DIFFERENTIAL UPLIFTMENT OF A PLANE PERPENDICULAR TO THE STRIKE OF THE FAULT IN THE VICINITY OF KALLUR, BELGAUM DISTRICT, KARNATAKA, INDIA.

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Abstract: Faults are ruptures along which the opposite walls have moved past each other. The movement of these walls is best understood by obtaining the field evidence of faulting. The study area covers the Proterozoic rocks of the Kaladgi Basin mainly quartzarenites, which are well exposed at and around Kallur, Belgaum district, Karnataka. The usual trend of these rocks is East-West and dips towards North. Due to the differential upliftment, multi-directional movement of quartzarenites is observed. The stress is laid on the plane perpendicular to the strike which suggests the movement of the fault along the bedding plane. The present study reveals the clear examining of structural features such as Shear zones, Slickenside surface, and Pseudopachylite. The study of Sigmoidal Veins shows the movement of the blocks as the veins have been disturbed indicating the clear evidence of faulting in the study area.

IndexTerms - Fault, Shear zone, quartzarenites, Sigmoidal Veins.

I. INTRODUCTION

The area comprises quartzarenites with variegated colours such as dark grey, red, pink, pink with purple bands and white colours. The cardinal co-ordinates of the area studied are 15°33'17.57'' N to 75°19'23.94''E. The quartzarenites exposed here are in the form of ridges with dip slope and escarpment scenery, stretching all over Kallur The Litho- units are having a general E-W strike with a gentle dip towards north and resting over Archean basement of granitic gneisses of Dharwar Super Group with a profound angular unconformity marked by a conglomeratic bed. The rocks exposed in the Kallur region are highly disturbed due to the differential upliftment of south-central Kaladgi. The shears are of multi-directions indicating the high rate of disturbance. The difference in altitude has exposed the rocks over a great thickness and thus creates an opportunity for detailed geological investigations. The broad linear structures are delineated with the help of satellite imagery and the field evidence are collected to decipher the ground truth.

II. GEOLOGICAL SETTING OF THE AREA

The area under description is probably the best example for control of geomorphology by lithology and structures. Hillocks wherever developed, these display the characteristic dip slope and escarpment scenery, owing to the presence of hard quartzarenitic rocks at the top. The gneisses and other rocks have not given rise to such hills but are seen to develop moderate slopes. The Kallur area is a prominent cliff like structure that is seen to extend right from the west to east marking different dip angles. The rocks dipping towards the north, with an inclination of 25° to 30˚ suggesting a moderate range of upliftment near this area. Hills are mostly composed of the hard quartzarenitic rocks while the flat ground and depressions are normally due to the presence of argillites. However, the study has revealed that wherever valleys have been formed, these are invariably along sheared and ruptured quartzarenitic rocks. There is evidence of many crushed quartzarenites in this area which are clear evidence of disturbance, there are many hollow spaces or small cave-like structures formed due to the movement of these massive exposures.

III. FAULTS

This formulates one of the major structures which is invariably studied in the field by the geoscientists. The quartzarenitic rocks constituting the area under study are quite suitable for the development of faults as the rocks are competent ones. Further, the area is devoid of vegetation (scanty), the presence of several quarries together with the presence of many non-perennial streams has rendered it possible to identify numerous faults in the field.

3.1 Displacement Along the Bedding Plane.

Due to the differential upliftment of south-central Kaladgi Basin, numerous structures have been formed effecting the local rocks. The rocks at and around Kallur have been uplifted such a way that the rate of net slip is 90° indicating the movement along the bedding plane. Hence strike-slip component of the fault remains zero. There are numerous huge step faults due to this high angle

inclination of the rocks exposed, the upliftment has made different beds slide past one another as shown in figure 3.1(a). The development of slickensides in these quartzarenites and the association of striations groves and shear planes in the vicinity of Kallur support the existence of movement along the bedding plane or a bedding plane fault. In Figure 3.1(b), a block diagram showing the upliftment of the basin and due to the upliftment the blocks have been moved, which is indicated by the arrows along the bedding surface.

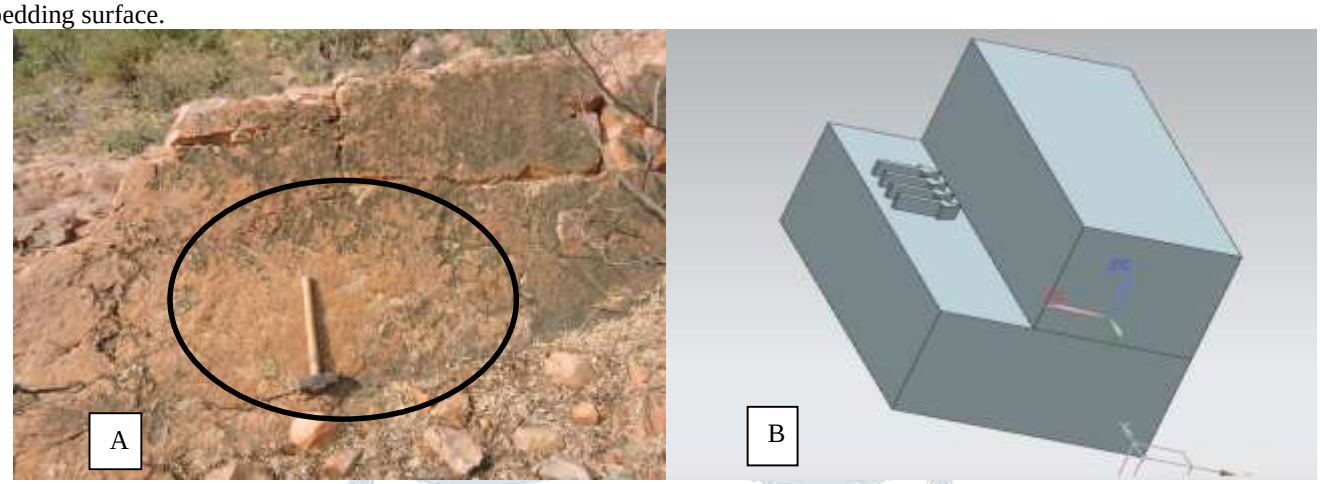


Figure 3.1(a). Circle indicating the slickenside surface along the bedding plane. Dipping North and trending EW; 3.1(b). Block diagram indicating the upliftment of the strata and the arrows indicating the movement of the beds along the bedding plane

In figure 3.2 (A) and (B) shows a quartz vein which has been deformed due to the movement of the block over it. The quartz vein is exposed on the bedding surface, are associated with the striations, grooves and shear planes. Due to the movement of the upper bedding layer over it has ruptured the single quartz vein into many smaller fragments. The quartz vein trend before deformation was trending North-South later due to the deformation the quartz vein has been ruptured and rotated having the general trend of East-West, due to the lesser pressure they are showing the intermediate stage of formation of the sigmoidal vein. As the quartz vein has been altered on the bedding plane, it is a clear indicator of the fault along the bedding plane.

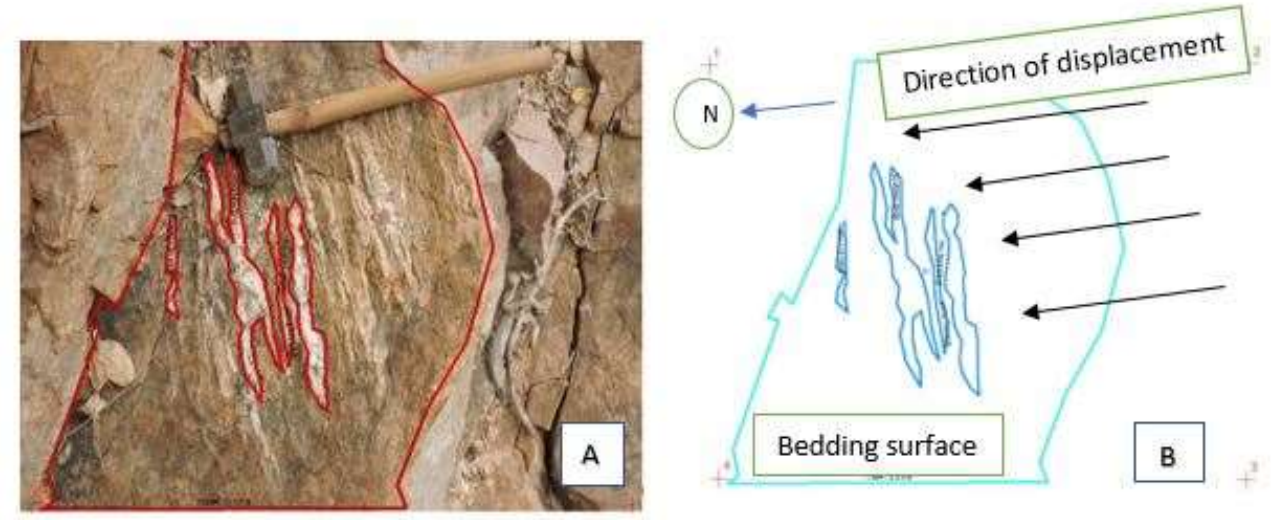
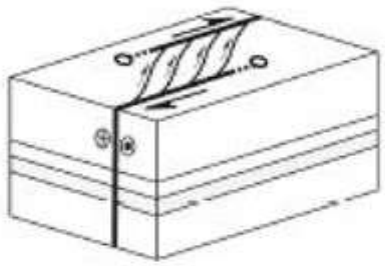


Figure 3.2 (A) Field photograph showing deformation of a quartz vein. (B) Schematic representation of deformed quartz vein.



Segmentation of bed-parallel slip-surfaces modes of faulting, woodcock, and Fischer (1986)

IV. RECOGNITION OF FAULTS IN THE FIELD

Various evidence of the faults is seen in the study area, which clearly indicates the movement of the rock beds, namely formation of caves, slickenside surfaces and fault breccia.

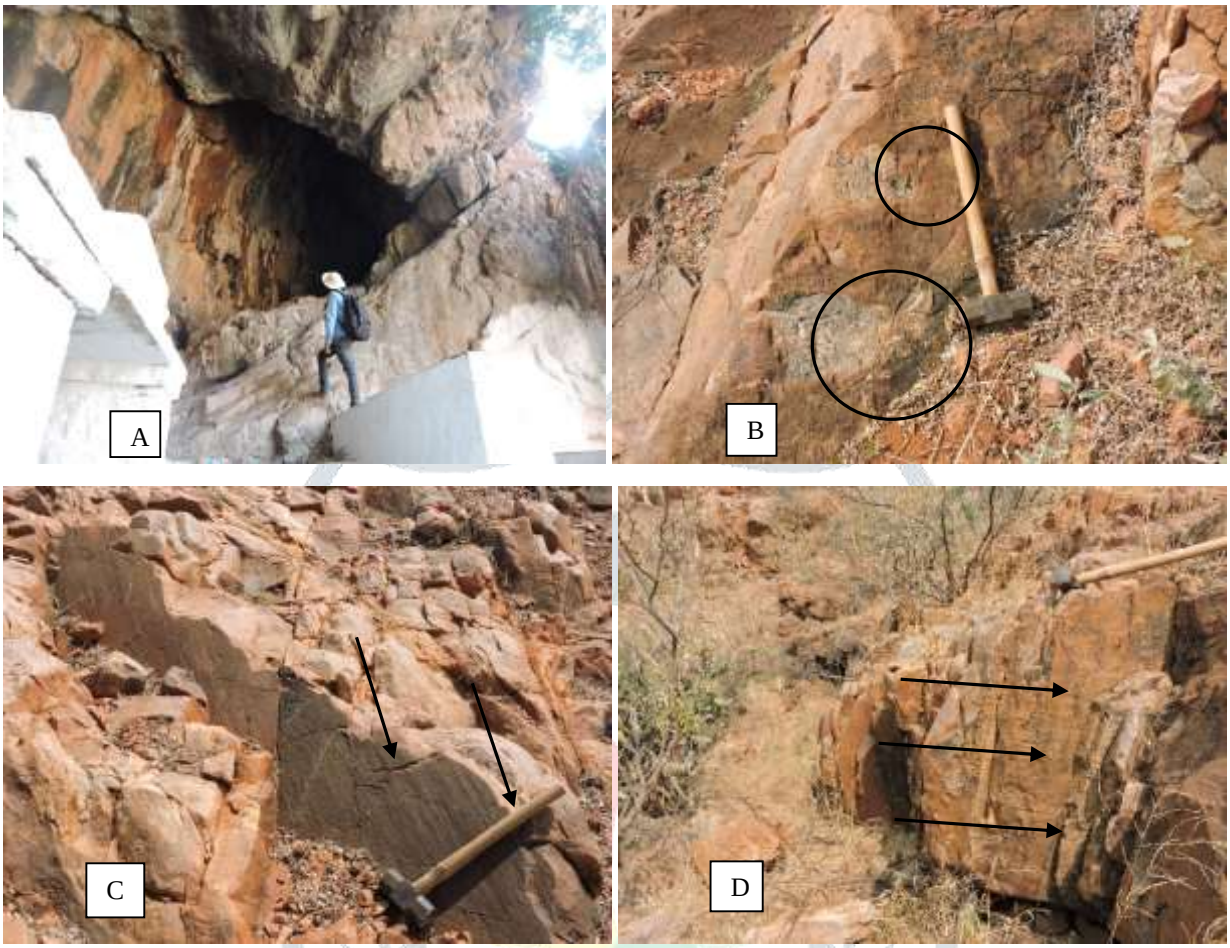


Figure 4.1. Indicating the evidence of fault at the vicinity of South Central Kaladgi Basin, Kallur, Belgaum district, Karnataka State.

A. Represents the Cave like formation, in the premises of Kada Siddeshwara Temple, Kallur., **B**. Psuedotachylyte on the bedding surface (NW part of Kada Siddeshwara Temple, Kallur)., **C**. and **D**. Indicating the slickenside surfaces (Western part of Kada Siddeshwara Temple, Kallur)

V. CONCLUSION AND DISCUSSION

The detailed geological investigations carried out on the southernmost border of south central part of Kaladgi basin reveal the presence of fault plane at and around the vicinity of Kallur. These Faults are associated with shear zones, shatter zones and deformed quartz veins along with other field evidence. The causative factor for the development of faults along the bedding plane on the southernmost border of south-central Kaladgi basin might be the differential upliftment of the Kaladgi basin during the end of Proterozoic Era. This differential upliftment caused by the deformation forces enacted upon the Kaladgi basin itself, brought in the multifarious rupture structures, change in the attitude of the rocks and also exposing the quartzarenites in the form of dissected ridges. The development of several evidential features of the fault on the bedding surface depicts the movement along the plane perpendicular to the to the strike of the fault or the bedding plane fault.

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