Indian J. Met. Hydrol. Geophys.(1976), 27, 3, 316 318

550.382:551.24 (548.4+282.4)

Domes on the eastern margin of the north Cuddapah basin

V. BHASKARA RAO and G. NARASIMHA SWAMY

Department of Geophysics, Andhra University, Waltair

(*Received 2 December 1975*)

ABSTRACT. The eastern margin of the north Cuddapah basin is characterised by a singular series of peculiar, ellipsoidal domes from Vinukonda upto the *Krishna* river in the north. In the course of the regional magnetic investigations conducted in the north Cuddapah basin and the adjoining areas, it is found that these domes are practically without any expression in the regional anomaly maps. It is suggested that these are probably mere topographic features only, without corresponding reflection in the basement.

1. Introduction

King (1872), the pioneer geologist, who made an extensive study of the geology, structure and tectonics of the Cuddapah basin, described the eastern half of the basin as crushed, folded and also faulted along the eastern margin. The apparent rising up of the lower groups of the Cuddapah system, which are seen as the higher ranges of Nallamalais in the east and also the preponderance of the Cumbum slates there, are ascribed to the original irregularity of the floor of the basin over which the strata were deposited. King described also the peculiar ellipsoidal undulations in the northern part of the basin especially between Vinukonda and Nekarikallu in his Memoir. Foote (1880) also described about the 'singular series of anticlinal domes along the northern end of the eastern boundary of the Cuddapah basin extending from Vinukonda up to the *Krishna* river'.

Narayanaswami (1966) considered the presence of these granite domes at Vinukonda, Ipuru and Nekarikallu as an effect of the domal upwarp on the structural pattern of the synclinal basin. This remarkable tectonic feature of domal upwarp along an axis trending NE-SW across the middle of the basin, marks the zone where the fold axis of the basin swerves from NW-SE to NE-SW. This, according to Narayanaswami, is a post tectonic impress that has happened during the waning stages of the Cuddapah- Kurnool deformation, or possibly during some subsequent orogenic history of this part of the Peninsular shield. This zone of upwarp is supposed to be, probably, the result of some vertical tectonic compressional force following the nearly right angled swerve in the axis of the basin.

The domes at Vinukonda and Ipuru are occupied by post or syntectonic granites, which partly transgress the strata at places and show marked effects of chilling and other contact metamorphic effects on the slates and argillites. While the domes at Vinukonda and Ipuru are bordered by quartzites, the Nekarikallu dome is surrounded by gneisses. The coarse grained granites of these domes, are supposed to be intrusive into the Cuddapahs along their highly disturbed eastern margins. The marginal strata of these domes dip at steep angles in the western side and at low to moderate angled in the eastern side. The copper and lead mineralisations around Agnigundala are localised in beds of quartzites and dolomites in the shear zones flanking the granite domes.

With an objective to investigate the suggested possibility that these domes are the effect of main domal upwarp along the basin axis, regional magnetic studies have been conducted in these areas, which are expected to throw light on the depth extent of these features and the underlying basement configuration.

2. Magnetic Surveys

As a part of the regional magnetic investigations conducted in the north Cuddapah basin, this area has been surveyed with a close network of magnetic observations at 2 to 3 mile intervals spread evenly in the area. The vertical magnetic anomalies have been computed with reference to the primary base established at Vijayawada for the regional gravity and magnetic investigations, conducted by this department in various other areas of the State. For practical convenience and for the purpose of computation of the correction

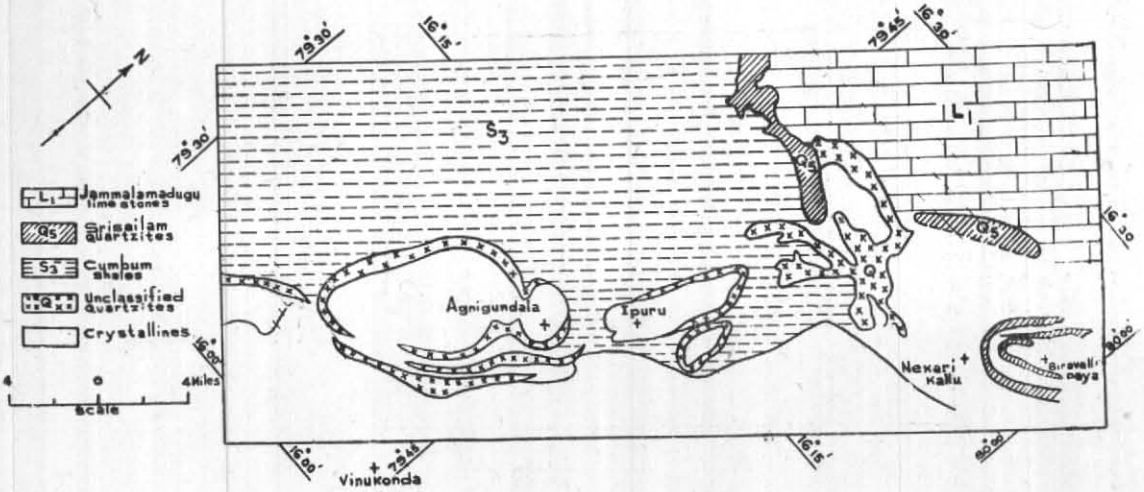

Fig. 1. Geology of the area

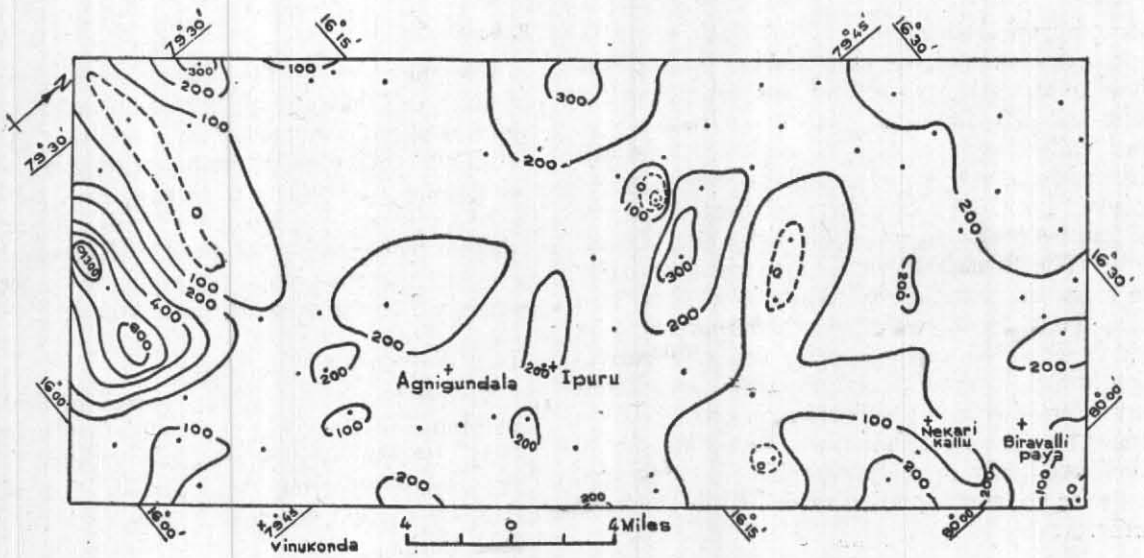

Fig. 2. Magnetic anomaly map of the area

for the diurnal variation of the earth's magnetic field, an auxiliary base at Vinukonda was set up which was later duly tied magnetically with the primary base. Normal correction is applied by using the tables and charts prepared by Vestine *et al.* (1959). The anomalies thus computed are presented in the isomagnetic anomaly map (Fig. 2) with a contour interval of 100 gammas.

The surface geology map (Fig. 1) of the area surveyed shows the domal structures at Vinukonda, Ipuru and Nekarikallu. From the isomagnetic anomaly map, it could be seen that while the high positive anomaly of the order of 1300 gammas and the Vinukonda dome little east of it seems to have some relationship with each other, the Ipuru dome of same composition does not seem to have any significant effect on the vertical magnetic picture. The probable effect of the Nekarikallu dome and he Biravallipaya outlier still to the north, seems to be the 300 gamma anomaly, west of the dome. The inability to get exact correlation of the anomalies with the domes, and their wide displacement in relation to the dome might, perhaps, be due to the effect of numerous dyke intrusives in the surrounding country rock adjacent to the basin and also probably due to the insufficient number of observations over these areas.

Different methods of resolving the observed anomalies into regional and residual components have been applied in the course of the analysis of the data of the north Cuddapah basin. The regional map (Fig. 3) prepared by the graphical smoothing technique (Vajk 1951) was more or less magnetically flat in the area under discussion. Grid

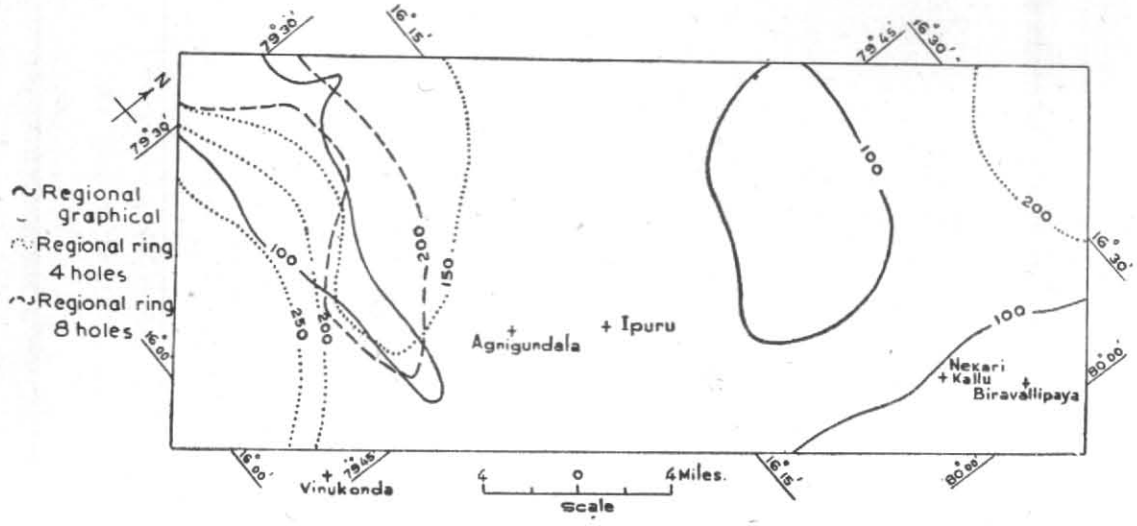

Fig. 3. Regional anomalies

methods were also applied and two rings one with four holes around the circumference and radius equal to unit grid spacing and another with eight holes and $\sqrt{5}$ times grid spacing as radius were used and average of the anomalies around the circumference are plotted as regionals at the centre points. Both, the regionals calculated with a ring of four holes and the regionals with a ring of eight holes (Fig. 3) have shown the area with practically no magnetic disturbance. Thus, it could be seen that though these domes have been represented by widely displaced anomalies with doubtful correlation in the observed anomaly map, they are without any expression in the regional map presented. It might be, therefore, that these domes are, in all likelihood only mere topographic features with little, or no, corresponding reflection in the basement.

3. Conclusion

Thus the series of domes along the eastern margin of the basin, have found no significant magnetic representation in any of the maps and they appear, in all probability, to be mere topographic features with no corresponding reflection in the basement topography. However, it is to be seen whether by increasing the density of observations, a better magnetic picture explaining these peculiar structural features, could be obtained.

Acknowledgements

Financial assistance of the Council of Scientific and Industrial Research, New Delhi for the conduct of the above work is gratefully acknowledged. The authors sincerely thank Dr. M. Gangadhara Rao for the assistance and support during the field work.

REFERENCES

King, W.	1872	*Mem. Geol. Surv. Indian*, **8.**
Foote, R. B.	1880	*Ibid.*, **16.**
Narayanaswami, S.	1966	*J. Geol. Soc. India*, **7.**
Vajk, R.	1951	*Geofisica Pura e Applicata*, 19.
Vestine, E. H., Laporte, L., Cooper, C., Isabelle, L. and Hendrix, W. C.	1959	Description of the Earth's Main Magnetic Field and its Secular Change, 1905-1945, Carnegie Inst. Wash. Publ. 578.