

Aplikasi Inversi 3D Menggunakan Data Gravitasi untuk Identifikasi Distribusi Densitas Batuan di Zona Prospek Panas Bumi Lebong = The Application of 3D Inversion Using Gravity Data to Identify Rock Density Distribution in the Geothermal Prospect Zone Lebong

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Abstrak

Lebong, Bengkulu merupakan salah satu zona prospek panas bumi yang dilalui oleh sesar aktif, yaitu Sesar Sumatera, yang berperan penting dalam mengontrol sistem panas bumi di wilayah tersebut. Informasi terkait distribusi densitas batuan bawah permukaan di zona ini masih terbatas, terlepas dari pentingnya karakteristik densitas dalam mengidentifikasi jalur migrasi fluida panas bumi dan zona reservoir. Penelitian ini bertujuan untuk mengidentifikasi distribusi densitas bawah permukaan di daerah prospek panas bumi Lebong melalui pemodelan inversi 3D data gravitasi. Pengukuran gravitasi dilakukan dengan jarak antar titik 250 meter pada area seluas 12×10 km. Data yang diperoleh dikoreksi menggunakan koreksi udara bebas, Bouguer (dengan densitas rata-rata 2,5 gr/cc berdasarkan metode Parasnis dan Nettleton), serta koreksi medan, hingga dihasilkan peta anomali Bouguer lengkap. Pemodelan dilakukan dengan pendekatan unconstrained dan constrained inversion yang memanfaatkan pendekatan Cartesian Cut Cell (CCC) dan algoritma Iterative Reweighting Inversion (IRI). Interpretasi hasil pemodelan dikorelasikan dengan data magnetotellurik (MT) dan peta geologi. Hasil analisis menunjukkan adanya zona densitas rendah yang memanjang searah struktur sesar dan terpusat di area graben, yang diinterpretasikan sebagai jalur utama migrasi fluida panas bumi pada zona prospek Lebong.

.....Lebong, Bengkulu is one of the geothermal prospect zones traversed by an active fault, the Sumatra Fault, which plays a significant role in controlling the geothermal system in the area. However, information related to the subsurface rock density distribution in this zone remains limited, despite the importance of density characteristics in identifying fluid migration pathways and reservoir zones. This study aims to identify the subsurface density distribution in the Lebong geothermal prospect area through 3D gravity inversion modeling. Gravity measurements were conducted with a 250-meter station spacing across an area of 12×10 km. The acquired data were corrected using free-air correction, Bouguer correction (with an average density of 2.5 g/cc based on the Parasnis and Nettleton methods), and terrain correction, resulting in a complete Bouguer anomaly (CBA) map. Inversion modeling was performed using both unconstrained and constrained, which utilizes the Cartesian Cut Cell (CCC) method and the Iterative Reweighting Inversion (IRI) algorithm). Interpretation of the modeling results was supported by magnetotelluric (MT) and geological data. The analysis revealed a low-density zone trending parallel to the fault structure and centered in the graben area, which is interpreted as the main fluid migration pathway in the Lebong geothermal prospect zone.