ABSTRAK

IDENTIFIKASI STRUKTUR BAWAH PERMUKAAN BERDASARKAN PEMODELAN DAN ANALISIS ANOMALI MAGNETIK PADA CEKUNGAN WAIPOGA, DAERAH PERAIRAN YAPEN, PAPUA

Oleh

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Penelitian ini mengidentifikasi distribusi anomali magnetik dan memodelkan struktur bawah permukaan Cekungan Waipoga (perairan Yapen, Papua) untuk menilai karakter geologi dan potensi cekungan sedimen. Data marine magnetic yang telah dikoreksi (diurnal, IGRF) diproses menggunakan Surfer dan Geosoft Oasis Montaj; pemodelan inversi 3-D dilakukan dengan ZondGM3D. Analisis mencakup peta medan total, *Reduction to the Pole* (RTP), *upward continuation,* pemisahan regional–residual, serta derivatif spasial (FHD & SVD) untuk menandai zonasi struktural. Hasil menunjukkan nilai AMT berkisar 42,0 nT sampai −234,5 nT; regional 16,6 nT sampai −222,2 nT; residual 16,4 nT sampai −24,6 nT. Pola anomali memanjang berarah SW–NE dengan pola bermagnetisasi tinggi dan rendah. Model 3-D menampilkan zona anomali rendah pada kedalaman 150–400 m (Model 1: UTM 600000–607000; Model 2: UTM 618000–622000) dengan kinematika patahan beragam (*normal, reverse, strike-slip*) dan pengaruh struktural hingga 400 m. Interpretasi menunjukkan sistem patahan termasuk patahan yang mengontrol pembentukan cekungan; terdapat indikasi perangkap berbasis sesar, dan seal berupa *marine shale*. Untuk penelitian selanjutnya, disarankan dilakukan integrasi data magnetik dengan metode geofisika lain serta kajian geologi regional guna memperkuat interpretasi dan meminimalkan ambiguitas model bawah permukaan.

Kata kunci: Anomali Magnetik; Inversi 3-D; Cekungan Waipoga; Data *marine magnetic.*

ABSTRACT

Identification of Subsurface Structures Based on Modeling and Analysis of Magnetic Anomalies in the Waipoga Basin, Yapen Waters, Papua

By

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This study identifies the distribution of magnetic anomalies and models the subsurface structure of the Waipoga Basin (Yapen waters, Papua) to assess geological character and the potential of a sedimentary basin. Corrected marine magnetic data (diurnal, IGRF) were processed using Surfer and Geosoft Oasis Montaj, and 3-D inversion modeling was performed with ZondGM3D. The analysis includes total field mapping, Reduction to the Pole (RTP), upward continuation, regional–residual separation, and spatial derivatives (FHD & SVD) to delineate structural zonation. Results show total magnetic anomaly (TMA) values ranging from +42.0 nT to −234.5 nT; regional component from +16.6 nT to −222.2 nT; and residual component from +16.4 nT to −24.6 nT. The anomaly pattern is elongated in a SW–NE direction with alternating high- and low-magnetization zones. The 3-D models reveal low-anomaly zones at depths of 150–400 m (Model 1: UTM 600000–607000; Model 2: UTM 618000–622000) with varied fault kinematics (normal, reverse, strike-slip) and structural influence down to 400 m. Interpretation suggests that a fault system, including the Waipoga Fault, controls basin formation; there are indications of fault-bound traps with seals consisting of marine shale. For further study, integration of the magnetic data with other geophysical methods and regional geological investigations is recommended to strengthen interpretations and minimize subsurface model ambiguity.

Keywords: Magnetic Anomaly; 3-D Inversion; Waipoga Basin; marine magnetic data.