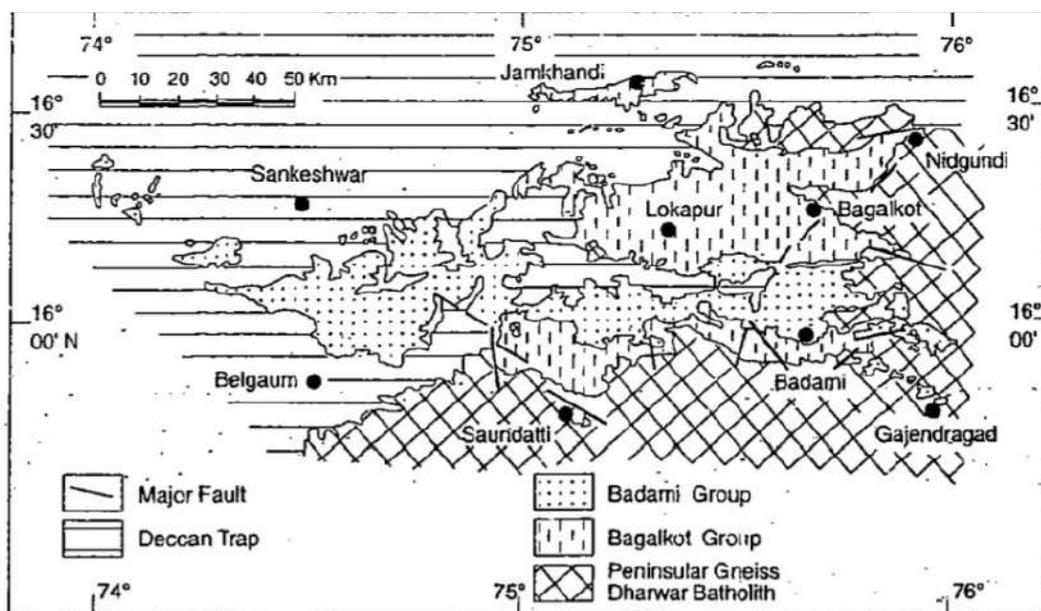
The north and northeastern segments of Peninsular India witnessed orogenic event of MesoProterozoic Mobile Belts, involving the subduction of the margins of plate boundaries, these compressive forces were complemented by intraplate extensional tectonics resulting in the formation of a series of intracratonic basins, viz. Kaladgi (Bagalkot and Badami) and Bhima. These sedimentary basins are popularly known as Purana Basins and the hiatus involved is called Eparchaeon Unconformity in the Indian Geological Literature.

On the basis of the imprints of diastrophism, these basins can be broadly classified into an older group that underwent buckling deformation by compressive forces, i.e. Bagalkot Basin and the younger group that were subjected mainly to faulting deformation i.e. Badami and Bhima basins.

Kaladgi Supergroup (earlier known as Kaladgi Series) is divisible into two groups,

- the Lower Bagalkot Group and
- the Upper Badami Group

separated by a disconformity. These sedimentary sequences occupy an area of 8300 sq.km spreading in parts of Bijapur and Belgaum districts. Their total aggregate thickness measure around 4500 m(Jayaprakash et al, 1987).



Kaladgi basin in Dharwar craton (simplified from Jayaprakash et al. 1987).

Bagalkot Group has been further sub-divided into two Subgroups, viz.

- the Lower Lokapur and
- the Upper Simikere.

They consist predominantly of carbonates and argillites with siliciclasts in lesser quantity.

Badami Group of sediments are found as a vast expanse of horizontally bedded ferruginous arenites from the northwestern tip of Raichur district, spreading over Bijapur and Belgaum districts and beyond into Maharashtra State; argillites and carbonate precipitates too occur, but as small and isolated outcrops in the central part of the basin.

Deccan Trap: Flows of Deccan basalts occupy an area of 31,500 sq.km. covering the entire Bidar district, parts of Belgaum, Bijapur and Gulbarga districts. Their maximum thicknesses are estimated to be of the order of 600 m, spreading to a total number of

31 flows.

By and large these continental flood basalts are tholeiitic in composition and exhibit flow characters of both "Aa" and "Pahaehoe" types. Integrated geomagnetic, geochemical tectonic and radiometric studies indicate the age of their outpouring was in the range of 65 to 67 million years (Courtilott, et al 1986).

	Group	Subgroup	Formation	Member
Deccan traps				
<i>Angular and erosional unconformity</i>				
KALADGI SUPERGROUP	Neo-Proterozoic B A D A M I		⇒ Konkankoppa Limestone	<ul style="list-style-type: none"> • Gokak Sandstone • Kendur Sandstone • Torgal Conglomerate
			⇒ Halkurki Shale	
			⇒ Cave Temple Arenite	
<i>Angular unconformity</i>				
	Meso-Proterozoic	S I M I K E R I	⇒ Lakshanhatti Dolomite	<ul style="list-style-type: none"> • Tulasigeri Quartzite • Bevinmatti Conglomerate
			⇒ Niralkeri Chertbreccia	
			⇒ Arlikatti Argillite	
			⇒ Muchkundi Quartzite	
	B A G A L K O T	<i>Disconformity</i>		
		L O K A P U R	⇒ Petlur Carbonates	<ul style="list-style-type: none"> • Chikshellikeri Limestone • Chitrabhanukot Dolomite
			⇒ Mahakut Chertbreccia	<ul style="list-style-type: none"> • Yargatti Calc. Shale • Jalikatti Phyllite • Manoli Ferrug. Shale
			⇒ Yadhalli Argillite	<ul style="list-style-type: none"> • Timmapur Quartzite • Almatti Quartzite • Salgundi Conglomerate
			⇒ Saundatti Quartzite	
<i>Angular and erosional unconformity</i>				
PRECAMBRIAN BASEMENT COMPLEX (PBC) Granitoids, Gneisses & Metasediments				

Approach

All of the locations were reached by bus; at 9:30 in the morning, we boarded a Karnataka Local Transport bus to Belgaum from Panjim Bus Stand. After arriving in Belgaum at 1:30 p.m., we boarded a private bus that would take us to all of the day's destinations.

Day 01

BELGAUM – BAGALKOTE HIGHWAY ROAD

Loaction 01: Karidiguddi Village, near Soman Airport

Lat: 15°52'37"

Long: 74°41'49"



Fig 01: a) Exposed area

b) conglomerate exposed on hillside.

The outcrop was seen on a hillside at the road's northernmost negotiable side. The exposed rock was conglomerate, which signifies basement rock. In Indian Stratigraphy, this conglomerate was attributed to the Kundargi formation of the Simikeri subgroup of the Badami Group. This 820-meter-high conglomerate is referred to as the Bevinmatti Conglomerate.

As we proceeded from the bottom of the hillside to the top, the conglomerate in that outcrop displayed variation in clast, its clast size, and its matrix. At the base of the hill, the conglomerate matrix was siliceous, and as we ascended, the matrix changed to ferruginous. The aggregate has size variations ranging from roughly 0.5 cm to 5.0 cm. Quartz and feldspar made up the clast's mineralogy; quartz was distinguished by its vitreous sheen.

The Conglomerate indicates the presence of unconformity.

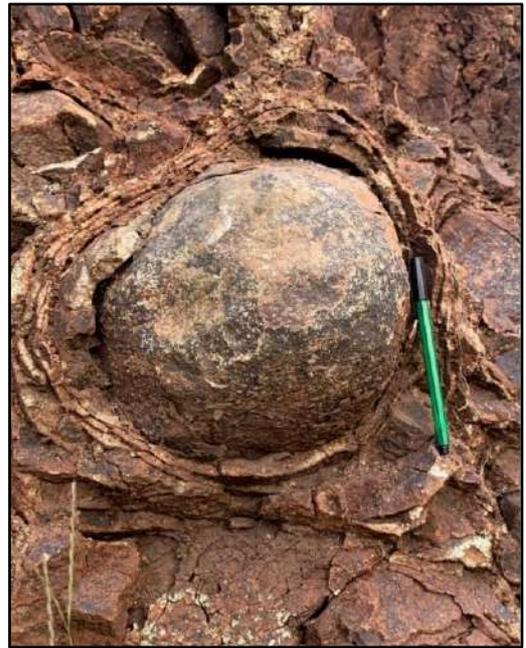
Location 02: Approximately 130m away from the Spot 01

Lat: 15°52'37.5" N

Long: 74°49'49" E



Fig 04: vesicles observed in the rudaceous rock



b) The rudaceous clast exposed on Location 2 of day 1.

On the side of the road, an exposed outcrop was surrounded by some dry vegetation. The rock was clast supported and the outcrop was composed of rudaceous size clast measuring approximately >15 cm. Spheroidal weathering led to the formation of the outcrop. Small vesicles were visible on the clast's surface, and weathering had split the rock. Basalt from the Deccan trap is more exposed.

Deccan Traps (66 Million Years)

500

Million years gap

Badami Group of rock (541 Million Years)

Date: 11/12/2022

Day 02

RAMTHAL

Location 01: Ramthal, Hillside

Lat: 16°25'78" N

Long: 75°50'88" E

The Hungund Schist band, which is composed of metavolcanic sediments with metamorphosed ultramafics, makes up the foundation of Kaladgi in this location. Metasediments, acid volcanics, and BIF-bearing Greywackes are further features.

Spot no 01:

At the base of the hill, there were conglomerate with BIF clast, Conglomerate with BIF showed clast size up to 9cm length & 3.5cm in width.

Spot no 02:

15-20 mins few meters towards the hill slope and towards the river Malaprabha there were phyllite folds seen which were deeply, steeply towards NE direction, they were striking N 163° and dipping by 76° NE. The basement is made up of BHQ phyllite. The BHQ phyllite was showing foldings the core of the anticline shows BHQ belonging to older Hungund schist belt. They were showing metallic lustre and the non shiny part shows granular texture. BIF were also seen. They were showing competent & incompetent layers with shallow plunge with dip amount 24° dipping in direction N333°. The phyllite were seen as chipped formed. The Hungund schist belt is Archaean age (0.4 – 2.5 Ma) older than Proterozoic (25 - 541 Ma).



Fig :a) there are phyllite showing folded layers b) The rock sample shows Intrafolial folding

Spot no 03:

On the hill slope at 600m height which were separating the formation above by an unconformity (fig d) which is seen in the conglomerate with variation in clast size from 3cm to more than 15cm and clast was Quartzitic in composition.



Fig: c) Malaprabha river



d) the contact between 2 formation

Location 02: 200mts away from Ramthal

Lat :16°05'25"N

Long:75°52'2"E

The outcrop exposed was a section of caliche deposits. It had non-crystalline variety of CaCO_3 which could be Ankerite. There were minerals like smoky Quartz (identified by its vitreous lustre and smoky appearance and amorphous variety of calcite as the cleavage were absent. Calcite was confirmed by the chemical analysis i.e by putting HCl^- on a sample from the outcrop, it gave effervescence.



Fig: e) caliche deposit

Location 03: 500mts away from Ramthal

Lat: 16°4'50"N

Long: 75°52'9"E

The outcrop in this location is exposed on road side area. The lithology of that area consists of phyllite and BHQ. The lithology in the area are folded in which some folds are primary fold and some are secondary folds Also an Intrafolial fold is observed which is showing steep folding with well exposed hinges.

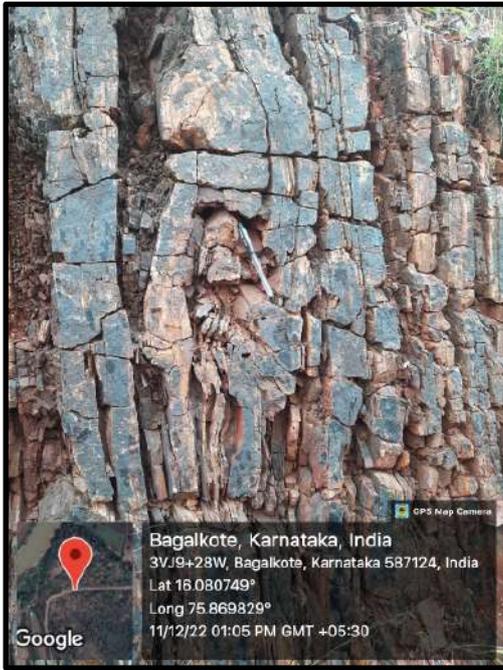


Fig : f) folding of Phyllite & BHQ



g) folding of limb at lower positions with steeply dipping.

DAY 03
NARGUND

Location 01: Nargund, hillbase

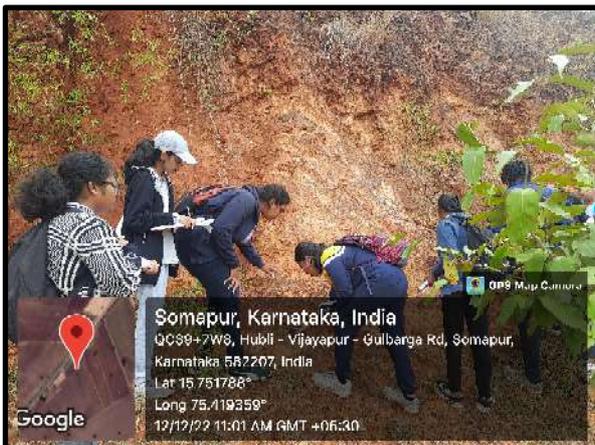
Lat:15°44'23"N

Long:75°22'26"E

Spot no 01:

The exposed area was under government guidance, with dry condition and with some vegetation. The rock exposed in this location is metamorphosed phyllite interconnected with BIFs. The rock has foliation in which the minerals have aligned and arranged themselves well. Also there are Quartz veins observed intruding in the weakly metamorphosed rock.

The Quartz veins are parallel foliation. The intrusion is Synchronous with the deformation of the rock. The Quartz veins hav thickness from 2cm -9cm approximately. Also we observed a shear sense which indicated by shear sense indicator.



Spot no 02: 15m away from spot 01

The rock exposed in this area has caliche deposit. There is a layer of pebbles/cobbles of varies clast size which is of recent age which is a recent age unconformity and is not q part of Kaladgi formation. The Quartz veins which are steep/vertical dipping are seen to become horizontal as they move upward, this is due to erosional surface and slumping of the veins.



Location 02: Nargund hill top, near Power plant (800mts above location 01)

Lat: 15°43'49"N

Long: 75°22'47"E

The outcrop was 60mts and was exposed near power plant, consist of numerous sets of joints , fractures,etc. The rock exposed was Quartzit, identified on it's lustrous appearance. There was some features like Ripple marks and Herring bone structure observed on this outcrop.





Date : 13/12/2022

DAY 04

AIHOLE

Location 01:Aihole, 1km away from heritage site

Lat: 16°01'48"N

Long::75°53'05"E

The outcrop was exposed on both side of the road. In the North side of the road horizontal beds of Badami was exposed and On the south side of the road was the inclined beds of Bagalkot.

Spot no 01: South side of the road

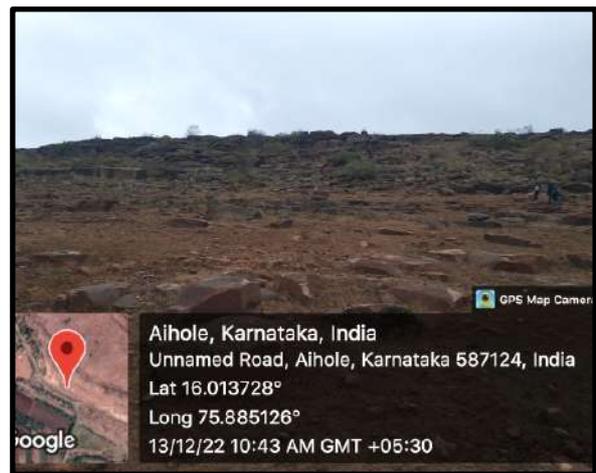
The exposed rock is Quartzite with pinkish appearance. There was 6-7 layers of conglomerate observed in this outcrop. The outcrop passes through Intraformational conglomerate/breccias;(some angular fragments was also observed) within the beds consisting clast made up of Quartz, Jasper, BIFs and Cherts which are generally Elongated.(Conglomerate in this region was not a basement rock).

The clast size varies from 0.5-3cm as we move from bottom to top. Also there were features like Cross-bedding observed in this outcrop.



Spot no 02: North side of the road

The outcrop exposed on hill and hill slope of Aihole. The beds were tilted at small angle. The rock appeared reddish indicating the arenite rocks i.e sandstone, having high amount of SiO_2 .



Location 02: Shirur, near the temple

Lat: $16^{\circ}05'34''\text{N}$

Long: $75^{\circ}49'39''\text{E}$

The outcrop was present on hill side near a temple. This area was showing structural features like fault, joints, shear sense indicator like slickenside and lineation.

The fault plane was identified based on the presence of striation on its surface. Also lineation along with slickenside was observed on the fault plane. By applying Anderson theory of faulting we have concluded that it was a Reverse faulting. Also there were perception of minerals observed.

On the surface of the outcrop there were joints present which were making an acute angle (30-60) w.r.t each other indicating the Conjugate joints.



Date: 14/12/2022

DAY 05

AMINGAD

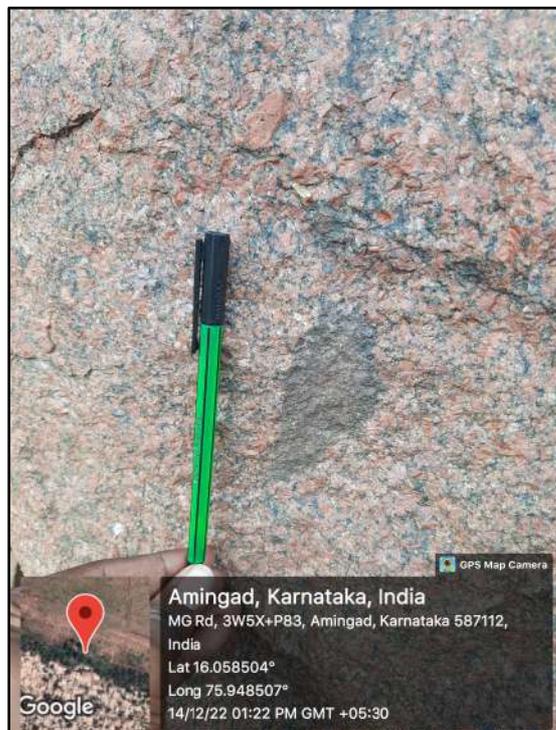
location 01: Amingad Hill

Lat: 16°03'22"N

Long: 75°56'43"E

Spot no 01: Hill base of Amingad, Right side of the temple path

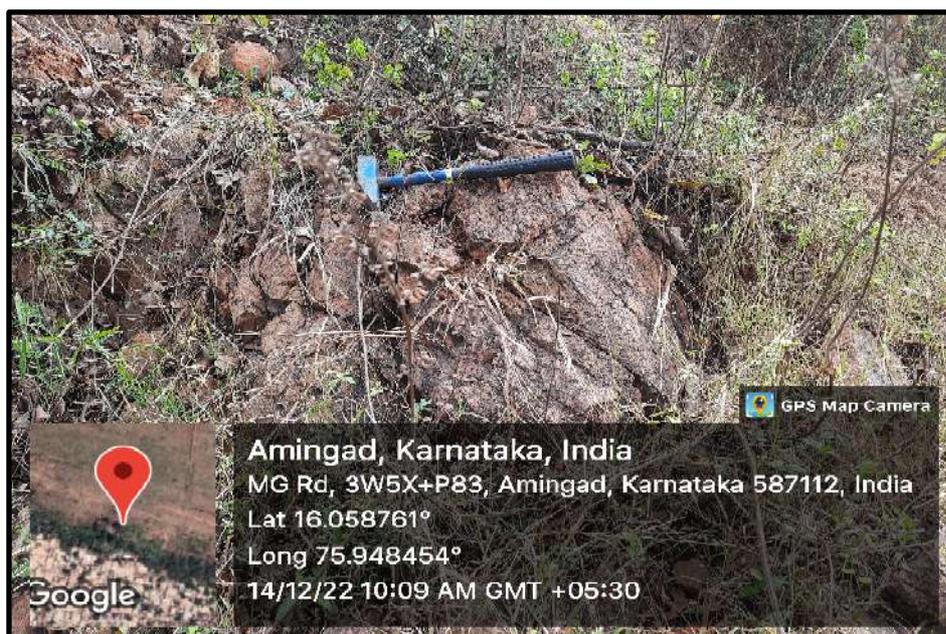
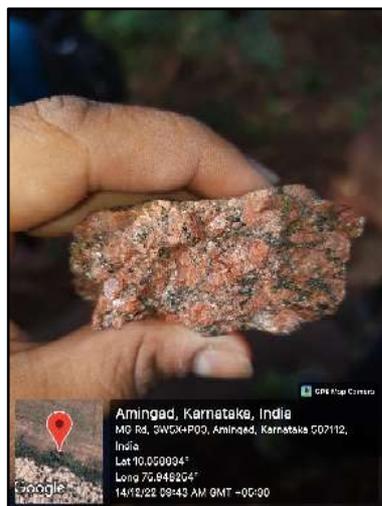
The rock exposed at this spot was Granite which had pink appearance. The rock was separated from the hill top and rolled down at the base and slope in form of boulders. The Boulder were having large Xenoliths with long axis-10.5cm and short axis-7cm, which was dark color indicating mafic composition. The Xenoliths is of accidental type. The rock in this area is the basement rock.



Spot no 02: Hill slope of Amingad

The rock was similar Pinkish Granite. The rock was exposed on both side of the temple path. The rock was consist of minerals like feldspar(orthoclase),Quartz as the essential minerals along with some assessorry minerals like hornblende or biotite(it was difficult to identify). It was showing porphyritic texture i.e feldspar(orthoclase) as the phenocryst and Quartz & Hornblende or biotite as groundmass. The phenocryst was of 1-2cm in size.

On the right side of the path, it was the same rock as left side but this rock was jointed and weathered. Also there was presence of shear zone, the plane was dipping towards eastward with dip of 86° trending NS. Also there was shear sense indicator shown by the alignment of clast in a direction. The Granite at this location is CLOSEPET GRANITE.



Spot no 03: 1km away from spot 02

At this spot, the rock was showing connection between the basement and the formation, above which it was separated by conglomerate, which was having clast of BIFs which was Similar to the conglomerate exposed at Ramthal.

Location 02: Hungund, behind Adarsha Mahavidyalaya

Lat: 16°04'09"N

Long:76°03'02"E

The outcrop is exposed behind the school is Hungund Schist belt that had BIF with high Iron concentration compared to previous location. This is the basement of the kaladgi Supergroup. There was BHQ at the bottom and at the top were phyllite. Also Intrafolial fold were observed in this area. At some places there were Quartz veins cross cutting in this outcrop. The beds in this location were striking N125°in NNE with dip amount 55°. There were some shear lens observed at this location.



DAY 06

BILGI

Location 01: Hill base, Belgium

lat: 16°20'25"N

Long: 75°36'42"E

This location had the exposure of Grey Granite, which were undergoing deformation and hav features like joints,faults,pot holes, Exfoliation,etc. Also there were Quartz & Pegmatite veins intruded the Grey Granite. Speciality of this outcrop is that, it is having accessory minerals as Biotite and Hornblende is absent along with essential minerals as feldspar and Quartz.

This outcrop had different kinds of Xenoliths within it, having mafic composition.

- Xenoliths in Xenoliths that is know as Excotic Xenoliths.
- Also there was a Xenolith in which Quartz was present at center having alignment of hornblende surrounding it which were trending N72°.

The pegmatite vein were having thickness of 24-25cm average. At some place the pegmatite vein was showing intrusion of joint showing displacement. Also Exfoliation at this location is at early stage.





Location 02: 2km away from location 01, Quarry site

Lat: 16°31'72" N

Long: 75°36'50"E

The exposed rock in this area is Quartzite, which have undergone high-grade metamorphism. The Quartz is identified based on its lustrous appearance. This outcrop has 2 sets of joints; they are perpendicular to each other i.e the bedding plane & the vertical plane w.r.t bedding plane. The Sundatti Quartzite exhibit reddish, feldspar-rich sandstone at the base and at the top of it is Quartzite-Sandstone exposed. The beds in this area are horizontal, are upto 30-40 feet long, with 2-3 km width. There were features like Cross-bedding & ripple marks were observed.

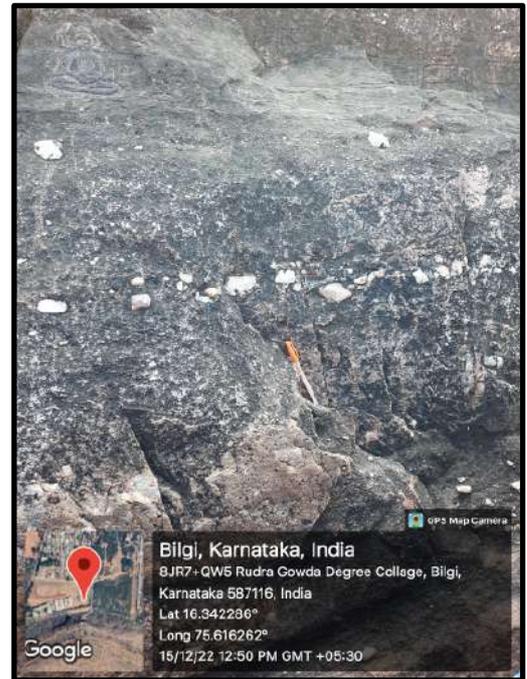


Location 03: Hill slope near Rudragudda Patil govt. College

Lat: 16°20'29"N

Long: 75°36'59"E

The outcrop exposed were having Intraformational conglomerate. The Conglomerate had clast 4cm length & 2cm width. The Conglomerate was of Oligomatic type i.e single type clast. There were Cross-bedding (current bedding structure). The rock have been undergoing cyclic deposition. Syndepositional primary structure were observed.



Date: 16/12/2022

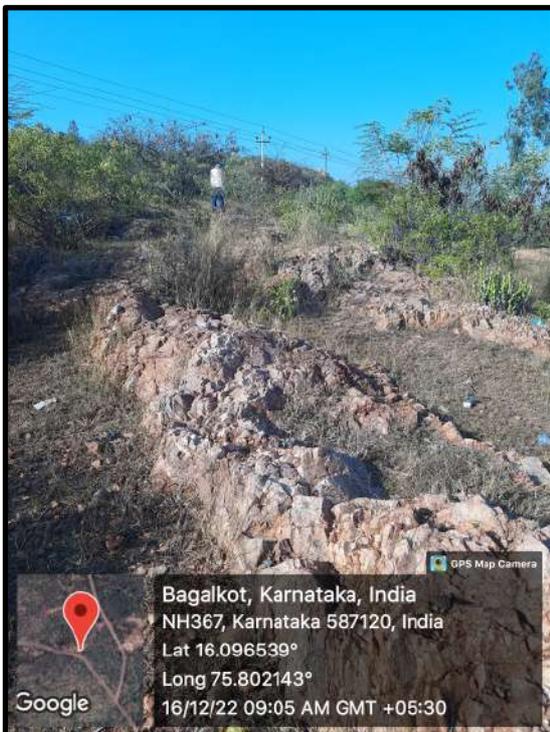
DAY 07

Location 01: Shirur

Lat: 16°05'47"N

Long: 75°48'07"E

The outcrop exposed near roadside where the rock is highly fractured . It has pink appearance with Quartz ,the rock is Quartzite. The outcrop is exposed for 2-3 mts over the area. It is having 2 sets of joints, consist of Conjugate as well as orthogonal joints. Also there are Gash veins, indicated by comb-structure with thickness varying from 0.5 -2.5cm (The Quartz was present at the margins oc the veins & there were space at the center).



Location 02: Budanagad,1600mts away from location 01

Lat:16°05'09"N

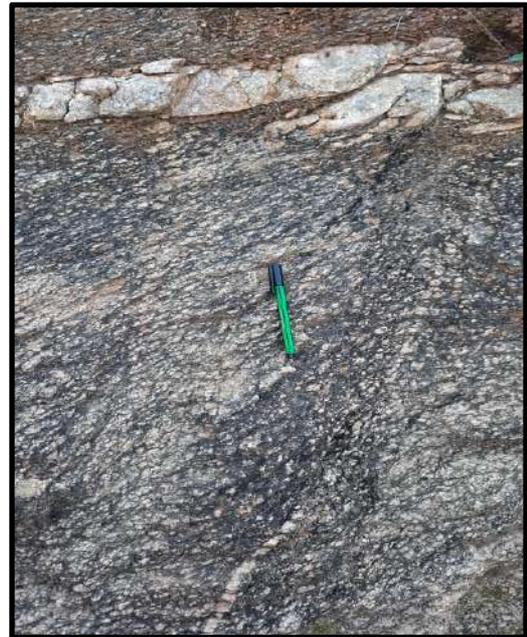
Long:75°48'50"E

Spot no 01:

The rock exposed in the area are in Boulder form which are insitu in origin which are deformed.

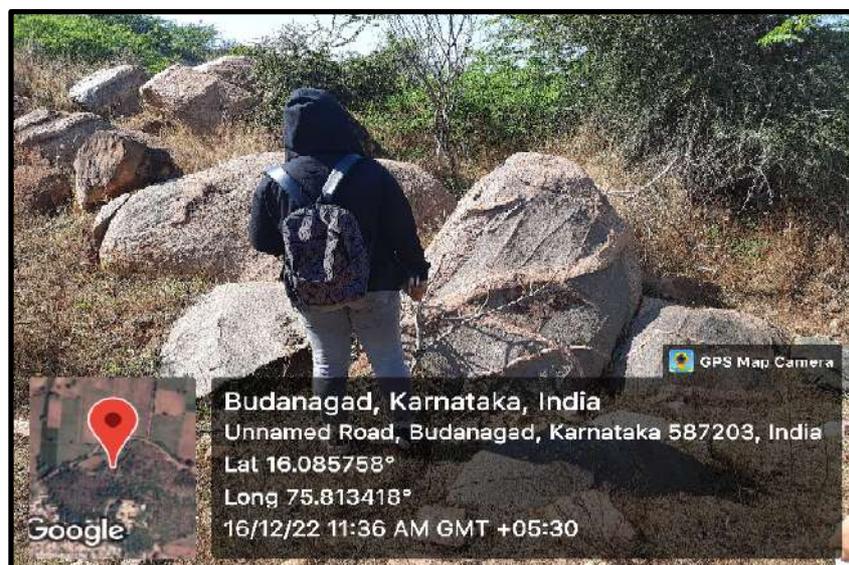
Spot no 02: 15mts from spot 01

The outcrop is a section of hillside which is highly weathered & weak and is covered with vegetation. The outcrop is having Quartz veins intrusion which cross cut each other. The outcrop is foliated and can be broken easily by hand.



Spot no 03: 20mts from spot 02

Granite was present in this spot which have mafic (dark) intrusion. Granite is pinkish in appearance with quartz veins intruded in it. In 5mts down spot 2 there is exposure of schistose rocks which is showing foliation.

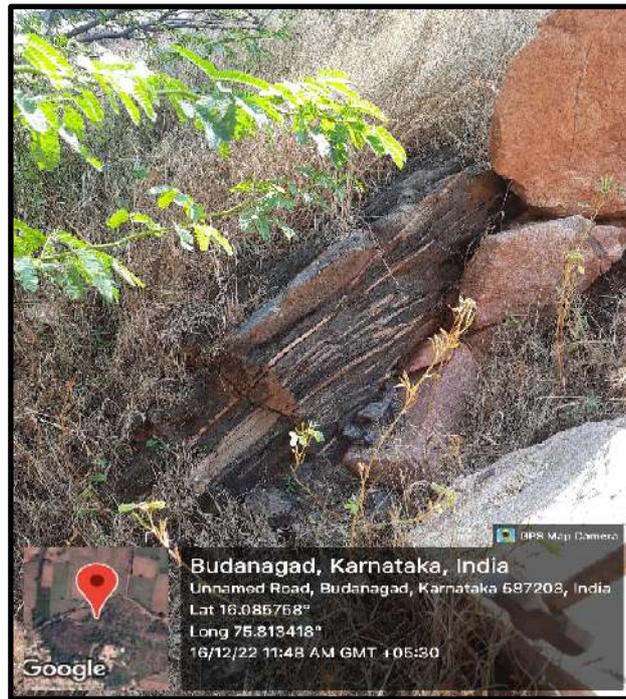


Spot no 04: Hill slope

Lat: 16°51'27"N

Long: 75°48'48"E

The rock exposed is Pink Granite which is not foliated where the surrounding rock have schistosity i.e Biotite schist. The granite is showing prophyritic texture.



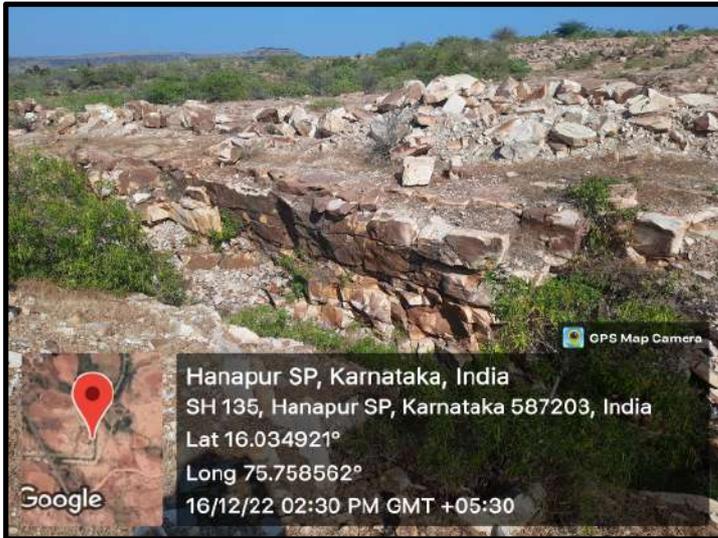
Location 03: Murdi/Hanapur Badami

Lat: 16°02'06"N

Long: 75°45'26"E

The outcrop was exposed in hot & dry condition the rock is exposed at roadside. A outcrop of Quartz veins is exposed. It have Intraformational conglomerate. There were Joints & fractures observed.

10mts away from roadside, there was canal section cut where the horizontal beds clearly exposed. The rock present in this area is Pure Sandstone. All the beds are horizontal. It shows sucrose texture having white appearance with vitreous lustre of Quartz veins.



Location 04: kelawadi,Niralkeri

Lat: 16°04'30"N

Long: 75°42'08"E

The area exposed in roadside which were showing folds of phyllite. There were open fold, tight fold observed in this area. The beds are dipping in SSE direction.



Location 05: Dolomite Niralkeri Mine, 5km from Location 04

Lat: 16°04'28"N

Long: 75°42'10"E

There was a Dolomite mine. Here open cast mining is practice for Dolomite extraction



Date: 17/12/2022

DAY 08

Location 01: kogalkom

Lat: 16°56'31"N

Long: 75°38'24"E

Spot no 01: 10mts away from roadside

A huge outcrop of Quartz is present in this area, which is present as broken fragments & as pebbles. The Quartz in this area are white color, showing vitreous lustre and conchoidal fracturing. The outcrop is trending in EW direction and expose 40-50 mts. There were Gash veins. The quartz outcrop was showing beautiful Radiating feature. Also on other side there was fracturing observed due to tensional force.





Spot no 02: Near the roadside

Before the Quartz outcrop, there were Dolomite beds exposed which were highly foliated & weathered and where steeply dipping. The Dolomite was confirmed by doing chemical analysis i.e by putting drops of HCl on the rock which gave effervescence.

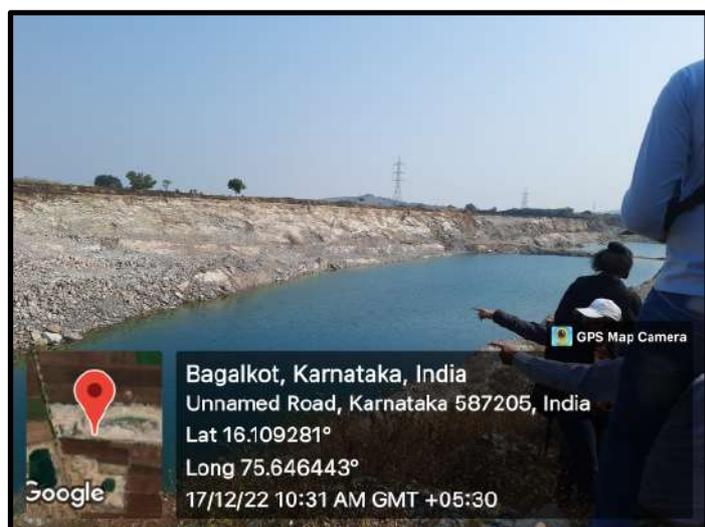
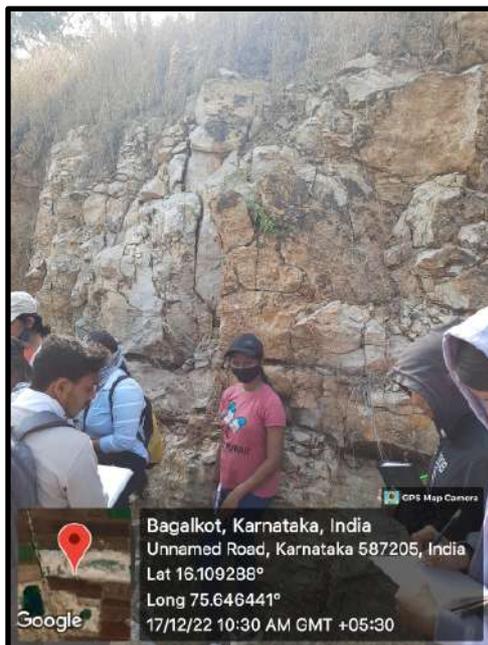


Location 02: Visit to Dolomite mine

Lat: 16°06'33"N

Long: 75°38'47"E

It was an open cast mine and it was an active mine.



Location 03: konkankappa

Lat: 16°01'14"N

Long: 75°45'58"E

The rock exposed in this location is limestone. The beds in this area are almost horizontal and are dipping with 1-2° amount. The limestone was confirmed by chemical analysis that is HCl test, which gave effervescence on reacting with the rock. The name of the exposed rock is konkankappa Limestone which belong to Badami group of kaladgi Supergroup.



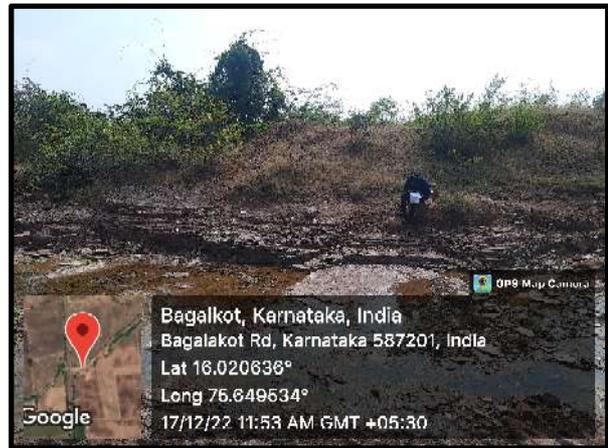
Location 04: 2-3km away from previous location

Lat: 16°01'13"N

Long: 75°38'58"E

The outcrop is exposed along a river bed. The rock made up of fine grained minerals and is laminated with dark & light bands closely indicating the shale. This shale is known as Halkurki shale which belongs to Badami of Kaladgi Supergroup. This shale consists of clay i.e. red clay like kaolinite clay, it is difficult to identify in Microscope. To study such rock, XRD- chemical analysis can be done to know the rock composition.

This type of clay deposits is observed in deep sea/oceans implies that this Location were underwater Million of years ago. Such clay are found on Abyssal plains where shale are deposited.



Location 05: Cave temple Boulders

Lat: 15°56'18"N

Long: 75°40'35"E

The rock exposed in this location is sandstone with Quartz & feldspar(Orthoclase) along with white cementing material. Also there are Siliceous & Ferruginous bands observed. Due to rainwater, there is weathering & Erosions seen on the outcrop, also there is fracturing & Cross-bedding observed.



DAY 09
LOKAPUR

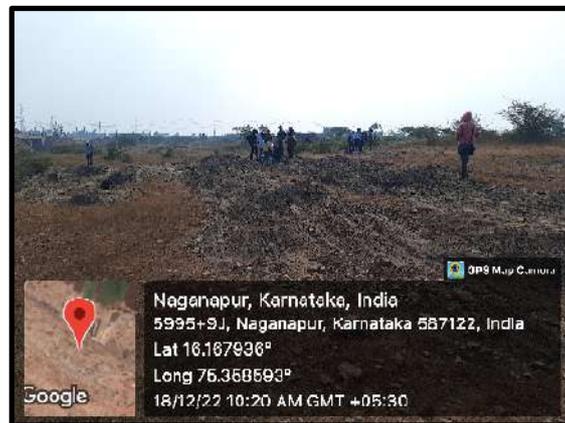
Location 01: Naganapur, Roadside

Lat: 16°10'04"N

Long: 75°21'32"E

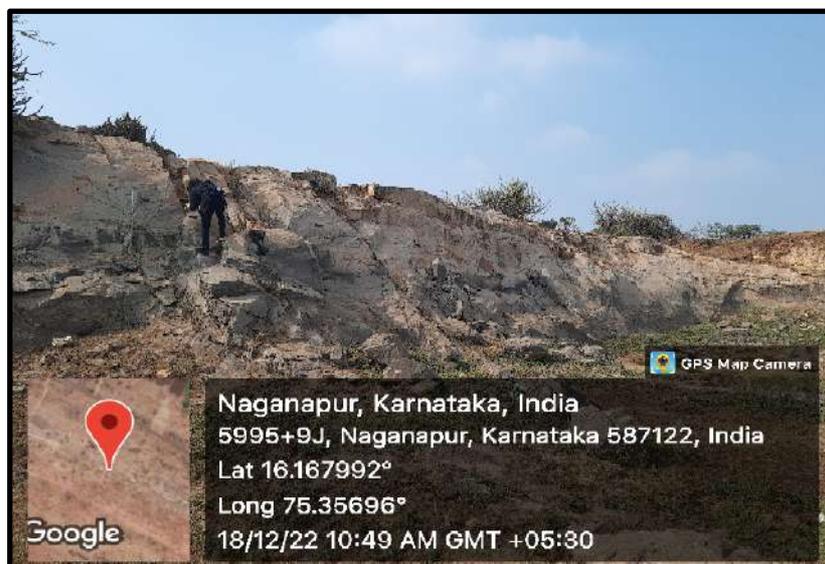
Spot no 01:

The outcrop was exposed in dry vegetation along the roadside. The rock exposed was limestone with some striation on it's surface indicating the stromatolite, which was organism present on limestone. The limestone in this area are impure form i.e Marl (impure limestone).



Spot no 02: 5-10 mts away from spot 01

There was cut section exposed over this area having CaCO₃ Composition(Dolomite/Limestone)

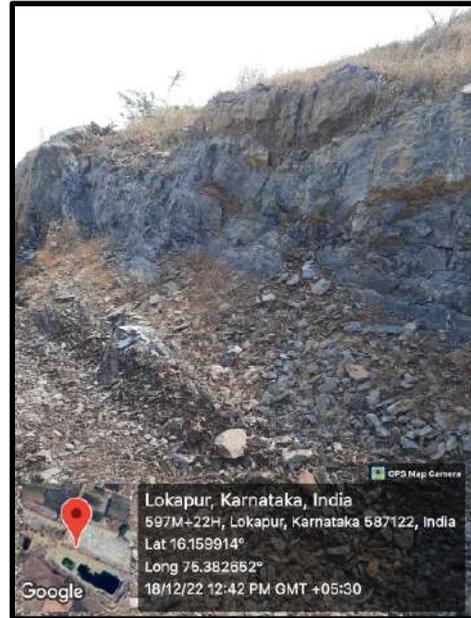


Location 02: Jkarikatti Limestone mining site, 1km away from lokapur

Lat: 16°09'58"N

Long: 75°23'31"E

It is a Dolomite mine, where extraction is in open cast form. There are primarily layers of Dolomite & Siliceous rich material folding.



DAY 10

Location 01: Almatti Dam

Lat: 16°19'58"N

Long: 75°53'09"E

The rock present at the basement of Almatti dam is Granite. The dam is made of composite /mixed/combined form. It has height of 160mts. It's heightest point for water level w.r.t Msl- 519mts. The dam is particularly made up of cement & earthly material. This dam is use for irrigation for agriculture over 60% of Karnataka. It also product electricity from the Hydro- turbines.

Location 02: Vijayapura

Lat: 16°20'28"N

Long: 75°55'34"E

The outcrop is aged up to 3 billion years and is one of the oldest basement. It consists of various episodes of intrusion in this single outcrop.

First,the Black Mafic rock was present with time there was intrusion of 2 magma in the outcrop i.e Granitic intrusion which was cooled and metamorphosed to for banded Gneiss after which there was next intrusion of granitic magma which was rich in Quartz and feldspar after solidifying resulted in formation of white Granite after which there was intrusion on Grey Granite which have similar composition as white granite but accessory minerals is Biotite in grey granite and in white its both Biotite and Hornblende. Followed by Pink Granitic intrusion or magma rich in k-feldspar minerals after which there was intrusion of Pegmatitic veins. At some parts the pegmatitic veins are present before pink granite intrusion.The pegmatite veins were having thickness 5-7cm.



