ABSTRACT

The Muria Peninsula region exhibits geological complexity that is intriguing for research to understand subsurface structures. This study aims to develop a subsurface model based on airborne gravity data and EMAG2-V3 magnetic data. The methods employed in this study include gravity and magnetic data processing, anomaly separation, and inversion modeling. The wavelet transform method is applied to separate regional and residual anomalies. Validation of the results is performed using the upward continuation method to ensure optimal anomaly separation. Residual gravity anomaly modeling is conducted using Python-based SimPEG programming, while residual magnetic anomaly modeling is carried out using ZondGM3D software. The results indicate that the subsurface density model of the Muria Peninsula exhibits low density (1.4 to 2 g/cm³) in the alluvial land area, which is suspected to be the remnant of the ancient Muria Strait. This low density suggests the presence of sedimentary materials such as sand and gravel. Conversely, this area has magnetic susceptibility values 2×10^{-4} - 6×10^{-4} CGS due to shallowing caused by deposits volcanic material. Additionally, a local fault structure oriented north-south is identified in Mount Muria, marked by a low-density anomaly (1.5 g/cm³) within the coordinate range of x 480000 to 485000. The integration of airborne gravity data and EMAG2-V3 magnetic data proves to be complementary in revealing the subsurface characteristics of the Muria Peninsula. Thus, the wavelet transform-based approach in gravity processing and modeling with SimPEG provides more optimal results in understanding subsurface structures. This study is expected to serve as a reference for further geophysical research in similar regions.

Keywords: Airborne gravity, EMAG2-V3 magnetic data, wavelet transform, SimPEG, subsurface modeling, Muria Peninsula.