GOA UNIVERSITY
गोंय विद्यापीठ

2022-2023

AGTC-408

GEOLOGICAL FIELD MAPPING

GEOLOGY FIELD REPORT

BAGALKOT, KARNATAKA

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Part-1, MSc Applied Geology

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CONTENT

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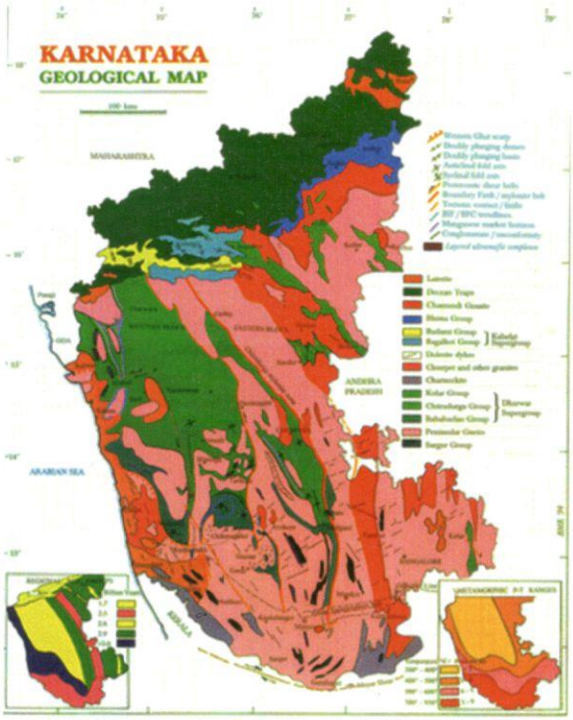
INTRODUCTION

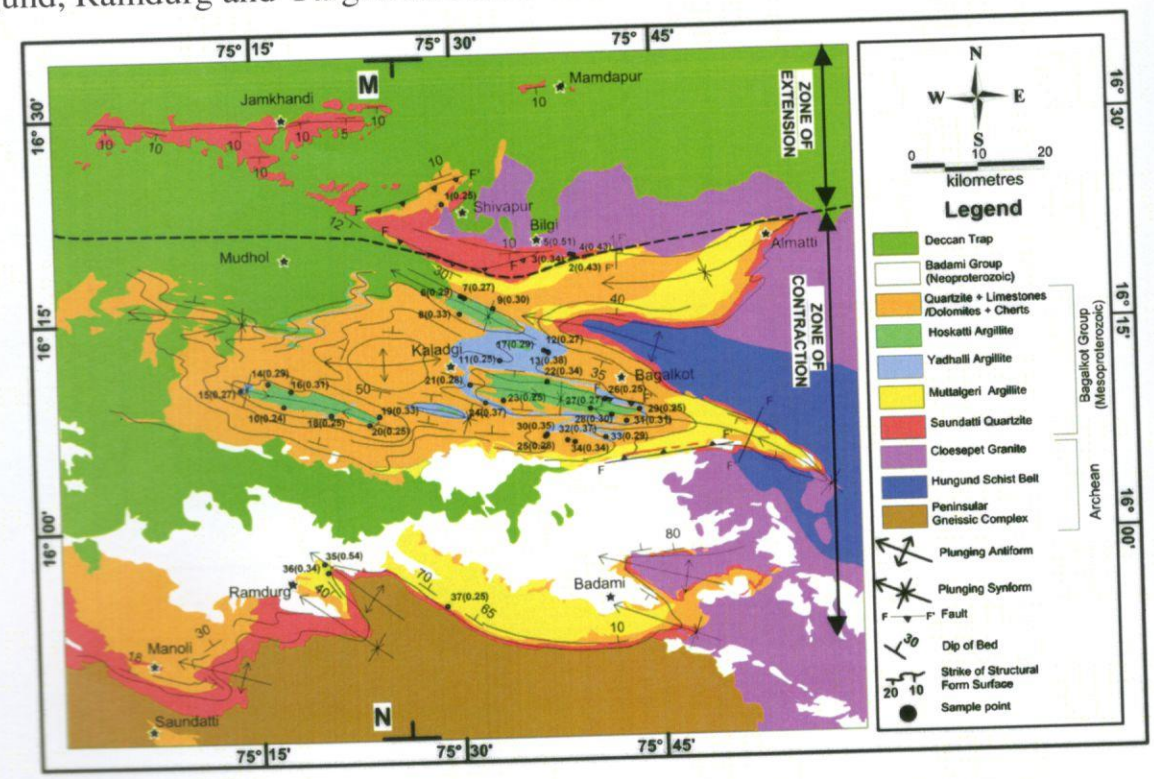
Geology of Karnataka

Karnataka state with a vast geographical area of 1,91,791 sq.km is diverse in its geological formations and is rich in mineral wealth embedded in them. Geology of Karnataka is a fascinating subject. Oldest rocks exposed in Gorur area, Hassan district, Karnataka date back to about 3300 million years. The Precambrian craton of Karnataka is made up of western and eastern segments. The Precambrians of Karnataka have been divided into older Sagar supracrustals (about 3300- to 3000-million-year-old) and younger Dharwar supracrustals (about 3000- to 2600-million-year-old. The Dharwar supracrustals Supergroup has been further divided into older Bababudan Group (ca.3000 to 2700 million years) and younger Chitradurga Group (ca.2700 to 2500 million years). The Karnataka craton has been extensively intruded by granites and granitoids of the age 2600 to 2500 million years. The north terrain is covered by extensive volcanic flows known as Deccan traps of Cretaceous -Tertiary ageThe state is drained by three major easterly flowing river systems, Manjira River of the Godavari basin in the north, Krishna draining the northern and central part and Cauvery draining the southern part. Most of the river courses are principally aligned in two directions, ENE-WSW to WNW-ESE and north-south to NNW-SSE, and corresponds 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. 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.



Geology of Kaladgi basin

The Kaladgi basin is located in the northern fringes of the Dharwar Craton of South India. It is comparable to other Proterozoic 'Purana Basins' of Peninsular India in its shallow marine, sedimentary sequences. It is the only Purana Basin that displays stronger deformation in its central parts than along the fringes. This deformation is restricted to the sedimentary succession of the Mesoproterozoic Bagalkot Group and is not observed in the younger Badami Group. The Kaladgi basin is exposed between the longitudes 73° E and 76° E and the latitudes of 15°30'N to 17° N. The contiguous exposures of these sediments, occurring in parts of the Belgaum, Bijapur and Bagalkot districts of Karnataka, from Almatti in the east to Ajra in the 8 west, across a distance of about 100 km in the E-W directions are commonly termed as the 'main basin'. Outliers of these sediments capping the Archean crystalline basement are scattered south of the main basin around Saundatti, Gajendragad and Nargund. Inliers of these sediments within the Deccan Traps are present near Jamkhandi in Bagalkot district of Karnataka, Kallamavdi in Kolhapur district and small isolated patchy exposures at Phonda, Malvan and Kankavli of Sindhudurg district of Maharashtra. Belgaum, Bijapur, Hubli and Dharwar are major urban centres in this region with significant industrial and economic activities. Bagalkot is the largest town within this basin, followed in size by Saundatti, Gokak and Badami. Jamkhandi, Lokapur, Mudhol, Nargund, Ramdurg and Yargatti are smaller towns.



LITHOSTRATIGRAPHY

Group	Subgroup	Formation	Member	Thickness in metres
Badami Group (286 m)		Katageri Formation	Konkankappa Limestone	85
			Halkurki Shale	67
			Belikhindi Arenite	39
		Keru Formation	Halgeri Shale	3
			Cave Temple Arenites	89
			Kendur Conglomerate	3
----------ANGULAR UNCONFORMITY----------				
Bagalkot Group (3451m)	Simikeri Subgroup	Hoskatti Formation	Molapur Intrusive	7
			Dadanhatti Argillite	695
		Arlikatti Formation	Lakshnhatti Dolomite	87
			Keralmatti Hematite Schist	42
			Niralkeri Chert-Breccia	39
		Kundargi Formation	Govindkoppa Argillite	80
			Muchkundi Quartzite	182
			Bevinmatti Conglomerate	15
..... DISCONFORMITY				
	Lokapur Formation	Muddapur Formation	Bamanbudnal Dolomite	402
			Petlur Limestone	121
			Jalikatti Formation	43
		Yendigeri Formation	Naganur Dolomite	93
			Chiksellikere Limestone	93
			Hebbal Limestone	166
		Yargatti Formation	Chitrabhanukot Dolomite	218
			Muttalgeri Argillite	502
			Mahakut Chert-Breccia	133
		Ramdurg Formation	Manoli Argillite	61
			Saundatti Quartzite	383
			Salgundi Conglomerate	31
..... NONCONFORMITY				
Granitoids, Gneisses and Metasediments				

Lithostratigraphy of the Kaladgi-Badami Basin (after Jayaprakash et al. 1987)

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Lithostratigraphy of the Kaladgi-Badami Basin (after Jayaprakash et al. 1987)

FIELD OBSERVATION

DAY-1

10.12.2022

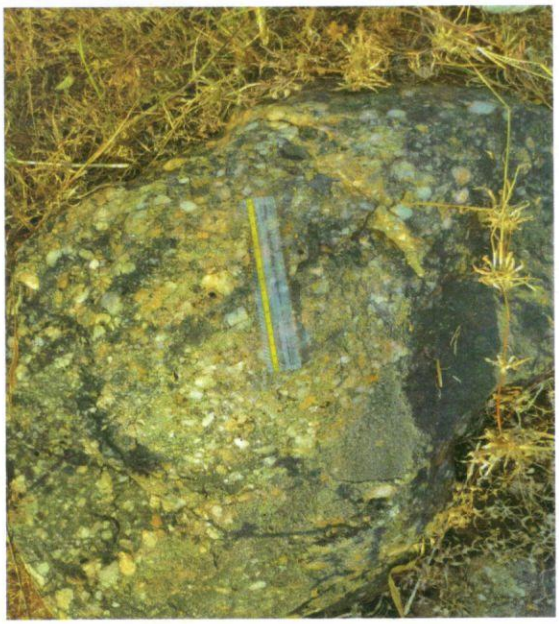
Belgaum-Bagalkot Road

Spot 1 (Karidigudda)

Lat: 15°52'37"

Long: 74°41'49"

The outcrop is along the roadside just next to the highway. The dominant rock type at the location was Conglomerate. It belonged to the kundargi formation of Simikeri subgroup. It was at an elevation of more than 780m. It had a lot of vegetation and fields around it. The Conglomerate is known as Bevinmatti Conglomerate. This conglomerate shows variation in its matrix, at the base it is more siliceous but as we go on top it becomes more ferruginous. It showed variation from clast supported at the base to matrix supported in the upper part. The clast was <1cm to > 5cm, also the shape was changed from rounded to subrounded. There might have been an unconformity present at the location. The mineralogy of the clast was quartz and feldspar on a smaller scale.



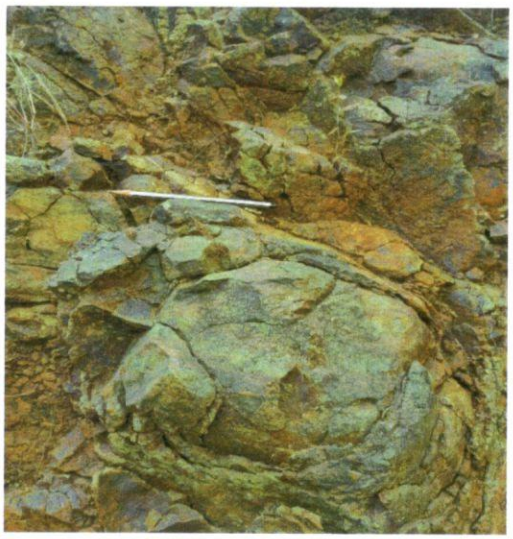
Bevinmatti Conglomerate

Spot 2 (4 - 5 kms from spot 1) at the highway

Lat: N15°52'37.5"

Long: E74°49'50"

The outcrop at the location was a Rudaceous sized boulders. This location was just next to the highway. The rocks present on the rock is conglomerate with boulder size clast which are of basaltic composition. It was a massive bulbous structure that indicated the presence of spheroidal weathering. The outcrop was covered by dry vegetation. The rocks at the location were highly fractured. Conglomerate had a size of around >15cm and it was clast supported



Boulder sized Conglomerate

DAY-2

11.12.2022

Kamatgi, Ramthal

Spot 1

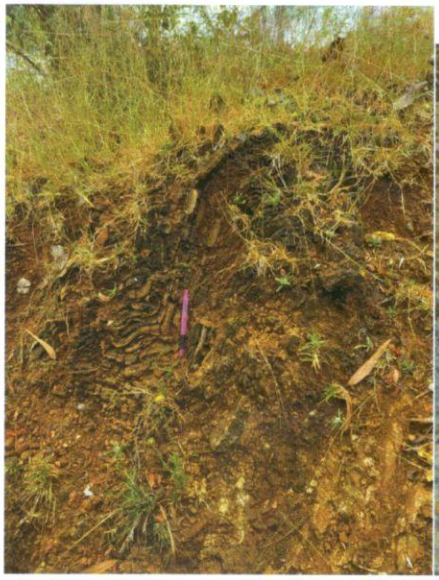
Lat: 16°05'09.4"

Long: 75°52'30.2"

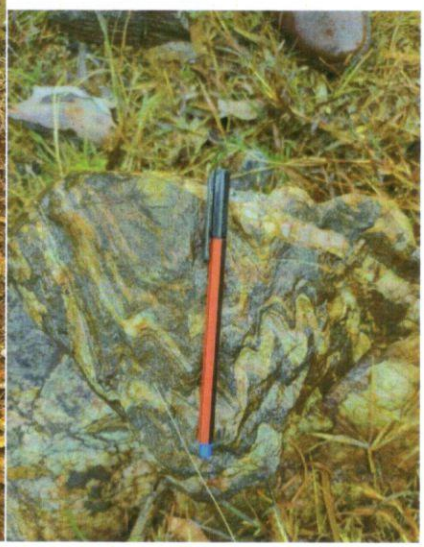
The basement here is made up of Hungund schist belt which is made up of Metavolcanic sediments which are ultramafic in nature. BIFs and conglomerate are the most likely lithology observed at the location. Traverse along the basement we saw BHQ Phyllite which were dipping steeply in NE direction. Folding was also present.

Strike and dip data of the folded series of BHQ

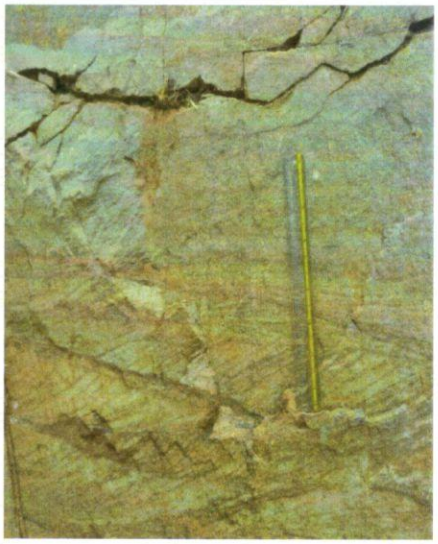
Strike	133	152	148	157
Dip	76	39	20	70



BHQ and Phyllite



Class 2 fold



Herringbone

Spot 2

Lat: 16°05'09.4"

Long: 75°52'30.2"

An exposed outcrop near the road is off-white in colour and was overlain by brown debris, the deposit showed effervescences on pouring of HCL acid indicating the presence of CaC03. The outcrop here had deposits of Caliche minerals. It had non crystalline variety of CaCO3 which could be Ankerite. None of the minerals had cleavage which indicates that Calcite was absent. These kind of deposits forms in the dry conditions.

outcrop of Caliche deposit

Caliche deposit

DAY-3

12.12.2022

Nargund

Spot 1

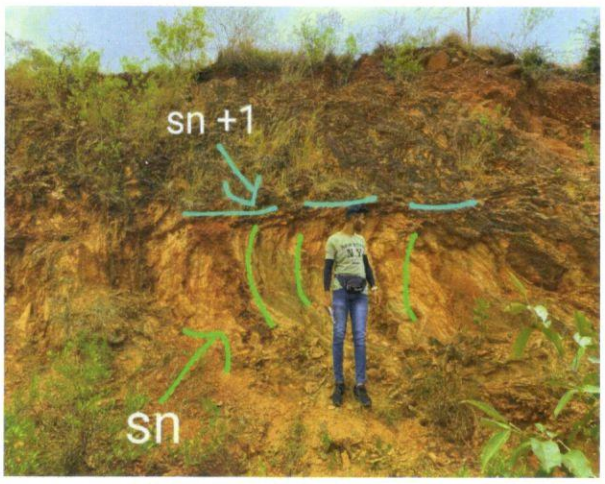
Lat: N15°44'23.0''

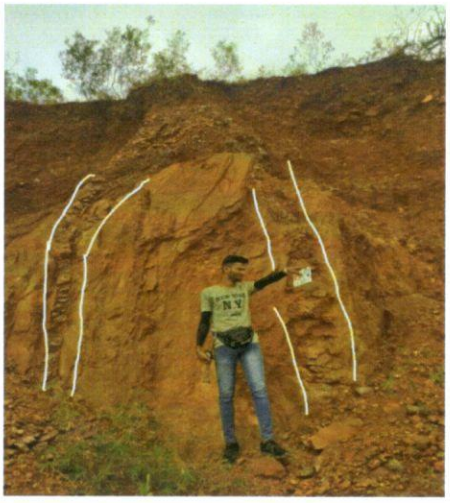
Long: E75°22'28.4''

At this spot phyllite was observed intercalated with BIF. The rocks present here were not sedimentary but metamorphic rocks because foliation was seen. Alignment was present due to the stress present. Quartz vein observed here was parallel to the foliation and might have been intruded later. The change in the strike indicated that there is a broad wop in the foliation plane. the foliation plane is the Sn and can be identified easily, the horizontal line which is the spaced fabric is the Sn+1 and because of Sn+1, the Sn is getting wrapped. Angular unconformity was seen.

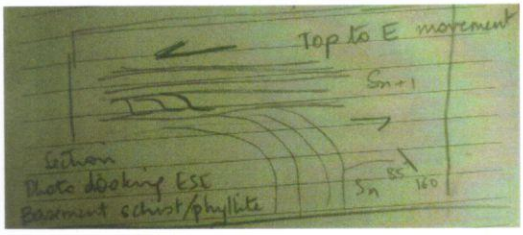
Strike and dip data;

Strike	153	150	155	140
Dip	85	84	73	65



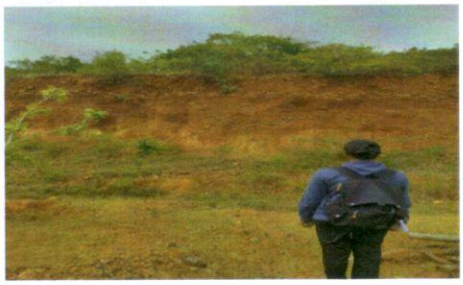


Wide view of the outcrop



section of photo looking ESE basement schist/phyllite

quartz vein



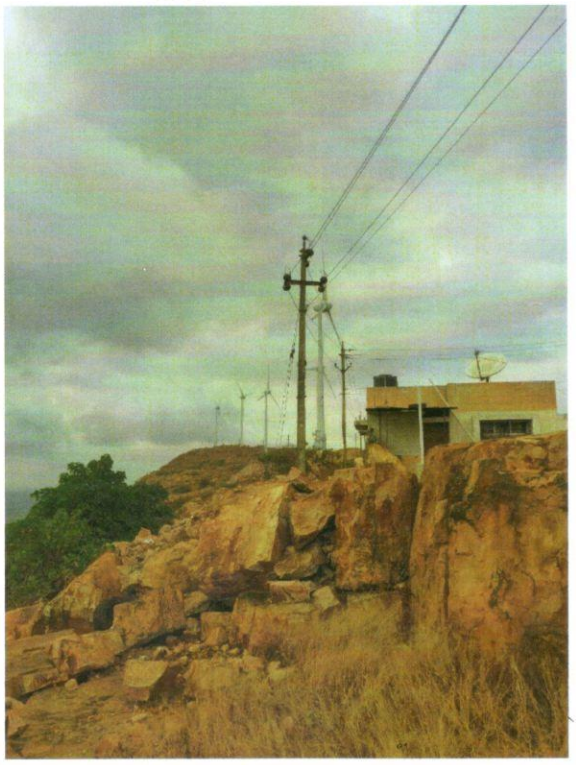
angular unconformity

Spot 2 (300 mtrs from the base of Nargundi)

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 colour indicating that the parent rock was ferruginous sandstone. The outcrop was massive spread across a wide area of about 60 mtrs. The outcrop exposed had a numerous set of joints. The rock which was exposed was Quartzite. Herringbone structures were present.

The bedding plane reading: -

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



Quartzite outcrop

DAY-4

13.12.2022

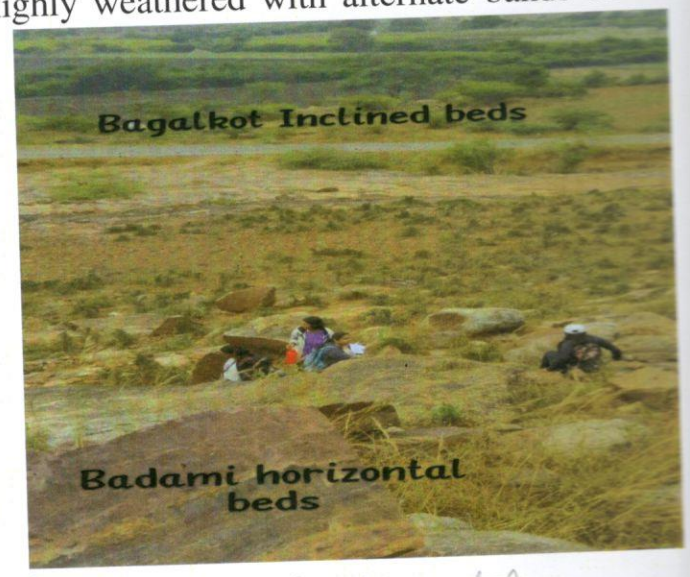
Badami-Bagalkot Discontinuity

Spot 1 (Bagalkot)

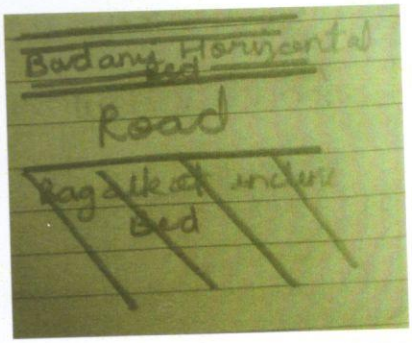
Lat: N16°0'48''

Long: E75°53'5''

This location is 1 to 2 kms away from Aihole heritage temple. On the North side of the road the exposure is massive with horizontal beds which is part of Bagalkot and to the South of the road the rocks are inclined which is a part of Badami. The North side and South Side of this area is marked by a Badami - Bagalkot angular unconformity. The lithology seen here is BIF agate, chert clasts and sandstone. The dip of the bed is towards SW and consists of the alternate colour of lamination. Around 50m away from spot 1, the rocks present are horizontal and is sandstone, mostly siliceous but some places it appears to be ferruginous as it is red in colour. It is highly weathered with alternate bands of siliceous and ferruginous sandstone. On the southern side of the road quartzite had a well-defined bedding junction. They also had well preserved cross bedding with variations in clasts across the dip.



from this picture horizontal & vertical outcrop



Spot 2 (Shirur)

Lat: N16°5'34''

Long: E75°46'39''

The outcrop next to the temple was expansive one made up entirely of quartzite. A fault plane was identified based on the slickensides. Lineation was seen on the fault plane which are called as surface lineation. By applying Anderson's theory of faulting, we could conclude that it was a reverse type of fault. Joint sets were observed which were conjugate joint sets. En echelon joints were also seen.

DAY-5

14.12.2022

Aminghad

Spot 1

Lat:16°3'21''

Long: 75°57'7''

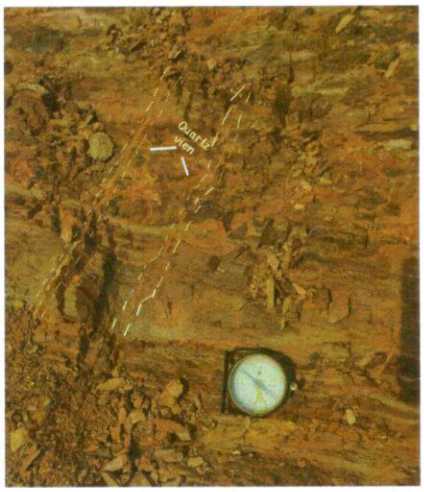
At this location granite boulders were observed which were coarse grained and pink feldspar.ie., orthoclase was seen. Accessory minerals quartz, feldspar, hornblende/pyroxene were present. As there was no alignment seen in the rock, we could conclude that no deformation had taken place. Xenolith of about 8-10 cms had been observed. The age of the rock is 2.5Ga. A few steps on top you get an outcrop of the same granite which shows some alignment of mineral grains along with joint sets. Reading shows the trend of 145^0 and joint sets at N 17 ^{0} same as the Hungund schist belt.

Granite with xenolith

Spot 2 (Adarsha Mahavidyalay)

Lat: N16°4'8''

Long: E 76°3'33''



Rocks phyllite and BHQ were seen at this spot along with quartz vein younger than the rocks. Here the iron concentration was more than that of Ramthal. There were quartz vein which were cross cutting the rock indicating there are younger then the rock. As we go from bottom to top, the dip is changing; shallow at bottom and steep almost vertical at the top, which tells us that it is a part of fold.

Strike and dip data:

Strike	125°	127°	118°	111°	143°	120-125°
Dip	56°	73°	82°	87°	85°	55°

DAY-6

15.12.2022

Bilgi

Spot 1

Lat: N16°20'43"

Long: E75°37'02"

Weakly foliated granite porphyry of the 'Closepet Granites' are seen here. It is an igneous rock of equigranular texture. They belong to the felsic acidic minerals like orthoclase, biotite and quartz. They are plutonic, phaneric, holocrystalline fine-grained minerals. Closepet granites exhibit exfoliation joints, pegmatitic veins and weak foliations. Veins of 'Pegmatite' intruding granite are hypabyssal rocks. They are phaneric and coarse grained. The sheet joints seen are formed due to the release of pressure. Tors were present. A few meters away, fault plane along right lateral movement along strike slip fault is spotted. Xenoliths were also present of size approximately 30cm. The composition of the xenolith is mafic, but less of hornblende. It is medium grained. Another xenolith was present at the same spot which had a xenolith within a xenolith which could be of restitic type.

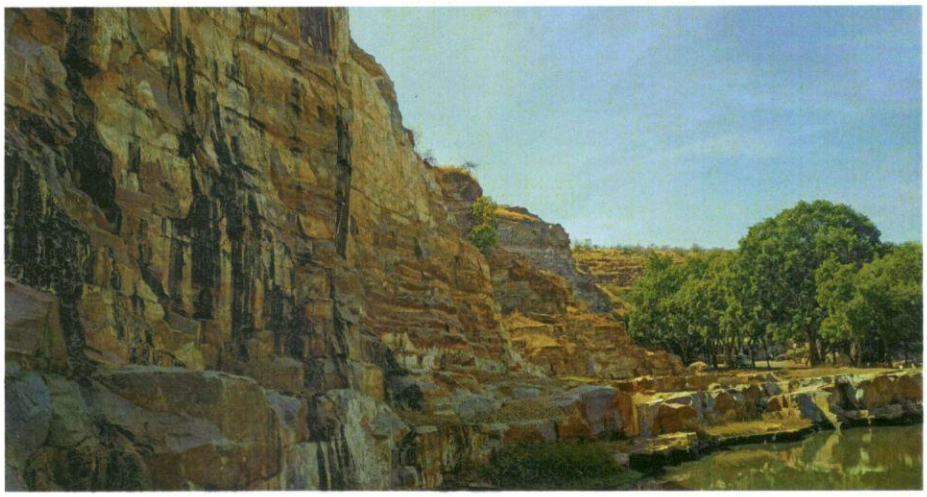
Spot 2: Quarry opposite to Siddeshwar Temple (500 mtrs away from spot 1)

Lat N16°20'58''

Long E75°36'50''

At Bilgi, Quartzite sandstones belonging to Saundatti Quartzite' are overlain on the weathered and undulating surface of potassic, weakly foliated granite porphyry of the Closepet Granites. The Saundatti Quartzites are separated from the Closepet Granites by a nonconformity. It is a metamorphic rock with granulose texture. The Saundatti Quartzites exhibit pinkish feldspar rich sandstones at the base followed by quartzitic sandstone exposed at the quarry. The sandstones are horizontal, well bedded and show primary sedimentary structure like cross bedding.

quartz vein

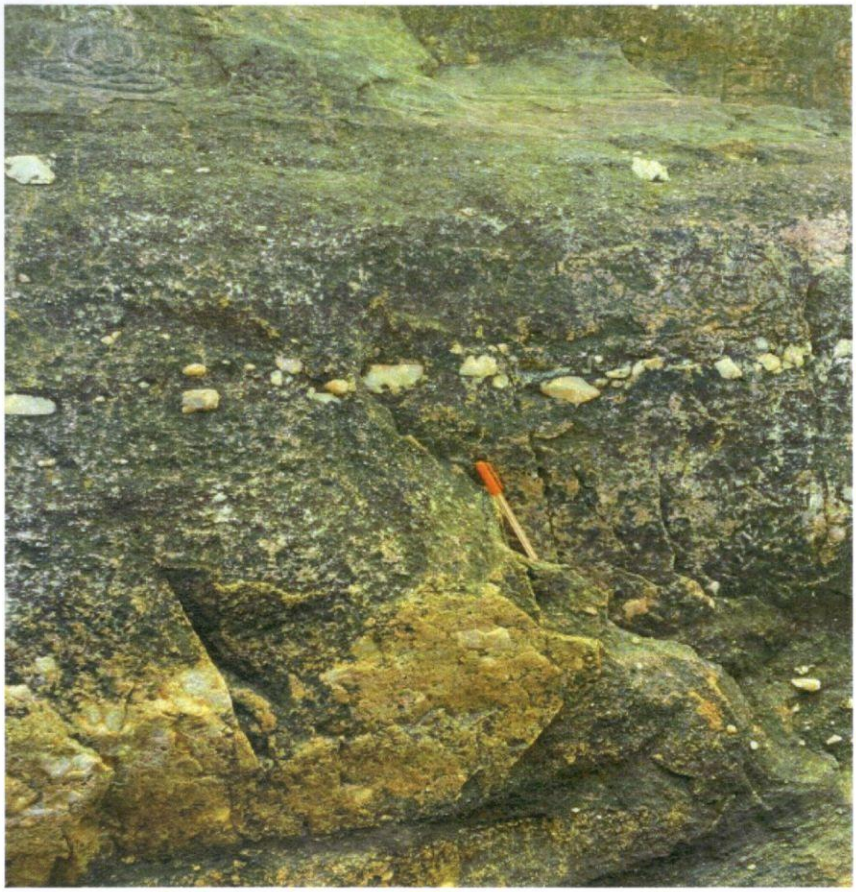


Spot 3

Lat: N16°20'30''

Long: E75°36'59''

At this spot intercalated intraformational conglomerate was seen. Structure of cross bedding, current bedding and graded bedding was observed along with quartz clasts which were 12cm in diameter. Here the conglomerate was matrix supported and oligomictic whereas in Ramthal it was polymictic. The dip of the horizontal beds was 0 to 10°. Joints were observed.



DAY-7

16.12.2022

Shirur

Spot 1

Lat: N16°0.5'47''

Long: E75°48'0.7''

The rock exposed here was quartzite which had numerous weak planes. The bedding planes were moderately inclined towards the SE. The quartzite was highly fractured. There might have been offsets present but were difficult to observe because the entire rock was made of quartz. Fault zone is trending E – W. There were different veins present, which are coarsed grained, elongated, looks like teeth, growth is perpendicular to the vein wall. Such veins are termed as gash veins, they have comb structure.

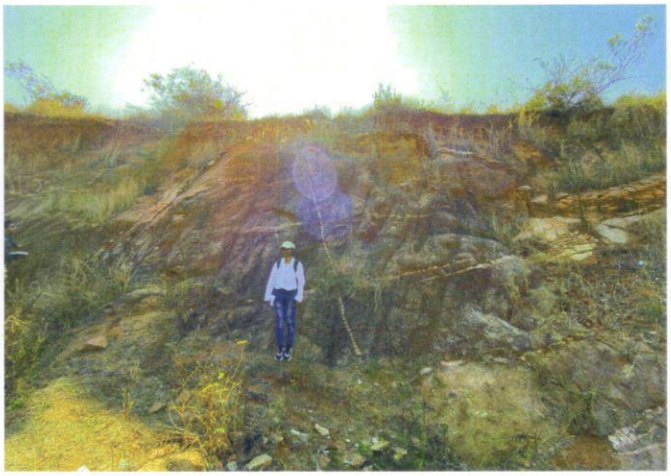
Highly fractured rock

Spot 2 (around 50 m from spot 1)

Lat:16°05'10"

Long:75°48'46"

The rock exposed here are granite. Veins are present, they are perpendicular to each other. There were 2 veins at this outcrop, one was parallel to the foliation and the other was cross cutting across the foliation.



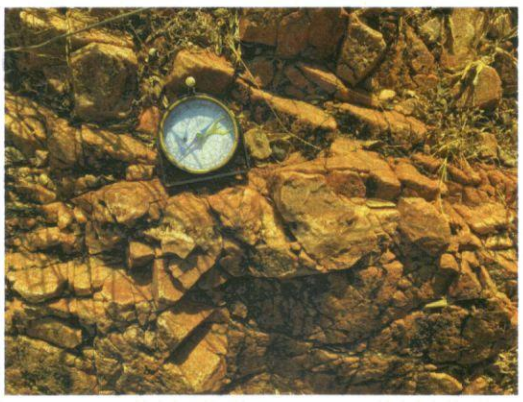
veins cross cutting each other

Spot 3 (Around 200 mtrs away from spot 2)

Lat:16°05'05"

Long:75°48'50"

Rock was exposed over a large area where there was a lot Granite which was not foliated whereas the other rock had schistosity which was Biotite Schist. Granites had intruded the foliated rock. Granite here was hornblende rich. of vegetation around. The rock exposed was pink.



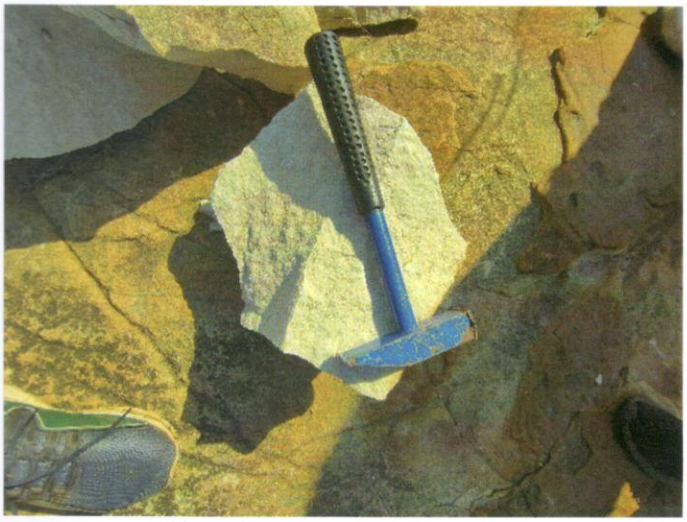
Pink granit

Spot 4 (Murdi)

Lat: N16°02'06"

Long:75°45'26" E

The vegetation was sparse here and the area was very dry. The spot was just next to the highway. Expansive outcrop of Quartzite was exposed. It had intraformational conglomerate. Joint sets and fractures were present. Joint sets were orthogonal. Joints were trending in N180° direction. In the same area Sandstone was also present which was white in colour.



DAY-8

17.12.2022

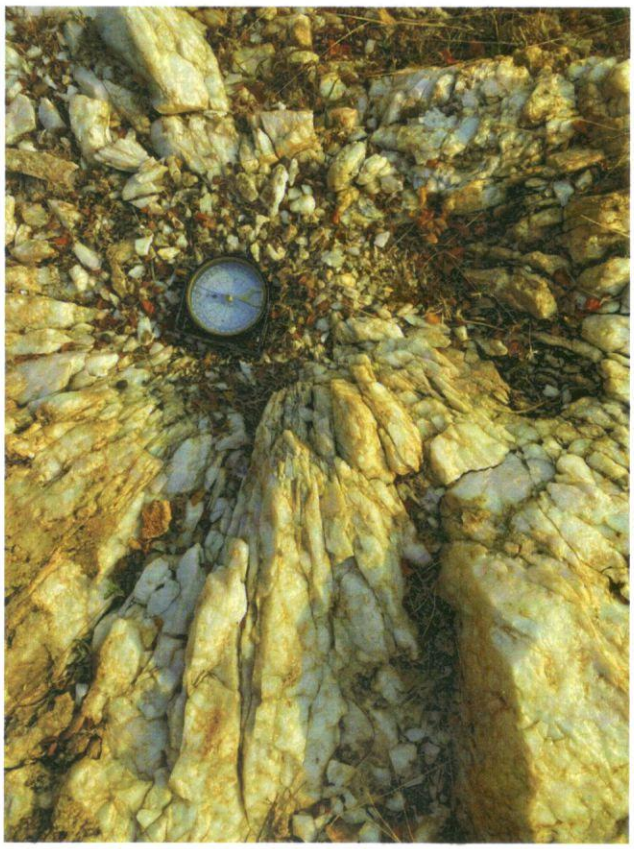
Kagalgomb

Spot 1

Lat: N16°6'51''

Long: E75°38'24''

The rock exposed here is highly fractured and it is off white in colour.The rock is weathered. The huge outcrop observed here was quartz which was about 40-50 m, trending E-W.There has been extensive deformation. The data of the joints here was N38° and N132°. Radial joints were observed which were due to jointing. Tension cracks seen here were perpendicular to extensional cracks. Comb structures were observed as well. Gash vein present here had a trend of N112°.



Spot 2

Lat: N16°7'9''

Long: E75°35'46''

The rock exposed here was dolomite which was moderately dipping. Strike and dip data:

Strike	106	108°
Dip	44	46

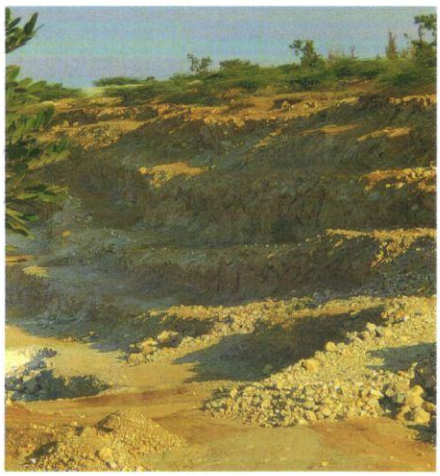
(Dipping-SW)

Spot 3 (Sulikeri Mine)

Lat: N16°6'33''

Long: E75°38'47''

This location was a dolomite mine which had a trend of N102°.



Spot 4 (Konkan Kappa village)

Lat: N16°03'19''

Long: E75°38'45''

The rock exposure here was Konkan Kappa limestone. Strike and dip data:-

Strike	86°	85°	81°	85°	70°
Dip	4°	4°	4°	4°	3°

(Dipping SE.)

Spot 5

Lat: N16°01'13''

Long: E75°38'57''

The rock exposed here is Halkurkut shale having alternate bands of brown and white layer. Here age of the rocks is Neo-Proterozoic whereas Bagalkot was Meso-Proterozoic. Fine grain lamination of coloured bands was observed. Shale is made up of Clay mineral kaolinite, bentonite, Illite etc.

DAY-9

18.12.2022

LOKAPUR

Spot 1

Lat: N16°10'4''

Long: E75°21'32''

The rock exposed here was impure limestone. It was a marly limestone because there was silica present. The rock exposure is present on the left side of the road as we move from Bagalkot to Lokapur. At this location stromatolites were seen that weren't penetrative and were deformed. They had a trend of N116°. An intercalated rock, greyish in colour and fine grained was seen. Shale and limestone were also observed. They were steeply dipping.

Strike and dip data: -

Strike	118	120	122
Dip	72	71	70

Spot 2 (Jalkatti, Lokapur Mine)

Lat: N16°9'36''

Long: E75°22'58''

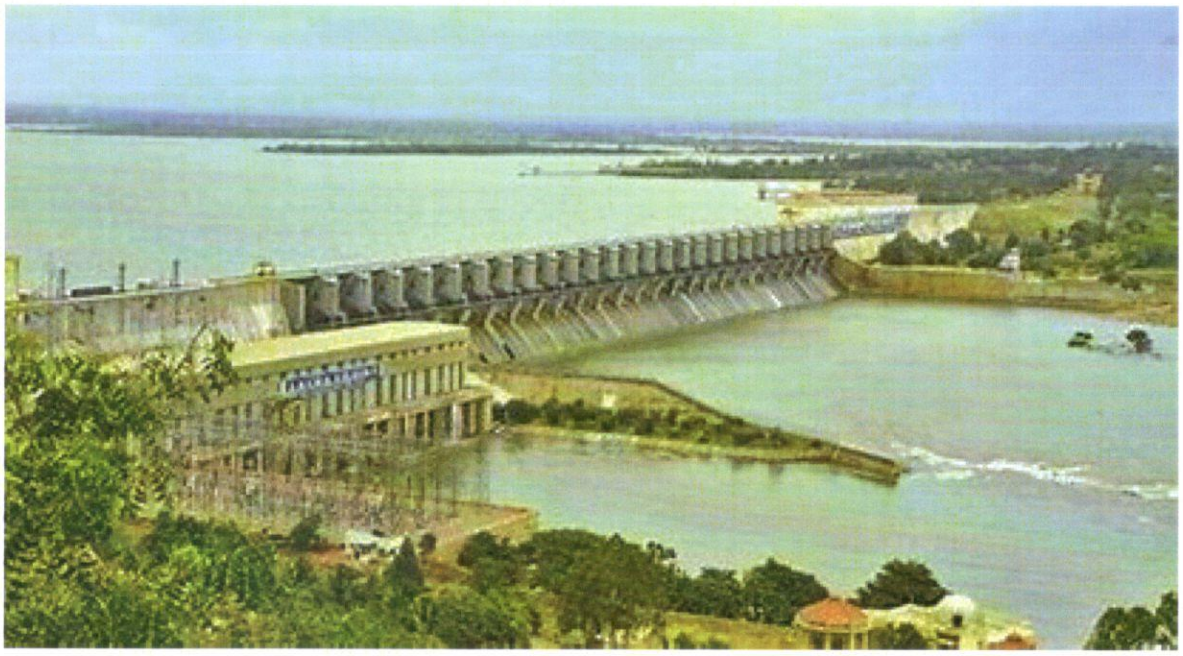
The rock mined Is limestone. It has narrow foliation which is dipping due south.

DAY-10

19.12.2022

Spot 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.



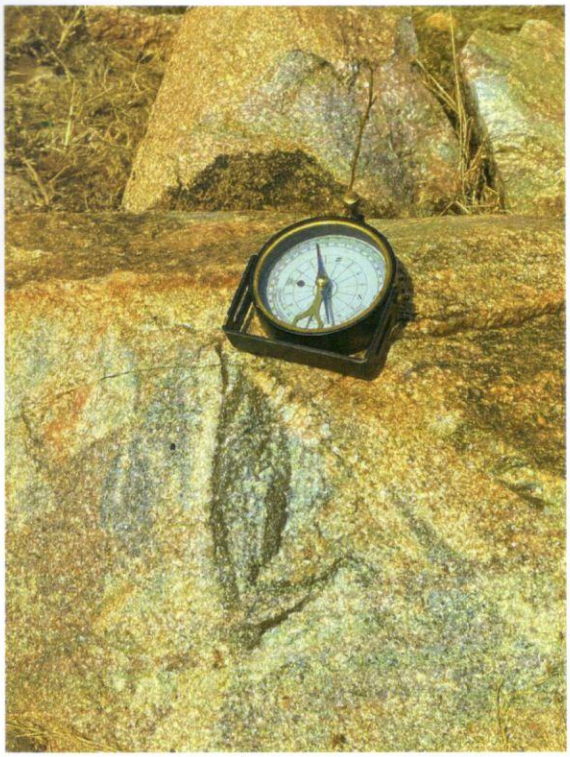
Almatti Da

Spot 2

Lat: N16°20'29''

Long: E75°55'34''

The exposed rock is migmatite. The location is near the road. It is a huge wide body of igneous origin showing exfoliation, it is migmatite. Its trend recorded was N306°, N48° and N58°. The trend of joint set here is 105°. Rocks seen here were banded gneiss, pink granite (fine grain), grey granite and pegmatite vein (coarse grain) being the youngest of all above. Dark coloured rocks here might be the oldest. Xenolith has been spotted at the spot. Folding of mafic bands have been observed. All the pegmatite veins seen here might not be of the same age. Minor faults were seen. Many episodes are possible of this area.



Conc of dark coloured minerals

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