J. Ind. Geophys. Union, 27(2) (2023), 1-11

Structural inferences from Bouguer gravity data analysis in and around Armoor area, southern part of the Godavari basin, Eastern Dharwar craton (India)

Telu Raju*, Udaya Laxmi G, Linga Swamy Jogu and Kolipaka Venu

Centre of Exploration Geophysics, Osmania University, Hyderabad-500 007, India.
*Corresponding author: teluraju50@gmail.com

ABSTRACT

The Gravity survey area is located south of the Godavari basin in Eastern Dharwar Craton. Bouguer gravity anomaly is prepared which is based on 965 observations acquired at 200-meter station interval in and around the Armoor region (18°30'N-19°00'N and 78°00'E–78°30'E) in Nizamabad district, Telangana state of India, covering an area of about 604 sq km. The Bouguer gravity anomaly reveals the variance from -33 mGal to -54 mGal. The qualitative analysis of the Bouguer gravity anomaly map, low-pass, high-pass filtered and tilt derivative maps, reveal a combination of E-W, N-S and NW-SE trends that coincide with the lineaments and deep-seated faults present in the region. Six highs (H1-H6), three lows (L1-L3), and four deep-seated faults (F1-F4) are identified in this area. The high anomalies are attributed to the basement rocks, basic dykes and mineralized zones (banded magnetite quartzite) while low anomalies correspond to the variations in the peninsular gneissic complex.

Keywords: Armoor area, Eastern Dharwar Craton, Bouguer gravity, Structures, Low pass and high pass filters, Tilt derivatives.

INTRODUCTION

The current research region is located in the eastern Dharwar craton (EDC) in southern part of the peninsular India, belonging to the Archean-Proterozoic age. It is confined between 18°30'N-19°00'N and 78°00'E-78°30'E and covers toposheets E44G1, E44G2, E44G5 and E44G6. The study area is approximately 604 square kilometers and is located in the Armoor (Armur) region to the south of the Godavari basin in Nizamabad district, Telangana state, India. Figure 1 shows the location map of the study area. EDC contains the lithologically oldest rock types of granites, schists and other intrusive igneous rocks that have been extensively studied. EDC evolved through many tectonic events, resulting in the development of secondary structures like faults and folds, that reallocated the basement configuration to the present shape. The various litho-units of the study area includes Archean granites. Gray granites are rich in hornblende and biotite and pink granites are associated with potash feldspar (orthoclase). Amphibolites and plagioclase with little quartz and igneous intrusive (quartz veins, pegmatites, dolerites) and a small portion of chlorite schist and banded magnetite quartzite (BMQ) are found in the study area. Geophysical studies were attempted to better understand the subsurface configuration. Early geophysical studies in this region includes regional gravity (Subramanyam and Verma, 1982; Ramadass et al., 2003; Mishra et al., 2008; Sunil et al., 2010), heat flow (Gupta, 1982; Gupta et al., 1987) and deep seismic profiling across the Dharwar craton (Kaila et al., 1979; Reddy et al., 2003). In recent times also, several parts of the South Indian Shield have been actively probed by the different geophysical methods (Anand and Rajaram, 2002; Ramadass et al., 2006; Mandal et al., 2018; Malleswari et al., 2019; Rama Rao et al., 2020, 2023; Raju and Udayalaxmi, 2021; Lingaswamy et al., 2022).

GEOLOGICAL SETTING

The area under consideration belongs to the eastern Dharwar craton. Detailed geology of the study area is shown in Figure 2. The area contains various litho-units of the oldest rock types belonging to the Dharwar supergroup. They are exposed widely in most parts of the studied area. The Peninsular Gneissic Complex (PGC) rock units are further identified and re-organized based on the variations in their mineralogical composition. Dark coloured or grey granites cover around 15-20% of the study area and contain quartz with plagioclase, chlorite schist, feldspars, amphiboles, hornblende, and biotite. Later on, these grey granites are metamorphosed to hornblende and biotite gneisses. Amphibolites and migmatites are intruded into these grey granites as veins and linear ridges. Pink granites are believed to be younger than the grey granites and are dominated by K-Feldspars of microcline, orthoclase and sanidine. Alkali feldspar granite is medium to coarse-grained, dominated primarily by alkali feldspar with few mafic minerals. The microcline phenocrysts have quartz and twinned plagioclase inclusions with occasional alkali feldspar (Ramakrishna et al., 2016; Praveen et al., 2018). The metamorphic rocks of the EDC show an increase in the grade of metamorphism to southward from greenschist to amphibolite's facies (Jayanada et al., 2013). Amphibolites and pegmatites are intruded into the pink granites. Small clusters of amphibolites and meta basalts are encompassed in to younger pink granites on the SE and SW corners of