GOA UNIVERSITY

2022-'23

AGTC-408
GEOLOGICAL FIELD MAPPING

GEOLOGY FIELD REPORT

BAGALKOT, KARNATAKA

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ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude towards the efforts put in by my professors who accompanied us to the field, HOD Dr. Anthony Viegas, Dr. Poornima Sawant, and Dr. Nicole Sequeira for their knowledge and guidance throughout the fieldwork.

I also thank the non-teaching staff Ma'am Heena for providing us with the necessary instruments required to carry the fieldwork.

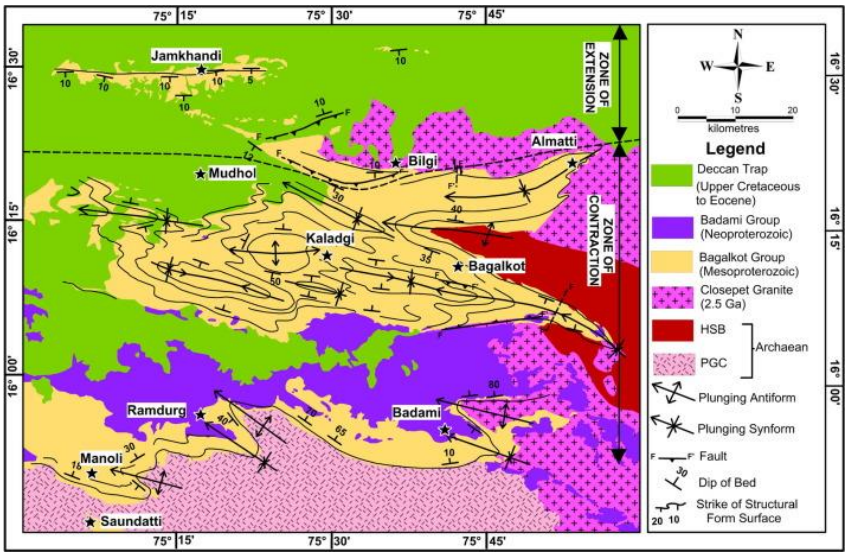
I would like to thank my classmates for helping me throughout the fieldwork.

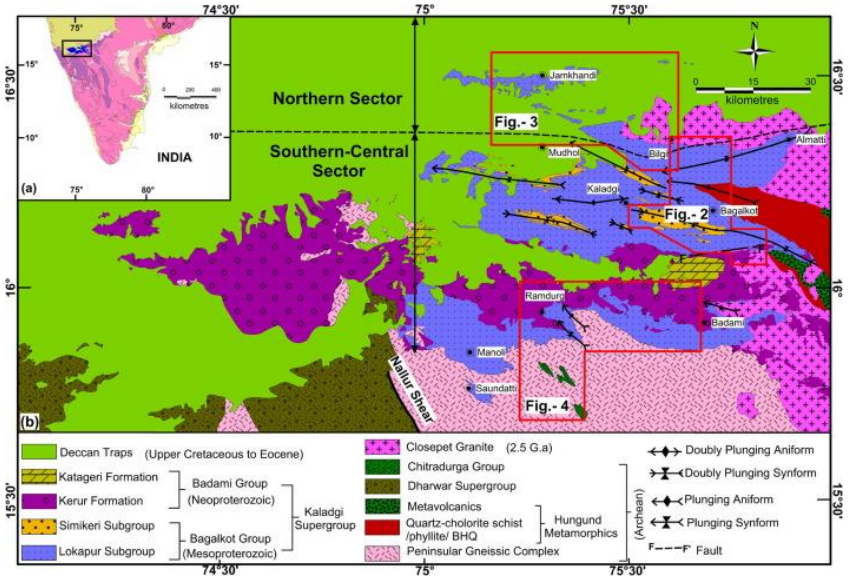
Lastly, I would like to thank my parents for providing financial and moral support.

CONTENTS

INTRODUCTION

The Proterozoic (Purana) basins are a unique feature of the Proterozoic geology of the Indian Peninsular Shield. There are seven independent sedimentary basins in India which were collectively known as Purana Basins. The words 'Purana Basins' refer to the most of the subhorizontal pre-cambrian sedimentary sequences deposited over the crystalline basement of gneisses, granites and schists. The Vindhyan, Cuddapah, Bhima, Chattisgarh and Kaladgi basins are the important Purana Basins. The field trip has been organised choosing the Kaladgi Basin which is present at the northern edge of the Dharwar craton.





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.

(1) The coastal plains on the west bordering the Arabian Sea- The coast line is straight and is about 400 km long. The coastal plains rarely exceed 30 km in width.

(2) The Malnad or mountainous region Geological Survey of India 2 comprising the Western Ghat- the Western Ghats forming the sub-continental water divide rise precipitously in a series of scarps and terraces towering more than 1000 m above msl. within a short distance from the coastal plain.

(3) 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.

Many of the major rivers, particularly drainage pattern.

GEOLOGY OF THE KALADGI BASIN

The elliptical Kaladgi Basin is situated on the northern and north-western exposed fringes of the Dharwar craton which is composed of strongly deformed and metamorphosed rocks of the Archean and early Proterozoic. The northern and western extents of the basin are concealed under the basaltic lava flows of Cretaceous-Tertiary Deccan Traps. The rocks forming the basement for the sediments of Kaladgi Basin are the Archean and early Proterozoic rocks comprising Older Gneissic Complex, Shimoga Schist Belt, Hundgund kushtagi Schist belt and younger closepet granites. The Kaladgi basin covers an area of 8,300 sq. km and is made of an older Bagalkot Group and Younger Badami Group. The Kaladgi basin consists of 3 cycles: Quartzite-Shale-Limestone. The entire thickness is 4500m. Also, the Kaladgi basin is important as it hosts vast resources of limestones and dolomites along with minor traces of Fe ore. The Kaladgi basin sediments are divided into the Upper and Lower Kaladgi series. The prominent lithology is sandstones & shales. It is noticed that the lower Kaladgi series was flat lying unit and the upper series was folded, marked by an angular unconformity. The deformation of Kaladgi is connected to the center of the basin and the periphery remains unaffected.

	Group	Subgroup	Formation	Member
			Deccan traps	
			Angular and erosional unconformity	
KALADGI SUPERGROUP	**Neo-Proterozoic** BADAMI		⇒ Konkankoppa Limestone ⇒ Halkurki Shale ⇒ Cave Temple Arenite	 • Gokak Sandstone • Kendur Sandstone • Torgal Conglomerate
			Angular unconformity	
	Meso-Proterozoic BAGALKOT	SIMIKERI	⇒ Lakshanhatti Dolomite ⇒ Niralkeri Chertbreccia ⇒ Arlikatti Argillite ⇒ Muchkundi Quartzite	 • Tulasigeri Quartzite • Bevinmatti Conglomerate
			Disconformity	
		LOKAPUR	⇒ Petlur Carbonates ⇒ Mahakut Chertbreccia ⇒ Yadhalli Argillite ⇒ Saundatti Quartzite	• Chikshellikeri Limestone • Chitrabhanukot Dolomite • Yargatti Calc. Shale • Jalikatti Phyllite • Manoli Ferrug. Shale • Timmapur Quartzite • Almatti Quartzite • Salgundi Conglomerate
			Angular and erosional unconformity	
			PRECAMBRIAN BASEMENT COMPLEX (PBC) Granitoids, Gneisses & Metasediments	

DAY-1

10.12.2022

Belgaum-Bagalkot Road

Spot 1 (Karidigudda , near Soman Aiport)

Lat : 15°52'37"

Long: 74°41'49"

The location was at a hill just next to the highway and it had a lot of vegetation and fields around which indicates that there will obviously be drainage.

This is a part of the Kundargi formation of the Badami group which has conglomerates. This conglomerate is known as Bevinmatti Conglomerate which is at a height of 820m. The conglomerate at the outcrop showed variation in the size of clasts and the matrix as we moved from the bottom to the top of the hill. The conglomerate showed variation from clast supported at the base to matrix supported at the top. The clast size varied from approximately <1 to > 5cm. The mineralogy of the clast was quartz and feldspar on a smaller scale. Presence of Conglomerates indicates Unconformity.

Spot 2 (5-6 kms from spot 1) at the highway

Lat: N15°52'37"

Long: 74°49'49"

This location was just next to the highway which had dry vegetation around. The outcrop consisted of rutaceous-sized boulders. The conglomerates at this location had a size of around >15cm and it was clast supported. The massive bulbous structure indicated the presence of spheroidal weathering that weathered the Deccan trap basalt. Vesicles were also present at this particular outcrop. The basalt showed vesicles and the rocks at this location were highly fractured.

DAY-2

11.12.2022

Kamdgi, Ramthal

Spot 1

Lat: N15°44'23.0"

Long: E75°22'28.4"

The basement here is made up of Hungund schist belt which is made up of Metavolcanic sediments which are ultramafic in nature. Sediments are present with some acid volcanics, and greywackes with BIF.

At this location, there was also the deposition of CaCo3 along trenches. The basement is made up of BHQ Phyllite which was seen to be steeply dipping towards the NE direction. They were striking in N163° in the NE direction which were dipping by 76° NE. Folding was present along the traverse.

Strike and dip data of the folded series of BHQ

Strike	142	334	326	330	157
Dip	65	76	76	75	70

Spot 2

Lat: N16˚14’54”

Long:75˚39’45"

The core of the anticline shows exposure of ‘Banded Haematite Quartzite’ belonging to the older Hundgund-Kushtagi schist belt. They show metallic luster and the non-shiny part shows granulose texture. They exhibit Banded Iron Formations(BIF). There are layers of competent and incompetent beds with shallow plunge with the dip amount of 24° dipping in the direction of N333°. Conglomerates with BIF's clasts were present. The clasts were 9 cm in length and 3.5 cm in width.

The basal part of Badami has an unconformity.

Micro folds were also present with a class of chevron folds. Sn is parallel to the axial plane and Sn+1 is the Intrafolial fabric which indicates that the 2 events of folding has taken place.

Age: Archean

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. Angular unconformity was seen. Also, this spot is not a part of the Proterozoic Kaladgi basin, its recent. The beds were so eroded that, looked like soil. Reverse grading had been observed.

Strike and dip data were recorded as follows:-

Strike	148	150	164	155	150
Dip	79	76	74	73	84

Spot 2

At this location ferruginous sandstone had been seen. Also, orthogonal joint sets were observed which had a trend of 225˚N. Conjugate joint sets data recorded here was N250˚ and 161˚.

DAY-4

13.12.2022

Badami-Bagalkot Discontinuity

Spot 1 (Bagalkot)

Lat: N16°0'48"

Long: E75° 53'5"

This location is 1.5 kms away from Aihole heritage temple and on the south side of the road.

The lithology seen here is BIF agate, chert clasts and sandstone.

Spot 2 (around 50m away from spot 1)

Lat: N16°0'48"

Long: E75°53'5"

The rocks present here 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.

Spot 3 (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 were 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.

DAY-5

14.12.2022

Aminghad

Spot 1

Lat: N16°3'21"

Long: E75°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.

Spot 2 (few meters away from spot 1)

Jointing had been observed here which was N17°. There was lineation on erosional surface. Trend alignment here was 145°N which was weakly and locally formed and was same as that of Hungund Schist.

Spot 3 (Sulebhani village)

This spot was 600 mts from the MSL. Here the strike and dip data was recorded135° and 29°, 128° and 19°.

Spot 4 (Adarsha Mahavid)

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. Fractures were present here as well as cross cutting. Minor fractures observed which were perpendicular to the foliation plane.

Strike and dip data was recorded as follows:

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

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. Shear lens were preserved the fabric without taking part in the deformation.

DAY-6

15.12.2022

Bilgi

Spot 1

Lat: N16°20'43"

Long: E75°37'02"

Weakly foliated granite porphyry of the 'Clospet 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, scoop holes 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 present at the same spot which had a xenolith within a xenolith which could be of restitic type.

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

Lat N16˚20'58"

Long E75˚36'50"

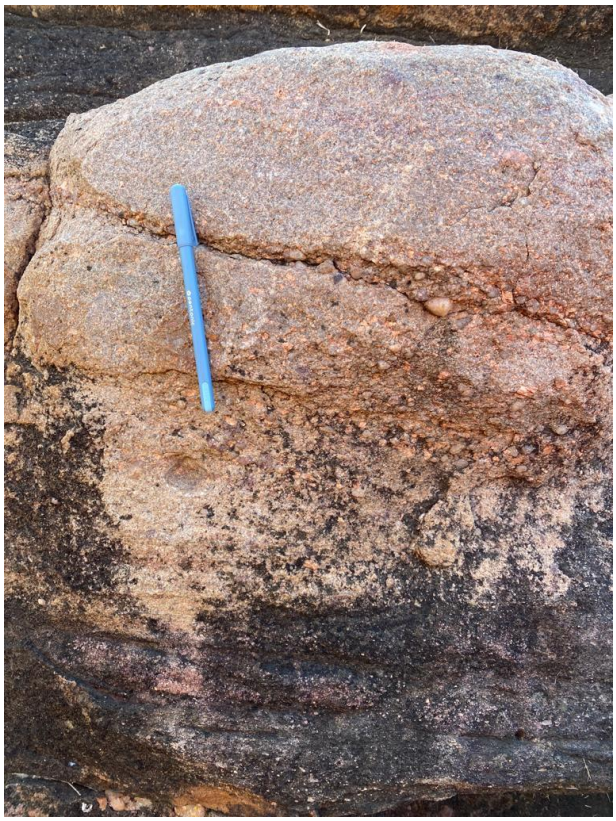
At Bilgi, Quartzitic sandstones belonging to Saundatti Quartzite' are overlain on the weathered and undulating surface of pottasic, weakly foliated granite porphyry of the Clospet Granites. The Saundatti Quartzites are separated from the Clospet Granites by a nonconformity. It is a metamorphic rock with 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 numerous primary sedimentary structures like ripple marks and cross bedding.

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 diamneter. Here the conglomerate was matrix supported and oligomictic whereas in Ramthal it was polymictic. The dip of the horizontal beds were 0 to 10˚. Joints were observed. There had been cyclic deposition of conglomerate.



DAY-7

16.12.2022

Shirur tapering part

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. When strike and dip data was recorded the strike was similar at places whereas the dip differed. The joint sets seen at this spot were not penetrative they were present locally.

DAY-8

17.12.2022

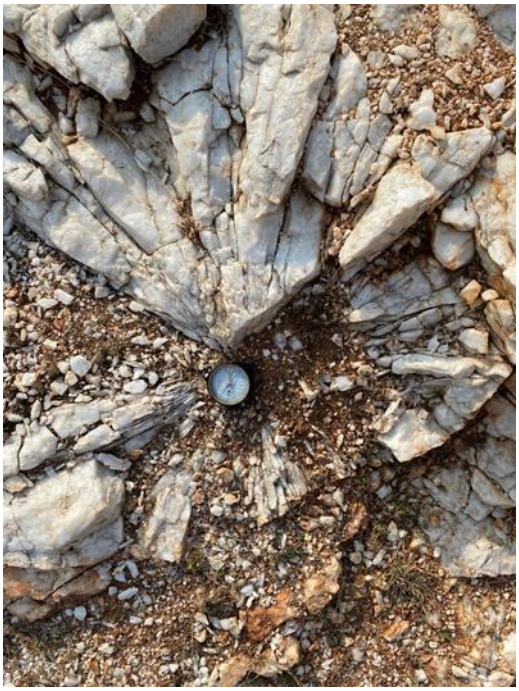
Kagalgomb

Spot 1

Lat: N16°6'51"

Long: E75°38'24"

The huge outcrop observed here was quartz which was about 40-50 m, trending E-W. The rock exposed was highly fractured and is in off-white colour. 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 recorded is as follows:-

Strike	112°	108°
Dip	44	47

(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 recorded here is as follow:-

Strike	104°	86°	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.

DAY-9

18.12.2022

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. 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 recorded here was as follows:-

Strike	118	120	120
Dip	72	71	70

Spot 2 (Rudreshwar Temple)

Lat: N16°11'58"

Long: E75°18'12"

Spot 3 (Jalkatti, Lokapur Mine)

Lat: N16°9'36"

Long: E75°22'58"

DAY-10

19.12.2022

Spot 1 (Almatti Dam)

The Lal Bahadur Shastri Dam is also known as Almatti Dam 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. The facility uses vertical Kaplan turbines: five 55MW generators and one 15MW generator. 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.

Spot 2

Lat: N16°20'29"

Long: E75°55'34"

At this location, near the road there was 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 here at this 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.

Beds	Characters
Pegmatite	It is the youngest and is made up of quartz and feldspar.
Pink Granite	The rock is rich in orthoclase feldspar crystals therefore it appears pink.
Grey Granite	It is grey in colour due to the presence of mafic minerals.
White Granite	It is the purest form of granite in the region.
Gneiss	The bands of gneiss show banding, this might be due to syntectonic activity as there is no breakage in the rock.
Dark colour mafic	It is the oldest rock.