ABSTRACT

The location of Java Island within one of the world's active tectonic zones has resulted in the development of complex geological structures. This study aims to construct a 2D model to identify lithological boundaries in the Central Java region. The research was conducted through several stages. First, airborne gravity data were corrected and reduced to obtain Complete Bouguer Anomaly (CBA) data. Subsequently, the CBA data were separated into residual and regional anomalies. The residual anomaly data were processed using 2D inversion modeling with the SimPEG program to produce a lithological model. The CBA values in the study area range from −280 to 240 mGal, with residual anomaly depths of approximately 5,500 m and regional anomaly depths of about 13,000 m. Residual anomaly modeling was carried out along five profiles, each of which produced density variations ranging from −0.4 to 1 g/cm³ relative to an average density of 2 g/cm³. These density variations are capable of detecting fault zone boundaries and geological lineaments. Several fault zones were identified, including the Kendeng Fault, Ungaran Fault, Merapi–Merbabu Fault, Muria Fault, Ambarawa Fault, and Weleri Fault. Furthermore, the estimated basement depth in the study area is approximately 10 km, with density contrast distributions ranging from −0.1 g/cm³ to 0.24 g/cm³ relative to an average density of 2.67 g/cm³. Variations in density contrast indicate differences in basement thickness, where positive values suggest a shallower basement, while negative patterns are associated with a deeper basement.

Keywords: Airborne gravity, Complete Bouguer Anomaly, 2D Inversion, SimPEG, Density Contrast, Northern Central Java.