SCHOOL OF EARTH, OCEAN AND ATMOSPHERIC SCIENCES

GOA UNIVERSITY

Exam: Roll No:

LABORATORY CERTIFICATE

This is to certify that Mr. /Ms. DEEVYAM D. RAWAL has satisfactorily completed the course of practical for M.Sc in Applied Geology.

Experiments conducted are pertaining to paper AGTC - 408 GEOLOGICAL FIELD MAPPING Practicals prescribed by the University for M.Sc. PART I class, during the academic year 2022 - 2023

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REPORT ON THE GEOLOGICAL FIELD WORK CARRIED IN AND AROUND BAGALKOT

TABLE OF CONTENTS

LIST OF PHOTOGRAPHS

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INTRODUCTION GEOLOGY OF INDIA

The geology of India is diverse. Different regions of India contain rocks belonging to different geologic periods, dating as far as back as the Eoarchean Era. Some Of the rocks are very deformed and altered. Other deposits include recently deposited alluvium that has yet to undergo diagenesis. Mineral deposits of great Variety are found in the Indian subcontinent in huge quantity. Even India's fossil Record is impressive in which stromatolites, invertebrates, vertebrates and plant Fossils are included, India's geographical land area can be classified into the Deccan Traps, Gondwana and Vindhyan.

The Deccan Traps covers almost all of Maharashtra, a part of Gujarat, Karnataka, Madhya Pradesh and Andhra Pradesh marginally. During its journey Northward after breaking off from the rest of Gondwana, the Indian Plate passed Over a geologic hotspot, the Reunion hotspot, which caused extensive melting underneath the Indian Craton. The melting broke through the surface of the craton in a massive flood basalt event, creating the Deccan Traps. It is also thought that Reunion hotspot caused the separation of Madagascar and India. The Gondwana and Vindhyan include within its fold parts of Madhya Pradesh, Chhattisgarh, Odisha, Bihar, Jharkhand, West Bengal, Andhra Pradesh, Maharashtra, Jammu and Kashmir, Punjab, Himachal Pradesh, Rajasthan and Uttarakhand. The Gondwana sediments form a unique sequence of fluviatile Rocks deposited in Permo-Carboniferous time. The Damodar and Son rivers Valleys and Rajmahal hills in Eastern India contain a record of the Gondwana Rocks.

The Indian Craton was once part of the supercontinent of Pangaea. At that time. What is now India's southwest coast was attached to Madagascar and Southern Africa, and what is now its east coast was attached to Australia. During the Jurassic Period about 160 Ma (ICS 2004), rifting caused Pangaea to break apart into two supercontinents, namely Gondwana (to the south) and Laurasia (to the north). The Indian Craton remain attached to Gondwana, until the supercontinent began to rifts apart about in the early Cretaceous, about 125 million years ago (ICS 2004). The Indian Plate then rifted northward toward the Eurasian Plate, at a pace that is the fastest known movement of any plate. It is generally believed that the Indian Plate separated from Madagascar about 90 million-years ago (ICS 2004). This orogeny, which is continuing today, is related to closure of the Alps in Europe, and the Caucasus range in western Asia, created the Himalaya Mountains and the Tibetan Plateau in South Asia. The current orogenic event is causing parts of the Asian continent to deform westward and

eastward on either side of the orogen. Concurrently with this collision, the Indian Plate sutured on to the adjacent Australian Plate, forming a new larger plate, the Indo-Australian Plate.

The earliest phase of tectonic evolution was marked by the cooling and solidification of the upper crust of the earth's surface in the Archaean Era (prior to 2.5 billion years) which is represented by the exposure of gneisses and granites especially on the Peninsula. These form the core of the Indian Craton. The Aravalli Range is the remnant of an early Proterozoic orogeny called the Aravalli-Delhi Orogen that joined the two older segments that make up the Indian Craton. It extends approximately 500 kilometres (311mi) from its northern end to isolated hills and rocky ridges into Haryana, ending near Delhi.

Minor igneous intrusions, deformation (folding and faulting) and subsequent Metamorphism of the Aravalli Mountains represent the main phase of Orogenesis. The erosion of the mountains and further deformation of the Sediments of the Dharwarian group (Bijawar) marks the second phase. The Volcanic activities and intrusions, associated with this second phase are recorded in the composition of these sediments.

Early to Late Proterozoic (25 to 0.54 billion years) calcareous and arenaceous Deposits, which correspond to humid and semi-arid climatic regimes, were Deposited the Cuddapah and Vindhyan basins. These basins which bordered or Lie within the existing crystalline basement, were uplifted during the Cambrian (500 Ma (ICS 2004)). The sediments are generally undeformed and have in many places preserved their original horizontal stratification. The Vindhyan are believed to have been deposited between -1700 and 650 Ma (ICS 2004). Early Paleozoic rocks are found in the Himalayas and consist of southerly derived sediments eroded from the crystalline craton and deposited on them Indian platform.

In the Late Paleozoic, Permo-Carboniferous glaciation left extensive glacio-fluvial. Deposits across Central India, in new basins created by sag/normal faulting. These tillites and glacially derived sediments are designated the Gondwana Series. The sediments are overlain by rocks resulting from a Permian marine Transgression (270 Ma (ICS 2004)). The Late Paleozoic coincided with the deformation and drift of the Gondwana Supercontinent. To this drift, the uplift of the Vindhyan sediments and the Deposition of northern peripheral sediments in the Himalayan Sea can be attributed.

During the Jurassic, as Pangea began to rift-apart, large grabens formed in central India filling with Upper Jurassic and Lower Cretaceous sandstones and Conglomerates by the Late Cretaceous India had separated from Australia and Africa and was moving northward towards Asia. At this time, prior to the Deccan eruptions, uplift In the Southern India resulted in sedimentation in the adjacent nascent Indian Ocean. Exposures of these rocks occur along the South Indian coast at Pondicherry and in Tamil Nadu. At the close of the Mesozoic one of the greatest volcanic eruptions in the earth's History occurred, the Deccan lava flows. Covering more than 500,000 square kilometer (193,051 sq. mi) area, these mark the final break from Gondwana.

PHYSIOGRAPHY OF KARNATAKA

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 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. The coastal plains on the west bordering the Arabian Sea- The coast line is straight and is about 400 km long. The mountainous region comprising the Western Ghat. The plateau region on the 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 boulder granitoid hills.

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.

Most of the river courses are principally aligned in two directions:

(1) ENE-WSW to WNW-ESE,

(2) North- South to NNW- SSE and correspond to the major lineaments, faults, shear zones and joints.

GEOLOGY OF KARNATAKA

Karnataka forming a part of the Indian Shield is constituted of rock formations ranging in age from 3300 My to 5 My. 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, Geological Survey of India 3 geologically constituted of Dharwar Craton comprises of greenstone-granite belts, gneisses and granulite's. Greenstone belts essentially consist of metavolcanic-metasedimentary 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-old 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 basalt.

GEOLOGY OF KALADGI

FORMATION OF THE KALADGI-BADAMI BASIN

Granitoids and meta-sediments are the oldest rocks recorded which form basement of the basin. Nonconformity lies between Bagalkot and the basement rock. Disconformity between the Lokapur and Simikeri subgroups suggests a period of no erosion as shown by a basal conglomerate present there.

After deposition of the Bagalkot group the sea retreated followed by uplift and tectonism with compressional forces mainly acting NNE-SSW axis throwing the sediments into anticlines and synclines with their axis trending WNW-ESE. After this a new set of sediments were deposited called as the Badami group of sediment. A few hundred million years later the region received another layer of rocks namely basaltic lavas of Deccan in the form of fissure eruption interlayers with predominantly lacustrine inter-trappean sediments. The Kaladgi Supergroup overlies peninsular gneissic complex and is sub-divided into two groups namely Lower Bagalkot group and upper Badami group.

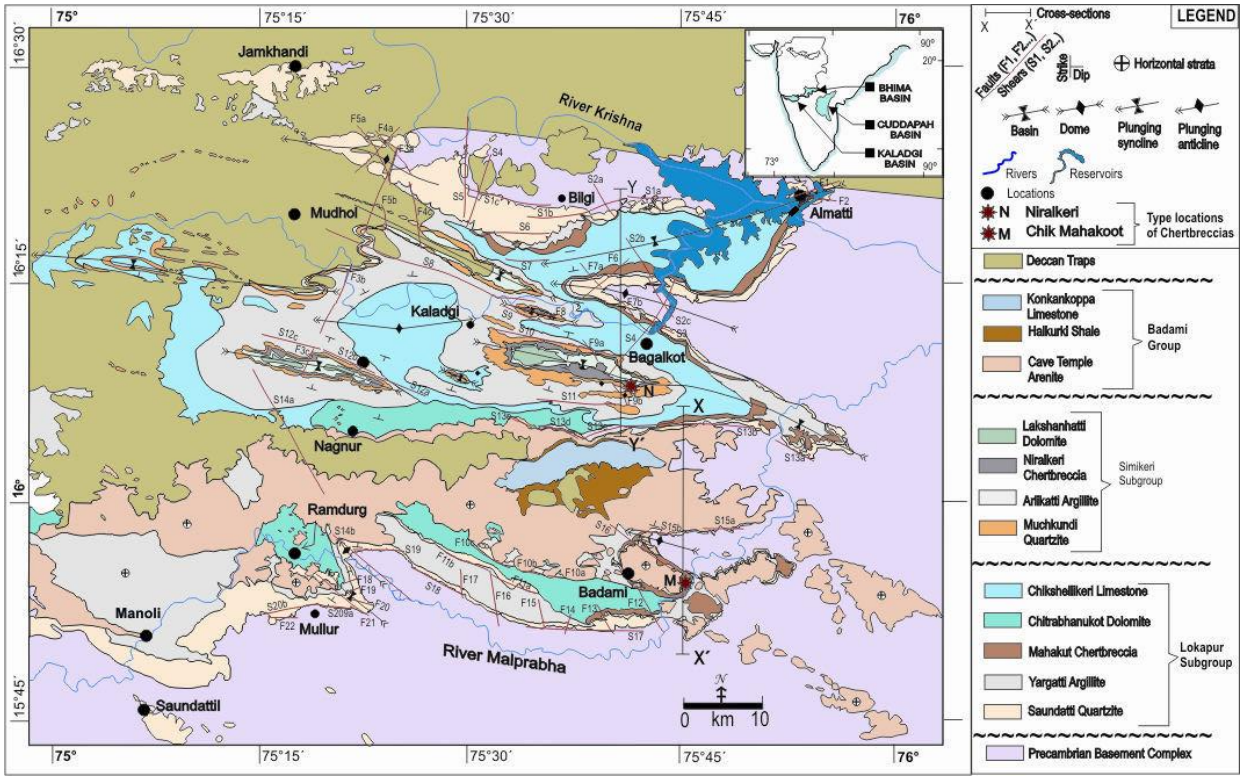
The basin has an average thickness of about 4500m. Four facies represent this basin.

1. Sandstone facies: Consist of mainly quartzites, sandstones and arenites and classed as quartz arenites and quartzite wackes.
2. Argillite facies: Includes siltstones and shales, brown to purple colored.
3. Chert-Breccia facies: It is an interesting rock composed of pink cryptocrystalline silica in which angular fragments of chert are embedded. Breccias contain pyroclastic.
4. Carbonate facies: Extensive beds of dolomites and limestones.
    a. Dolomites: Dolomites are differently colored being bluish to greenish grey to black. Bands of stromatolites structures are abundant said to be of secondary origin.
    b. Limestones: Limestones are thickly bedded deposits and occupy low grounds covered by black soil.
5. Intrusive Igneous Rocks: Exist as few minor dykes.

Regional Geology

This E-W elongated basin lies on the Northern fringes of western Dharwar craton with an exposed area of 8000 square kilometer.

STRATIGRAPHIC MAP OF KALADGI BASIN



Photograph 1 Stratigraphic map of kaladgi basin

STRATIGRAPHY OF KALAGADI BASIN

Group	Sub group	Formation	Member
		Deccan Trap	
		~~Angular and Erosional unconformity~~~~~~	
KALADGI SUPERGROUP	BADAMI (NEOPROTEROZOIC)	Konkankoppa Limestone Halkurki Shale	
			Gokak Sandstone Kendur Sandstone Torgal Conglomerate
		Cave Temple Arenite	
		~~Angular and Erosional unconformity~~~~~~	
	SIMIKERI	Lakshanhatti Dolomite Niralkeri Chert-breccia Arlikatti Argillite	
		Muchkundi Quartzite	Tulasigeri Quartzite Bevinmatti Conglomerate
		~~Disconformity~~~~~~~~~~~	
	BAGAL KOT (PALAEO - MESO PROTEROZOIC)	Petlur Carbonate	Chikshellikeri Limestone Chitrabhanukot Dolomite
	LOKAPUR	Mahakut Chert-Breccia	
		Yargatti Argillite	Yargatti calc. Shale Jalikatti Phyllite Manoli Ferrug. Shale
		Saundatti Quartzite	Timmapur Quartzite Almatti Quartzite Salgundi Conglomerate
		~~Angular and Erosional unconformity~~~~~~	
		Precambrian Basement Complex (PBC) **Granitoids, Gneisses & Metasediments**	

Table- Lithostratigraphic succession of the Kaladgi Basin (modified after Jayaprakash et al., 1987; Kale et al.; 1999; Jayaprakash, 2007)

FIELD OBSERVATION

Day- 1

Date -10/12/22

Spot -1

Latitude-15°52’55”N

Longitude-74°41’41”E

Location- Kardigudda, after Samara airport, on left side of Belgaum –Bagalkot highway on the way to Bagalkot.

Topography & Vegetation – The outcrop is trending N280°. The highest elevation of the more than 820m. On the outcrop there are a lot of thorny bushes which indicate that this is an arid-semi arid region.

Lithology-At the base of the hill we have exposed bed of conglomerates, the conglomerate is matrix supported (para-conglomerate) having clast of size 1- 2 cm and clasts show composition of quartz, which are sub rounded- rounded. As we move 10m up the composition of matrix changes to ferruginous, becomes more matrix supported and the clasts size increases from 3 to 5 cm. The clasts became more rounded as we move up. We identify beds of ferruginous quartzite’s 20-25cm. The quartzite showed cross bedding structure. Presence of conglomerate indicates unconformity. The formation belongs to the Kundargi formation of Simikeri subgroup of Badami group in the Indian stratigraphy the name of the conglomerate is Bevinmatti conglomerate. This rock marks the unconformity between Simikeri and Lokapur.

(a)

(b)

Photograph 2(a and b):- Bevinmatti conglomerate near Sambar Airport (hammer head pointing towards North and coin indicate size of clasts

Spot -2

Latitude-15°52”37’N

Longitude-74°41”48’E

Location - approximately 150 m from spot 1 on the right side of the road while going to Bagalkot.

Lithology -The outer layer of outcrop shows huge bulbus structures formed by spheroidal weathering of basalt. This feature is formed due to joints in the rock, more than 15m bed the basalt is identified by the presence of vesicles. The formation is also highly fractured. The green colour in the formation is due to alteration of minerals from Basalt.

Photograph 3 Spheroidal weathering in Basalt

Photograph 4 Roadside outcrop of Basalt showing spheroidal weathering.

Day -2

Date-11/12/22

Spot-1

Latitude-16°05’07”N

Longitude-75°52’31”E

Location –Ramthal behind government nursery.

Topography and vegetations – There are lots of thorny bushes in this region and the area of study has a gentle elevation.

We studied the basement of Kaladgi group which is 500mya and made up of Metasediments, Metavolcanics, Greywackes with BIF’s. The Hungund schist Belt forms one of the cratonic assemblages that forms the basement of the Kaladgi. The assemblage comprises of metaphyllites, BHQ, which include chert, jasper. The BHQ are intensely folded.

Strike direction – N130°

Dip direction –SW30°

Amount of dip -39°

Photograph 5 Folding in BHQ

Photograph 6 Folding in Phyllite

Spot-2

Latitude-16°08”45’N

Longitude-75°87”56’E

Location – Few meters away from spot 1 towards N290°.

There is intercalation of metasedimentary rock like phyllites in the schist belt. We collected the data on the folded limbs and data was plotted on a stereonet.

Data on folded BHQ

Strike direction	Dip direction	Amount of dip
N161	SW	38
N133	SW	76
N155	SW	40
N148	NE	20
N163	NE	76
N154	NE	76
N145	NE	65
N146	NE	80
N152	NE	86
N158	SW	80

The Axial plane of the fold trends in N133° and plunges at 24°. The trend of the lineation is N333°. There are micro folds in the large fold. The large fold with longer wavelength is made of BHQ where the smaller folds are made of phyllite. The Hungund schist belt is the basement of Kaladgi (2.5-4.1ma). Whereas the kaladgi is Neoproterozoic (115mya) in age. On the top of the hill is a conglomerate bed which is made of ferruginous matrix and clast are made up of BHQ & Quartz, the clasts are well rounded with a size of 3 – 15cm. The name of the conglomerate is Salgundi Conglomerate.

Photograph 7 Salgundi conglomerate at Ramthal

Spot-3

Latitude-16°08’45”N

Longitude-75°87’56”E

The rock is red in colour, showing fused grains, the rock shows crossbedding, the rock is a ferruginous quartzite. It is called as Saundatti Quartzite.

Data on bedding plane of Quartzite

Strike direction – N285°

Dip direction –NE

Amount of dip -36°

Photograph 8 Cross bedding in Suandatti Quartzite

Photograph 9 Road cut section of Saundatti Quartzite Ramthal

Spot-4

Latitude-16°04’53”N

Longitude-75°52’28”E

Location – 1 km away from Ramthal on the left side of the road’

Lithology- There is a huge bed of off-white colour around 5 meters in height. These are Caliche deposit exposed just few meters away from road. Minerals present in deposit were Smokey quartz and amorphous variety of calcite. Presence of $CaCo_3$ was confirmed with HCl. This type of deposit form in dry condition.

Photograph 10 Caliche deposit

Spot-5

Latitude-16°08”45’N

Longitude-75°87”56’E

Location –

Lithology – Intrafollial folds of phyllite and BHQ, the wide BHQ layers hold steep folds of phyllite. Since the basement rock has undergone a period of deformation, there are tight folds to be observed in the field.

Table 1 Data on intarfollial fold

Strike direction	Dip direction	Amount of dip
N334	NE	78°
N326°	NE	80°
N322°	NE	86°
N338	SW	80

Data on tight fold

Strike direction	Dip direction	Amount of dip
N40	NW	34
N306	NE	40
N320	NE	74

Photograph 11 Folds in BHQ hammer head pointing North (readings are not recorded due to slumping effect)

Day 3 **Date-12/12/22**

Spot-1

Latitude –15°44’23”N

Longitude-75°22’28”E

Location –Nargund

Lithology- The exposed rock is a phyllite intercalated with BIF. The development of foliation in the BIF indicates that the series is metamorphosed.

Data on foliation plane of the fold

Strike direction	Dip direction	Amount of dip
N152°	SW	74°
N160°	SW	85°
N168°	SW	76°
N175°	SW	63°

The dip varies 4-5° along the foliation plane. The Quartz vein are parallel to the foliation, this concludes that they were synchronous with the deformation of the rocks. There is a broad warp in the foliation in the phyllitic rock therefore the foliation is nearly horizontal. The presences of a small-scale shear zone indicator like foliation planes and quartz vein that gives the direction of shear.

There are 3 deformation fabrics

Sn present in veins and some places in the fabric

Sn+1 it is the penetrative formation

Sn+2 fabric is almost horizontal

On the top of the deformed there are recent deposits of recent cobbles and pebbles which are not well sorted and are not similar in age to that of the Kaladgi supergroup.

Photograph 12 Folded Phyllitic outcrop.

Photograph 13 Pen cap pointing towards North beds shows sinistral shear sense.

Spot-3

Latitude –15°43’49” N

Longitude-75°22’46” E

Location – Nargund fort [near Bhoruka power plant corporation limited]

Lithology – The rock is red in colour showing fused grains, the red coloration is due to ferruginous matrix and siliceous clasts are present. It shows fluvial features like cross bedding and ripple marks. The rock is a ferruginous Quartzite. Its highly jointed.

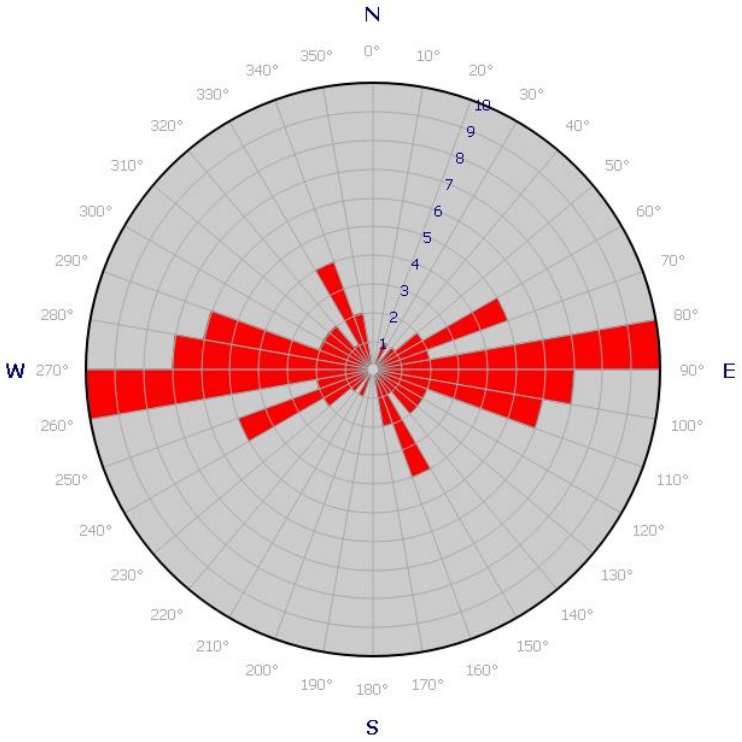
Photograph 14 Joints in Saundatti Quartzite hammer head pointing towards North

Data on bedding plane

Strike direction	Dip direction	Amount of dip
N142°	SW	10°
N132°	SW	12°

Data of joints on Saundatti Quartzite.

N60° N95° N51° N41° N86° N155° N152° N157° N23° N133° N103° N150° N80° N121° N91° N114° N65° N90° N149° N84° N63° N121° N60° N75° N94° N103° N114° N163° N93° N154° N82° N100° N81° N80° N103° N133° N83° N71° N245° N87° N87° N86° N93° N100° N91° N160° N105°



Photograph 15 Rose diagram

Photograph 16 Saundatti Quartzite Nargund

Day-4 Date-13/12/22

Spot -1

Latitude-16°00’49”N

Longitude-75°53’05”E

Location 1- ½km away from the heritage temple of Aihole

At this spot the north side of the road there are horizontal series of beds whereas on the southern side of the road there are incline series. This area shows the angular unconformity between Bagalkot and Badami group rocks.

Lithology of the incline series

On the southern side of the road there are incline series, the total extends of the incline out crop is approximately 27-30m wide. The ferruginous Quartzite with intra formational conglomerate. There are 6 layers of quartzite and conglomerate. Later the same bed is seen intercalated with breccia, the size of clast varies from 1-15cm. At some places the matrix changes to siliceous type and clasts include BHQ, Quartz & feldspar. The clasts are mostly angular to sub angular.

Data on bedding planes of incline series

Strike direction	Dip direction	Amount of dip
N114°	SSW	36°
N111°	SSW	35°
N117°	SSW	34°
N110°	SSW	32°

Photograph 17 Ferruginous Quartzite on Southern side of the road in Aihole

Spot 2

Latitude -16°00’51”N

Longitude-75°53’07

Topography –It is a hill with flat top and faces, it has highest elevation of 712m, it hosts less amount of vegetation compared to the surrounding area.

Lithology-the rock shows red colour, the grains are sand size and the boundary of it can be identified in the rock. Hence the rock as Sandstone. The bedding shows a shallow dip towards SSW. The rock is highly jointed. Fluvial features like current bedding can be seen in the out crop.

Photograph 18 Sandstone in Aihole on the Northern side of road

Spot 3

Latitude-16°05’06”N

Longitude-75°46’59”E

Location – Sirur [Around Sirur temple town opposite to the river]

Lithology –If we look perpendicular to the bedding the fault plane, we see the slickensides (lineation) they are dipping along the dip therefore it is a dip slip fault although there are no shear sense indicators to tell the direction of shear. In the field the amount of dip for different fault plane ranges from 90°,60°-30°, >60°. Overall, we can interpret that it is a fault zone, in a

major fault zone there are minor faults. At the base of the hill, we can identify a conglomerate bed with clast size from 2-5cm, the clast consists of BHQ Quartzite and chert. As we move up the hill, we can identify shallow dipping beds of Quartzite towards the north east. Angle of lineation is 88°and strike direction is N111°.

Photograph 19 Slickensides in Sirur

Day-5 Date-14/12/22

Spot 1

Latitude-16°05’06”N

Longitude-75°46’59”E

Location –Amingard

Lithology-At the base of the hill there are bolder of reddish pink granite, coarse grained and the size of feldspar grain is 2-3cm. There are xenoliths in the granite. Size varies from 8-10cm. There are other accessory minerals in the granite like hornblende and biotite. The name of the granite is Closepet granite, it is among one of the basement rocks of Kaladgi basin. On the left-hand side of the stairs there is a highly weathered granite indicating shear zone trending 21° towards ESE direction.

Photograph 20 Xenolith in pink granite

Photograph 21 Highly weathered granite on the left-hand side of the stairs in Amingard

Photograph 22 Weathered granite pen cap indicating North Direction

Spot 2

Latitude-16°30’32”N

Longitude-75°56’55”E

Location –Sulebhave

Lithology –The reddish pink colour rock. The clasts are intercalated with Quartzite; the clasts consist of BHQ and Quartz but the amount of BHQ in this location is high as compared to Ramthal.

Data on the bedding plane

Strike direction	Dip direction	Amount of dip
N115°	NNE	20°
N128°	NNE	19°
N116°	NNE	21°

Photograph 23 Quartzite at Sulebhave

Spot- 4

Latitude-16°04’08”N

Longitude-76°03’33”E

Location – Near Social Welfare Department and behind Highschool

Topography- The area is a mountain which has been cut for the construction.

Lithology – This outcrop is a continuation of Hundgund schist belt. There are alternate beds of phyllite and BHQ the data is given below.

Strike direction	Dip direction	Amount of dip
N125°	NNE	55°

At some places in the outcrop, we can see shear lenses within in this lens there are interafollial folds. As the schist belt is a basement for the kaladgi is the change in the dip of the schist belt will tilt the Kaladgi sequence.

Photograph 24 Pen indicating axial plane of fold in BHQ.

Photograph 25 Interfollial folds in BHQ and Phyllites pen cap points in North direction.

Photograph 26 Continuation of Hungund schist belt near Social Welfare Department and behind highschool.

Day-6 Date-15/12/22

Spot 1

Latitude-16°20’25”N

Longitude-75°36’41”E

Location –Bilgi

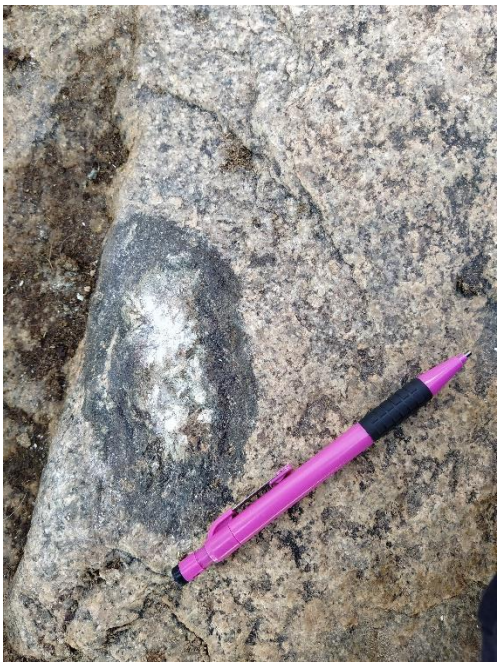
Lithology- The outcrop is greyish white in colour. A crystalline igneous rock, which is felsic in nature. The body also has xenoliths which show a trend of N96°, the xenoliths are angular in nature and show alignment of minerals (Hornblende, Biotite & pyroxene). The large body is grey granite with quartz and alkali feldspar. It shows exfoliation. The pegmatite vein shows a fault indication. Trend of fault plane-N129° and has a throw of 10.5cm. The body was intruded by Pegmatitic veins and the trend of veins is mention in the table below.

Sr No	Trend of veins
1	N62°
2	N48°
3	N52°
4	N62°

Photograph 27 Granitic body exposed at Bilgi.

Photograph 28 Xenolith in Granite, Bilgi.

Photograph 29 Trend of fault plane-N129° and has a throw of 10.5cm.



Photograph 30 Xenolith within xenolith

Spot 2
Latitude- 16°20’14”N
Longitude- 75°36’43”E
Location – Bilgi opposite to Siddheshwar temple.
Lithology – The outcrop shows white and red colour beds, the rock is a quartzite the change in colour is due to the presence of matrix, beds show current bedding and Herring bone structure.
Data on bedding plane

Strike direction	Dip direction	Amount of dip
N190°	SSE	6°
N114°	SSE	9°
N120°	SSE	10°

Photograph 31 Quartzite beds Siddheshwar temple, Bilgi.

Spot 3
Latitude---16°20’29”N
Longitude-75°36’59”E
Topography- a dome shape hill with highest elevation of more than 550m in elevation. Near Durgavamma Temple.
Lithology –The outcrop exhibits a sedimentary sequence of sandstone with inter depositional bed of oligomictic conglomerate. There are clasts of quartz varying in sizes in between 7-15 cm. The beds show primary syn-depositional structure cross bedding with current bedding and gradation.
Data on bedding plane

Strike direction	Dip direction	Amount of dip
N12°	SE	15°

Photograph 32 Gradation in Conglomerate

Photograph 33 Cross bedding

Day 7 Date-16/12/22

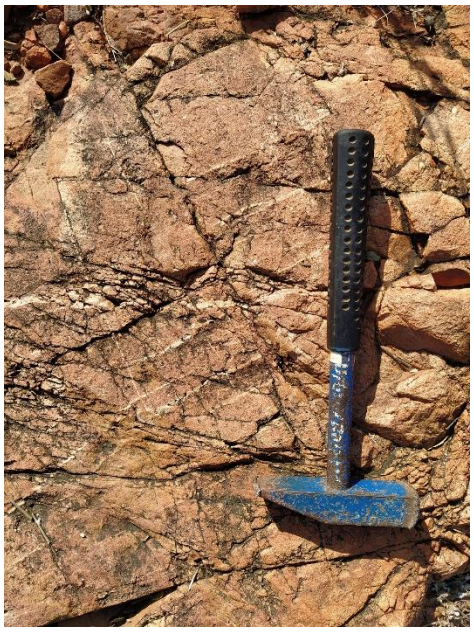
Spot -1

Lattitude-16°05’47”N

Longitude-75°48’07”E

Lithology- A cream colour outcrops with fused grains and don’t show a well define grain boundary this indicates that the rock has undergone metamorphism. The rock is a Quartzite. The rock had undergone brittle deformation which has created a joint set trending in N47°. The joints are localized in nature. In this joint sets gash veins are formed which trend in N55° There are two generations of veins. Older veins trend in N136° and younger trend in N55°.

Photograph 34 Sirur shear zone



Photograph 35 Veins showing displacement in Quartzite hammer head pointing towards North.

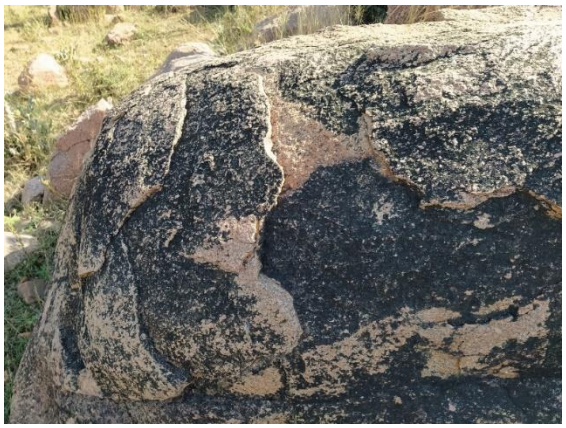
Spot -2

Lattitude-16°05’10”N

Longitude-75°48’47”E

Location – Few meters away from road

There are boulders of pink granite the rocks are not insitu. These boulders show exfoliation.



Photograph 36 Granite boulder showing exfoliation.

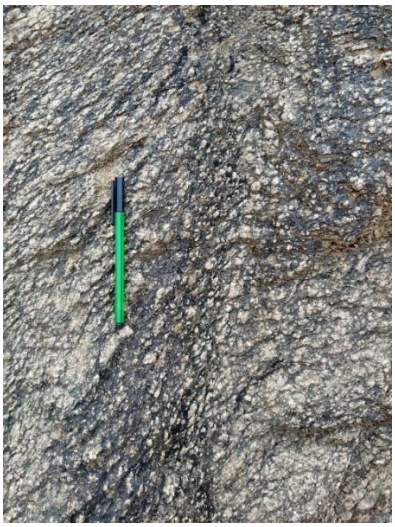
Spot -3

Lattitude-16°05’10”N

Longitude-75°48’47”E

Location – Few meters away from spot 2

Lithology – The outcrop is of weathered granite showing alignment of minerals, this indicates that the rock was metamorphosed and the shear sense is given by the foliation. Shear sense looking south. There are 3 generation of veins the youngest one is parallel to the foliation. Data on foliation plane strike direction 104°N and amount of dip is 32°.



Photograph 37 Highly weathered granite showing foliation.

Photograph 38 Outcrop of weathered granite showing foliation

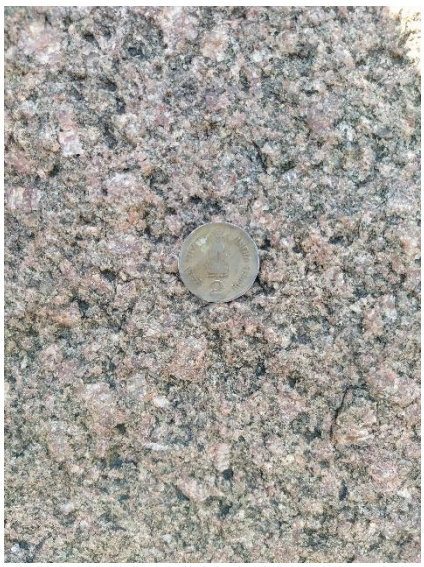
Spot -4

Lattitude-16°05’09”N

Longitude-75°48’48”E

Location – 20-25m towards the west

Lithology – It is a restrict zone shown by granite and schistose rock with a coarse gain Hornblende granite in between these two rocks. The trend of the foliation is N210°. The granite is made up of feldspar, quartz and little of accessory minerals Hornblende. Granite has medium size crystals of Hornblende. The schistose rock contains mostly mafic minerals like pyroxene, hornblende and biotite. The mafic rock may have undergone partial melting and the felsic composition of the pre-exiting rock may have rose above.



Photograph 39 Pink granite with coarse grain size.

Spot -5

Lattitude-16°02’06”N

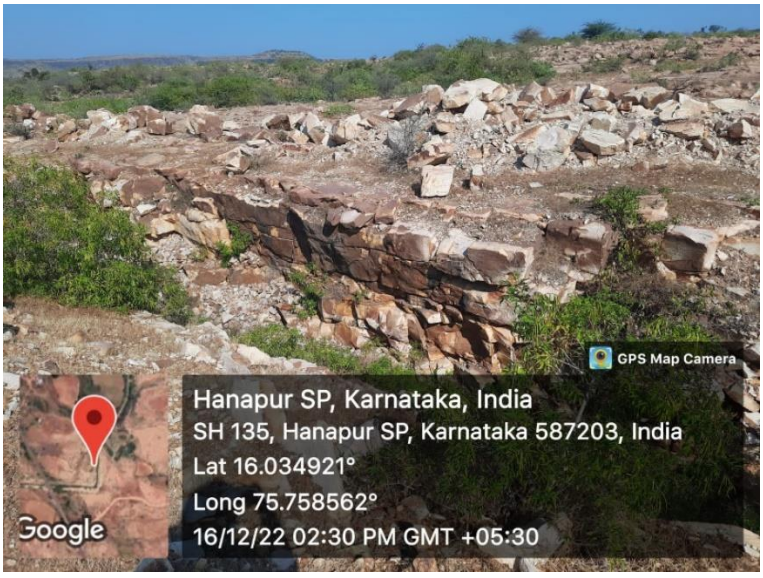
Longitude-75°45’26”E

Location – Murdi, Karnataka, A vast plane on the east side of the road while going

Lithology –the beds of conglomerate whit clast of quartz and BHQ. These beds are gently dipping towards northeast, the roads are jointed and the trends is N90° & N126°

Along the tunnel section there are sandstone beds.

Photograph 40 Sandstone beds near tunnel section.



Photograph 41 Tunnel section

Spot -6

Lattitude-16°04’51”N

Longitude-75°52’12”E

Location- Along the road side, Keralmatti

Lithology- The brown colour beds of phyllite which undergone folding.

Data on fold.

Strike direction	Dip direction	Amount of dip
N70°	NW	34°
N75°	NW	25°
N78°	SE	28°
N60°	SE	7°
N77°	NE	12°
N125°	SW	5°
N98°	SE	21°
N98°	SE	33°
N98°	NW	25°
N89°	NW	18°
N78°	NW	17°
N89°	SW	33°
N76°	NE	24°

Photograph 42 Folds in Phyllite

Day-8 Date-17/12/22

Spot -1

Lattitude-16°06’45”N

Longitude-75°35’23”E

Location – Kagalkomb

Lithology – The trend of the body is N100°, the body is localized in nature showing radial joints due to blasting, width of the body is approximately 48-50m and the body is made up of milky quartz.

Photograph 43 Quartz vein in Kagalkomb.

Spot -2

Lattitude-16°07’29”N

Longitude-75°35’46”E

Location –Kagalkomb below spot1.

Lithology – The beds are dipping on the either side of the road, this rock is made up of dolomite. (Checked by HCl test). The series has a joint trending in N102°

Data on bedding plane

Strike direction	Dip direction	Amount of dip
N102°	SSW	44°
N104°	SSW	45°
N100°	SSW	45°
N105°	SSW	44°

Spot -3

Lattitude-16°07’29”N

Longitude-75°35’46”E

Location –Sulikuri, Dolomite mine

Lithology- The rock mined is Dolomite; the trend of the mine pit is N100°, the bed shows similar characteristic to spot 2.

Spot -4

Lattitude-16°03’19”N

Longitude-75°38’45”E

Location – Below the bridge at Konkankappa village.

Lithology-in the Badami group, Konkankappa limestone is the first formation. The strike of the bed changes, also the dip this is due to because of the gentle warp in the formation.

Data on bedding plane.

Strike direction	Dip direction	Amount of dip
N104°	SSW	5°
N111°	SSW	2°
N106°	SSW	6°

Photograph 44 Konkankappa limestone

Spot -5

Lattitude-16°01’19”N

Longitude-75°38’58”E

Lithology- Shale is a deep water, sedimentary rock with size of 1/256cm, types of clay are identified using XRD. On this location Halkurki Shale is exposed. Along the canal which is dug. The shale shows a low angle dip.

Photograph 45 Halkurki Shale

Spot -5

Lattitude-15°56’18”N

Longitude-75°40’35”E

Location – behind petrol pump, Badami

Lithology – Huge bed of Sandstone can be seen. The beds are horizontal in nature. Structures like cross bedding can be seen in the rocks.

Photograph 46 Sandstone behind petrol pump

Day-9 Date-18/12/22

Spot -1

Lattitude-16°10’04”N

Longitude-75°21’32”E

Location – Naganapur, on the left side of the road.

Lithology-There are intercalation between Limestone &Shale, these beds are steeply dipping showed by the data given below.

Strike direction	Dip direction	Amount of dip
N121°	SSW	75°
N124°	SSW	72°

The Limestone beds host marks of Stromatolites; there are six distinct varieties of Stromatolites seen on this location (Sharma M and SK Pandey,2012).

Photograph 47 Stromatolites in limestone

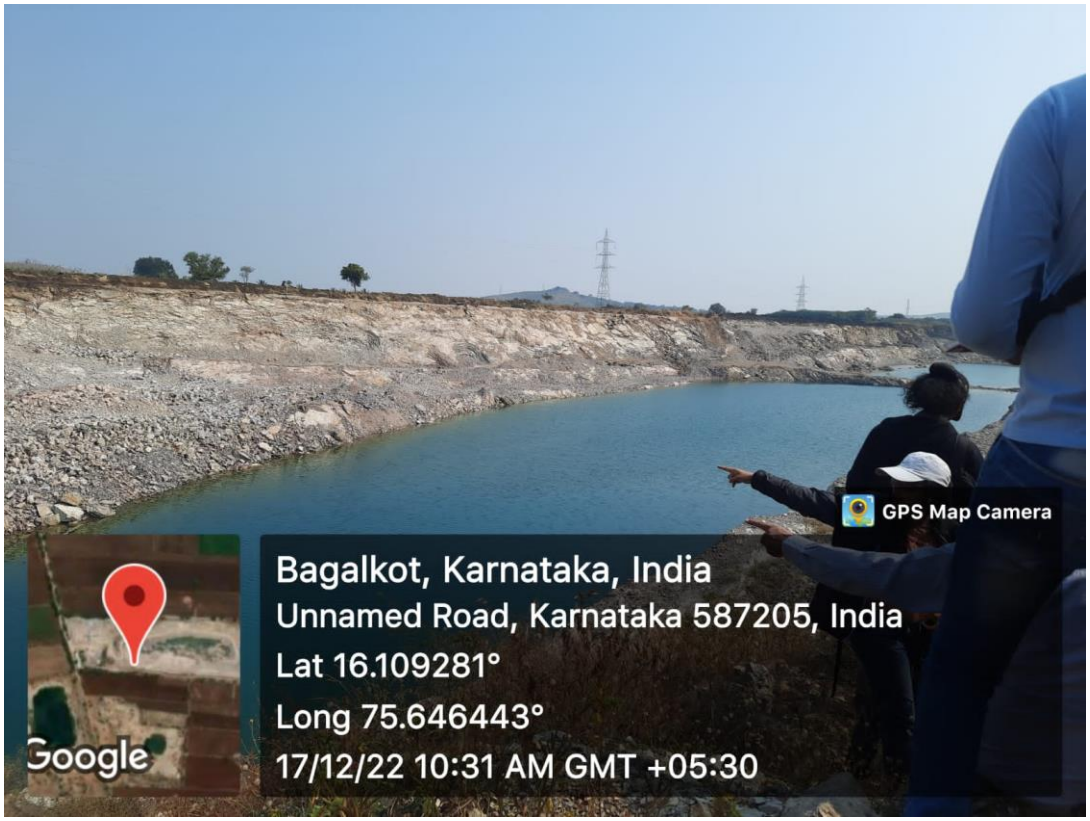
Spot -2

Lattitude-16°09’33”N

Longitude-75°22’58”E

Location –Jalikatti mine, 1km away from Lokapur

Lithology-there is Dolomite mining carried out in this region. There are primary layers of dolomites and Siliceous rich material showing folding and dip in South East. Trend of the mine pit is N115°.



Photograph 48 Dolomite mine

Day-10 Date-19/12/22

Spot -1

Lattitude-16°19’58”N

Longitude-75°53’09”E

Location –Almatti dam.

The Almatti dam is a multipurpose project on river Krishna also known as upper Krishna project (UKP). Construction of dam started in 1964 and was completed in July 2005. The height of the dam is 160m, having a reservoir capacity of 123.08TMC and can be increased upto 225TMC. The dam is partially made up of cement and partially of earth material. The foundation is in the basement of Kaladgi. The dam is built in a shallow valley. Around 180 villages are submerged and more than 2 lakh families have been displaced. This dam was inaugurated by former President of India Dr. APJ Abdul Kalam in 2006.

Spot -2

Lattitude-16°20’28”N

Longitude-75°55’34”E

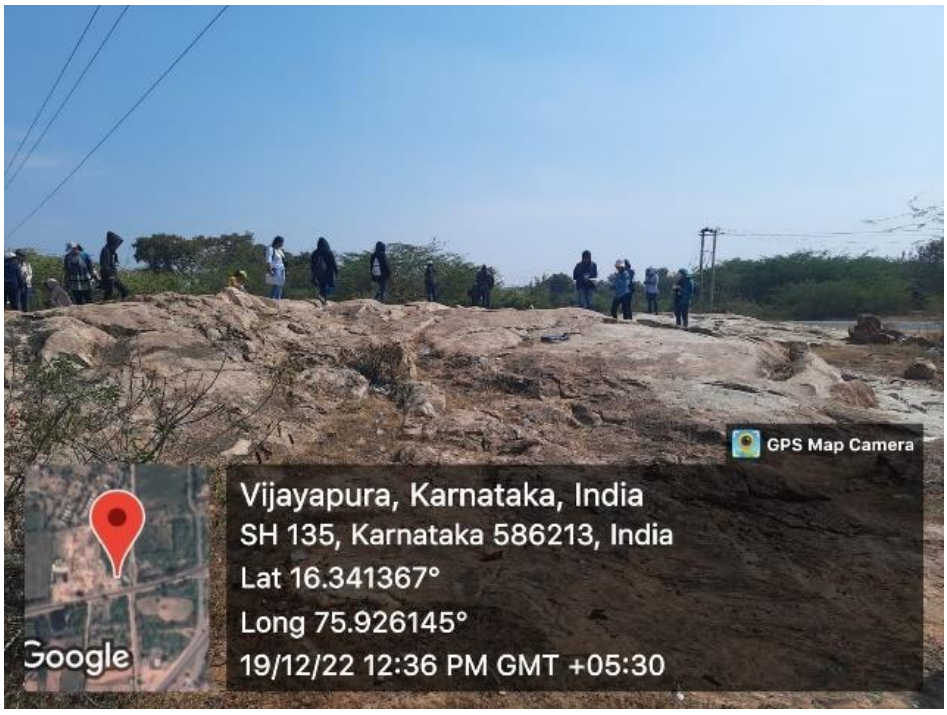
Location – Roadside exposure in Vijayapura.

Lithology-In this formation there are 6 types of rocks with their characters are described below as follows.

Beds	Characters
Pegmatite	It is the youngest. The rock is made up of feldspar and Quartz.
Pink granite	The rock is rich in Orthoclase feldspar crystals therefore it appears pink.
Grey Granite	It is grey in color due to presence of mafic minerals
White Granite	It is the purest granite in the region.
Gneiss	The band of the gneiss show banding, this might be a syntectonic activity as there is no brakeage in the rock.
Dark color Mafic	It is the oldest rock

The stratigraphy in this region can be confirmed using Geochemical methods.

Photograph 49 Xenolith in granite



Photograph 50 Granitic outcrop exposed along road in Vijayapura

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