GEOPHYSICAL STUDY OF THE GONDWANA BASINS OF EASTERN MAHARASHTRA by T.S. Ramakrishna, M.S.V. Rama Rao, K.V.S. Bhaskara Rao, D.V. Punekar, Geological Survey of India, Special Publication No.47, Kolkata, 1999, 44p.

The Gondwana rocks of Eastern Maharashtra spanning parts of Nagpur, Wardha, Yeotmal and Chandrapur districts are regarded as an extension to the NW of the better known Pranhita-Godavari basin. The region is under an extensive cover of the Deccan trap and Quaternary. The GSI has been deploying geophysical parties in these areas intermittently for many years, the earliest survey going back to 1948. These programmes were broadly two-fold comprising on the one hand gravity coverage of specific blocks and on the other detailed investigations by electrical resistivity and seismic refraction soundings either as a complement to gravity or independently of it.

While gravity surveys have mapped the Gondwanas under cover and also the underlying basement topography with associated structures, seismic refraction has yielded definitive basement depths besides tracing intrabasinal and boundary faults. However, attempts at differentiating individual members of the Gondwana sequence by resistivity has only met with limited success except in the case of Talchirs which are invariably marked by a diagnostic range of low order resistivities. For instance, recognition of coal-bearing Barakars has been possible only at places but not universally.

The aggregate area involved is around 13,000 sq. km that extends more or less as a linear belt from well beyond Chandrapur in the southeast to Kelod in the northwest. The gravity coverage by earlier workers was confined largely to the northern and southern parts of the belt. The intervening region was covered subsequently for the purpose of this publication, which, in fact, carries a comprehensive Bouguer gravity map of the entire belt (Plate II). This is accompanied by a residual gravity map as well (Plate III) prepared by Griffin's analytical method with appropriate radius. Very thoughtfully, each of these maps are well annotated by copious extracts from the text itself. Even a geological map based on published and unpublished maps for different parts of belt has been compiled (Plate I). All these three are in attractive colour on the same convenient scale of 1:250,000.

Spectral analysis of the Bouguer gravity data has indicated three density interfaces at depths of the order of 6, 12 and 44 km. This information has in turn guided the design of appropriate digital filters in an effort to map the basement and the deeper Moho. Thus, a basement depth contour map has been prepared on the basis of high-pass filtering of Bouguer gravity and inversion. Similarly low-pass filtering and inversion has yielded depth contours that are likely to correspond to undulations in the Moho surface. However, for the purpose of following the basin configuration in future exploration for coal, the authors have relied more on the residual map (Plate III) obtained in the spatial domain. They have also modelled two Bouguer gravity profiles across the belt and cited independent evidence of basement depths from earlier resistivity and seismic surveys in support of their interpretation. The most conspicuous gravity feature of the entire belt in the low around Katol which also they have attempted to model, albeit tentatively, in view of some unknowns and uncertainties with regard to anomaly sources.

Based on gravity it has been inferred that the Gondwanas in this region have been deposited along three distinct axes and are controlled by two deep crustal faults. Gravity is also indicative of an additional area of 4000 sq.km of Gondwanas under trap/Quaternary cover, thus vastly enhancing the potential for coal in the region as a whole.

Arduous retrieval of earlier records and reports from the archives, establishing additional gravity stations in a fairly vast area that was blank, harmonizing and compiling heterogeneous data into a comprehensive Bouguer gravity map and ultimately reviewing and interpreting this larger picture with a view to guide future search for coal – these are the tasks accomplished by the authors culminating in this valuable publication that will be welcomed not only by the coal industry but also by those concerned with the more fundamental issues of evolution of Gondwana basins in general. It has been an admirable effort that should inspire similar undertakings to produce geophysical maps for other areas in the country to guide exploration as well as to provide new geological insights.

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