

## Results of a vertical magnetic survey near Karimnagar town, Karimnagar district, Andhra Pradesh

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**ABSTRACT.** Magnetic surveys were conducted around Karimnagar town of Andhra Pradesh to trace the quartz-magnetite bodies and to determine the exact nature of the unexposed dykes known to be running through the local college and the surrounding areas. The results clearly state that the underground bodies are only dolerites and quartz-magnetites do not occur anywhere except at three places. Laboratory studies indicate that the magnetism necessary to produce the observed anomalies could be easily attributed to dolerites.

### 1. Introduction

The results of a vertical magnetic survey conducted over an area of about 200 sq. miles around Karimnagar town of Andhra Pradesh are presented here. The survey was aimed at tracing the quartz-magnetite bodies in this district and to determine whether the underground dyke like bodies, known to exist in the local college compound and running through the neighbouring localities relate to quartz-magnetites. The surveyed area is bounded by  $18^{\circ}20'$  and  $18^{\circ}30'$  N latitudes and  $79^{\circ}0'$  and  $79^{\circ}15'E$  longitudes in the toposheet No. 56N/SW of the Survey of India. The results clearly indicate that the underground dykes are only dolerites and not quartz-magnetites.

### 2. Geology of the area

To the best of our knowledge, no published geological information is available over this area. Hence a preliminary geological survey was also conducted before attempting any geophysical work. This region is mostly composed of pink and grey coloured porphyritic, and medium grained alaskitic type of granite rocks dated to be Archean age. The porphyritic granite is traversed by numerous dolerite dykes with almost a vertical dip and a little variation in their trend ranging from  $N60^{\circ}E$  to  $N80^{\circ}E$ . Some of these dykes were altered.

During the course of the survey the banded quartz-magnetites deposits of Precambrian age were located at only three villages Kistaraopalli ( $18^{\circ}29'N$  and  $79^{\circ}04'E$ ), Makdampur ( $18^{\circ}29'N$  and  $79^{\circ}12'30"E$ ) and Manjampalli ( $18^{\circ}22'N$  and  $79^{\circ}12'E$ ). The particulars of the dolerite dykes

and quartz-magnetite beds as traced geologically are included in Fig. 1.

Near Kistaraopalli village the quartz-magnetite rocks and basic igneous rocks are present as outcrops forming separate mounds of small dimensions. The Manjampalli deposits extend nearly 1 kilometer in length with an average width of 100ft. The deposit here outcrops only at the ground surface, but not on any elevated topography. Near Makdampur village the deposits form a conical hillock within the porphyritic granite. Their lateral extent is about 1600 ft in length with an average width of 250 ft. An altered dolerite dyke was observed to be running at a distance of about half a furlong south of the Makdampur quartz-magnetite rocks.

The dolerite dykes are running to a considerable length throughout the area, while quartz-magnetites occur as scattered patches only on a limited scale. Quartz-magnetites pinch out at lower depths and indicate shallow sedimentary deposition. This is also confirmed by the absence of outcrops anywhere in the river cuttings in the area.

### 3. Regional magnetic survey

Most of the geologically surveyed area was later covered with an Askania Torsion magnetometer of the vertical type, setting up a total of 450 stations on a regional basis at an average interval of half-a-mile. All the roads and passable tracks were gone over carefully and observations were made for every two furlongs along them. The density of observations was however comparatively less in the portions where there were no passable roads. The anomalies after

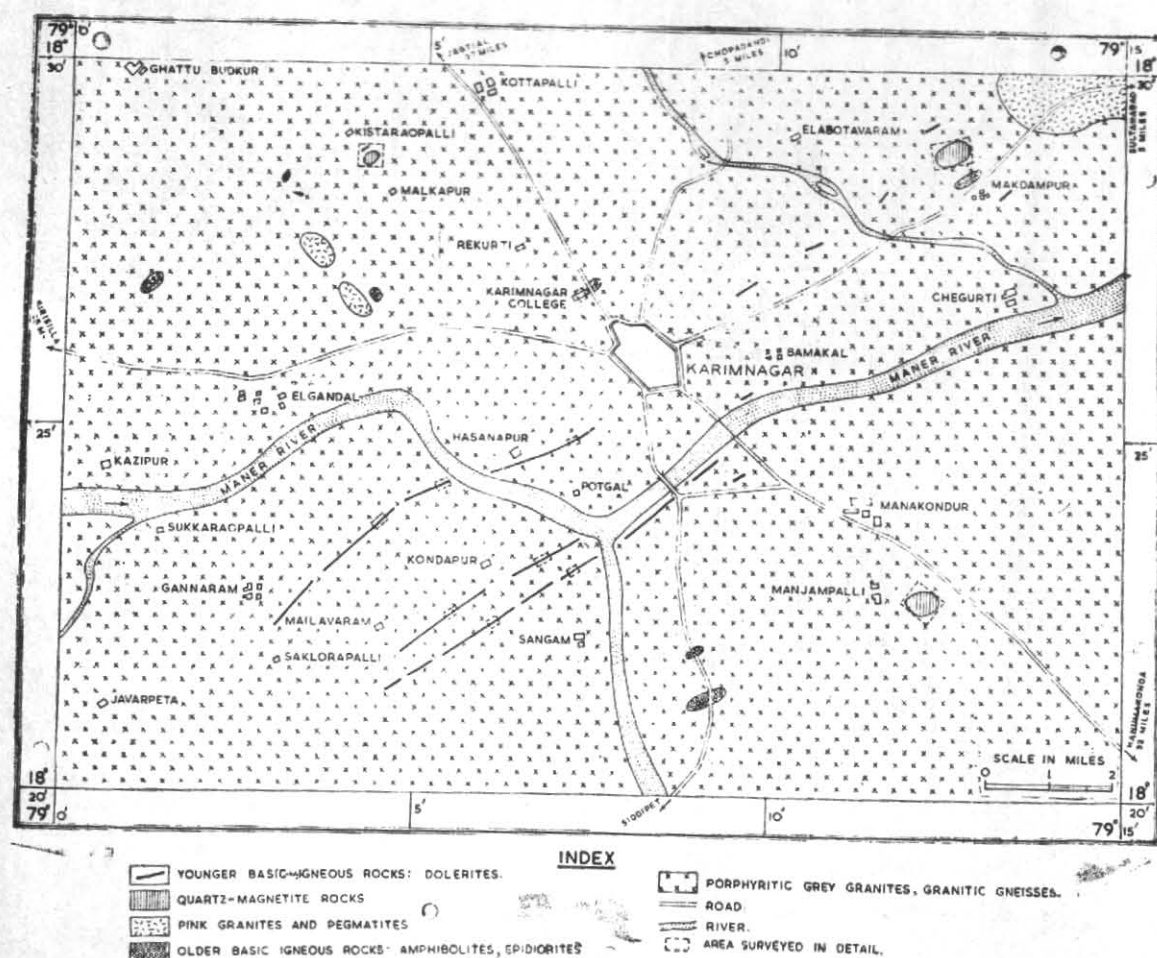


Fig 1. Geological map of Karimnagar area

being corrected for the various effects are presented in the contour map in Fig. 2.

The contour map is a moderately disturbed one and all its individual features can be explained by either the quartz-magnetite deposits or the dolerite dykes. For comparison, these bands are also marked in Fig. 2, along with the anomalies. Anomalies as high as 4,000 gammas are associated with quartz-magnetites, particularly at Kistaraopalli village. Most of the elongations of the contours, particularly in N 60° E direction, follow the trend of the dolerite dykes. As such, it is reasonable to conclude that the anomalies observed in this area need not necessarily be due to quartz-magnetites alone. They can as well be caused by dolerites themselves and due to concentrations of magnetic materials and polarization changes, if any, in the granitic terrain. The only major anomaly closure that cannot be explained by surface out-

crops is one present at Chinta Kunta village (18°26'30" N and 79°5'E) and around. This may be still due to a dolerite dyke covered by overlying alluvium, since they are always seen as small patches of this material all over the area of the survey.

#### 4. Detailed magnetic surveys

To make sure that the anomalies observed here are due to the dolerite dykes alone, some detailed surveys were also conducted at many places immediately above the quartz-magnetites and dolerite outcrops. A part of the area in the college compound was also surveyed, though there does not exist any outcrop, whether dolerite or quartz-magnetite. Only a contact was seen in this area between the dolerites and granitic rocks. The main purpose of this survey is to decide whether or not quartz-magnetites were present in this area. The exact locations of these surveys are given in Fig. 1. At all th

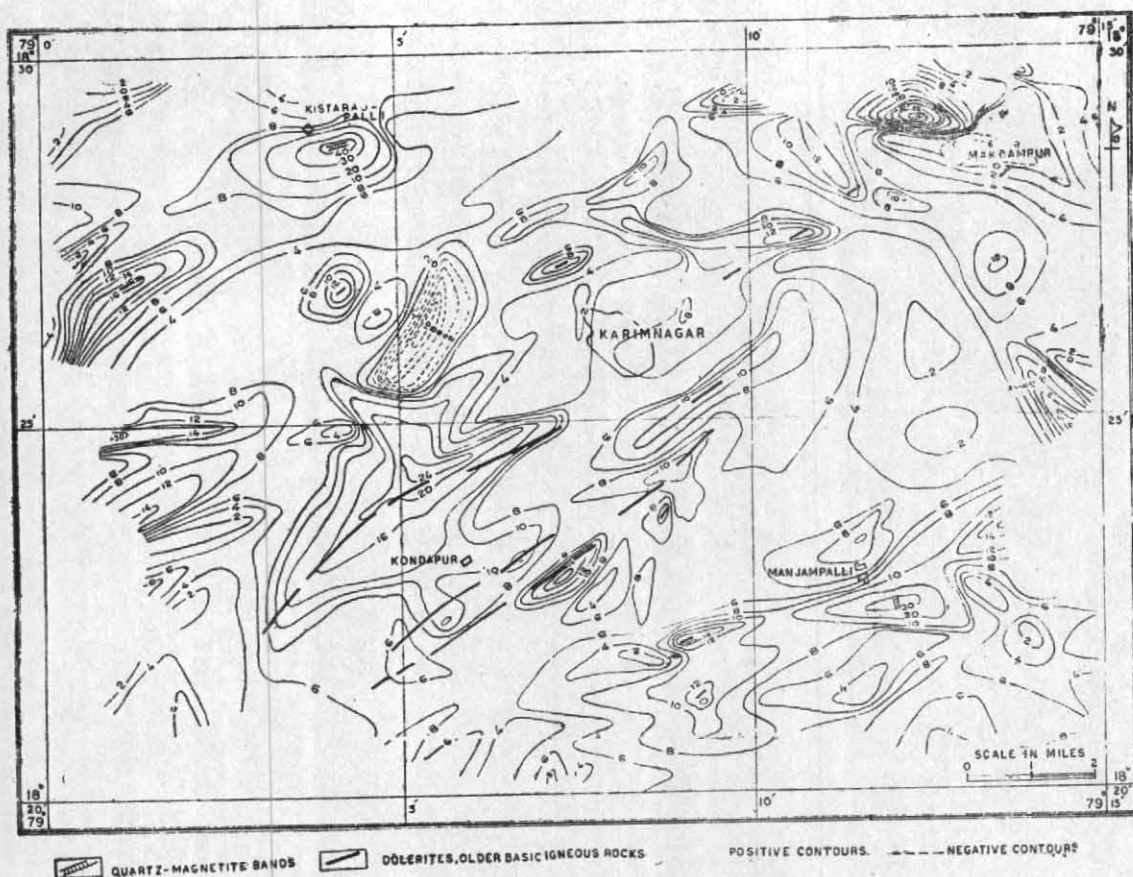


Fig 2. Vertical magnetic anomaly contours : Regional magnetic survey  
(The nos. on the contours indicate the anomalies in hundreds of gammas)

places except in the college area traverses were laid perpendicular to the strike of the outcrop and stations were occupied along them at an interval of 20 ft maintaining the traverse interval of 100 ft. In the college area, where no appreciable outcrops exist, a reconnaissance survey, with randomly occupied stations, was first conducted. This anomaly map showed a trend in the  $N 60^{\circ} E$  direction. Therefore, the proper place, from this map, was located for a detailed survey and the stations were occupied at an interval of 10 ft along  $N 330^{\circ} E$  running traverses, each 20 ft apart.

The maps relating to the dolerite outcrops showed consistent variation in the anomalies. The anomalies are regular and elongated along the strike of the dolerite dykes. The anomalies encountered over the quartz-magnetite beds showed a relatively disturbed picture as expected. Magnetic anomaly profiles were constructed for all these areas and were interpreted by the method of iteration, on the IBM 1130 computer of the Andhra University, by a method first proposed by Rao and Radhakrishna Murthy (1973). Some of the profiles here were also

analysed by the logarithmic analysis of Rao and Radhakrishna Murthy (1967). In all the cases, the causative bodies were equated to vertical dykes of infinite depth extension. The assumption of vertical dip is valid from geological observations and that of the infinite depth does not produce any appreciable error, for the anomaly varies inversely as the cube of the depth.

The various contour maps and the analysis of the profiles are omitted here for paucity of space. Two profiles constructed from the college area, are presented in Figs. 3 and 4. The results of all the profiles are included in Table 1.

The isoanomaly map of the college area clearly defines elongated contours in the  $N 60^{\circ} E$  direction, the general trend of the dolerites of the area. The magnitude of the anomalies obtained over this area also correlate with those on the dolerite dykes. Thus it may be quite likely that dolerites could be passing through the area also.

It can also be seen from Table 1, that the intensity of magnetisation necessary to produce the anomalies of dykes here in the college area is nearer to the dolerites than the quartz-magnetites

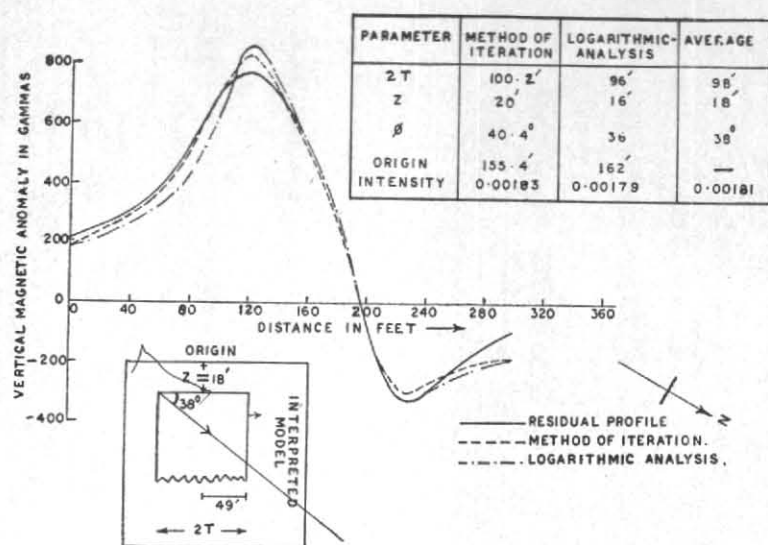


Fig. 3. Interpretation of vertical magnetic profile A B College area

TABLE 1

Profile No.	Profile reference	Type of the body	Logarithmic analysis				Method of Iteration				Strike direction
			Z	2T	$\phi$	I	Z	2T	$\phi$	I	
1	College area Profile AB	?	16'	96'	36°	0.00179	20'	104'	40°	0.00183	N60°E
2	College area Profile CD	?	15'	120'	17°	0.00190	8'	112'	15°	0.00155	N60°E
3	Manjampalli area Profile EF	Quartz-magnetite	18.5'	74'	43°	0.02052	17'	73'	40°	0.02004	N128°E
4	Manjampalli area Profile GH	„	37'	74'	16°	0.02080	39'	61'	16°30'	0.02542	N128°E
5	Makdampur area Profile LJ	„	44'	264'	349°30'	0.01424	40'	256'	348°	0.01327	N55°E
6	Makdampur area Profile KL	„	42'	252'	339°	0.01338	43'	298'	345°	0.01242	N55°E
7	Makdampur area Profile MN	„	5'	350'	1°	0.01000	—	—	—	—	N55°E
8	Kondapur area Profile OP	Dolerite	—	—	—	—	6'	83'	177°	0.00068	N60°E
9	Kondapur area Profile QR	Dolerite	—	—	—	—	7.4'	92'	174°	0.00054	N80°E

Z=Depth to the top of the body from the ground surface  
 $\phi$ =Direction of magnetisation

2T=Lateral width of the body perpendicular to the strike  
 I=Effective intensity of magnetisation

which has an intensity as high as 0.02 c.g.s. units.

##### 5. Laboratory studies

To decide whether or not the dolerites could have an intensity of 0.0018 c.g.s. units, as in the college area, susceptibility and NRM tests of

the various samples of both types of rocks were conducted. The weighted mean of the susceptibility of dolerites has worked out to be  $2.17 \times 10^{-3}$  where as that of the quartz-magnetites is  $34 \times 10^{-3}$  c.g.s. units. The natural remanent magnetism of the quartz-magnetites is  $120 \times 10^{-3}$  c.g.s. units dipping upwards at an angle of

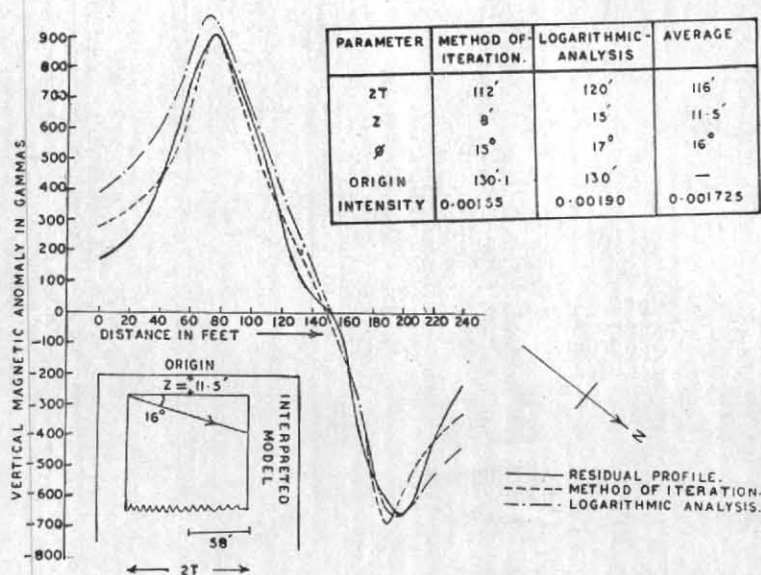


Fig. 4. Interpretation of vertical magnetic profile CD College area

48° and with a declination of 225°. On the other hand, the dolerites fall into two groups with an average intensity of about  $26 \times 10^{-5}$  c.g.s. units each. For one group the declination is N40°E, and the dip is -40°, while for the other the declination is N70°E and the dip is 13°. Obviously, the susceptibility and NRM values of quartz-magnetites are too high to explain the low intensity of magnetisation of the body at the college area. On the other hand, the effective earth's magnetic field has a total field of 0.388 oersteds for the college dyke with an effective dip of about 30° producing the effective induced magnetism of 0.0008 c.g.s. units. The remanent magnetism of the dolerites of the second group, which also dips downwards, can produce at least 0.0008 c.g.s. units of effective magnetism, which when added to the induced one could account for the total effective magnetism of the college dyke. Calculation and explanation of dip of the vector is however not advisable. It is also clear, then, that negative intensities of the dolerites at Kondapur village is due to the fact that they may represent the first group of dolerites, whose NRM opposes the induced magnetism.

#### 5. Conclusion

From the above discussion, the following conclusions may be drawn: (1) the magnetic anomaly trends of the regional survey can be correlated with the dolerite dykes themselves, (2) a dyke-like feature does exist in the college area, whose strike coincides with the strike of the dolerites elsewhere, (3) the magnetic anomalies of this body can be explained by susceptibility and NRM of the dolerites, (4) no outcrops of quartz-magnetites except at three places, were traced during geological mapping.

The final conclusion that follows from this survey is that the causative body for all the observed anomalies is the suite of dolerite dykes running around here. The existence of quartz-magnetite dykes need not be invoked for their explanation.

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