Identifikasi Struktur dan Kedalaman Basement Menggunakan Inversi Gravitasi di Lapangan AYS, Cekungan Sumatera Tengah = Identification of Structure and Basement Depth Using Gravity Inversion in AYS Field, Central Sumatra Basin

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Abstrak

Pada Lapangan “AYS”, interpretasi seismik menunjukkan variasi geometri basement yang signifikan berupa zona high basement dan low basement, namun keterbatasan cakupan lintasan membuat interpretasi bersifat lokal. Untuk mengatasi hal ini, data gravitasi digunakan untuk memetakan struktur dan kedalaman basement secara regional. Estimasi kedalaman dilakukan dengan metode inversi domain Fourier. Analisis struktur geologi dilakukan menggunakan filter Total Horizontal Derivative (THD) dan Directional Horizontal Gradient 45º (DHG). Hasil analisis peta kedalaman menunjukkan bahwa basement regional di Lapangan “AYS” berada pada kisaran +0.2 km hingga -2 km. Zona basement high dengan kedalaman +0.2 km hingga -0.6 km tersebar di barat laut dan tenggara, sedangkan zona basement low dengan kedalaman -0.6 km hingga -2 km terletak di bagian tengah hingga utara-tengah lapangan. Keberadaan zona basement low ini mengindikasikan sub-cekungan dengan akumulasi sedimen yang lebih tebal, yang berpotensi sebagai area prospek hidrokarbon. Analisis THD dan DHG menunjukkan bahwa struktur geologi regional pada Lapangan “AYS” didominasi oleh pola patahan berorientasi barat laut–tenggara. Struktur ini mengontrol variasi kedalaman basement dan membentuk pola tektonik horst dan graben. Zona transisi antara basement high dan basement low yang dikontrol oleh patahan ini berpotensi sebagai jalur migrasi dan perangkap struktural hidrokarbon.

.....In the “AYS” Field, seismic interpretation reveals significant variations in basement geometry, characterized by high and low basement zones. However, the limited coverage of seismic lines results in interpretations that are only local in nature. To overcome this limitation, gravity data is utilized to map the structures and depth of the basement on a regional scale. Basement depth estimation was conducted using Fourier domain. Structural analysis was carried out using the Total Horizontal Derivative (THD) and Directional Horizontal Gradient 45º (DHG) filters. The basement depth map indicates that the regional basement in the “AYS” Field ranges from +0.2 km to -2 km. High basement zones, with depths between +0.2 km and -0.6 km, are distributed in the northwest and southeast areas, while low basement zones, ranging from -0.6 km to -2 km, are located in the central to north-central parts of the field. The presence of these low basement zones indicates sub-basins with thicker sediment accumulation, which may serve as potential hydrocarbon prospects. THD and DHG analysis shows that “AYS” Field is dominated by fault structures trending northwest–southeast. These structures control the variation in basement depth and form horst and graben tectonic patterns. The transitional zones between high and low basement areas, controlled by these faults, are considered potential pathways for hydrocarbon migration and structural traps.