ABSTRAK

OPTIMASI METODE PARKER-OLDENBURG BERBASIS ALGORITMA GENETIK: STUDI KASUS ENIGMATIK KERAK INDONESIA TIMUR

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Indonesia Timur merupakan sebuah kasus khusus dengan memiliki situasi tektonik yang kompleks, terutama akibat perannya sebagai persimpangan lempeng Eurasia-Australia-Pasifik yang menyebabkan minimnya pemahaman mengenai geometri kerak di bawahnya. Di tengah keterbatasan observasi lapangan, model gravitasi modern menawarkan aksesibilitas data yang dapat digunakan untuk menunjang analisa tektonik di area studi. Parker-Oldenburg merupakan metode inversi yang dapat digunakan untuk mendeterminasi elevasi suatu lapisan tertentu di bawah permukaan, salah satunya adalah topografi Moho. Metode ini bergantung terhadap dua hiperparameter yang membangun algoritmanya, yaitu kedalaman referensi dan kontras densitas Moho, sehingga untuk mengatasi isu-isu klasik, penelitian ini memanfaatkan algoritma genetik untuk mengoptimasi proses inversi tersebut. Implementasinya kemudian dapat mereduksi ketidakpastian inversi hingga < 100 m untuk data gravitasi dana kontrol kedalaman yang cukup representatif. Hasil inversi menunjukkan sebagian besar kedalaman Moho di Indonesia Timur mencapai 34 km dengan kontras densitas yang mengonfirmasi posibilitas lherzolit di bawah kerak Indonesia Timur. Model Moho tersebut juga menunjukkan ketidakstabilan pembebanan kerak akibat gerak progresif Australia ke arah Pasifik di interior Papua dan Palung Weber. Asesmen terhadap model ekuivalen menunjukkan bahwa model inversi tersebut lebih detail dan realistis.

Kata kunci: Algoritma genetik, Indonesia Timur, Inversi gravitasi, Moho, Parker-Oldenburg.

ABSTRACT

ON THE OPTIMIZATION OF EASTERN INDONESIAN MOHO INVERSION BASED ON GENETIC ALGORITHM

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Eastern Indonesia consist of enigmatic case with complex tectonic evolution and inadequate analogus around the globe, which lead a long period of debates and controversies on its crustal geometries. Crustal geometris often defined along the Moho discontinuity, which represents the interaction between crust and mantle beneath. In the absence of adequate data and proper observation, global gravity model offer a great accessibility and capability to look deep inside the Earth's interior; a great help to get a great understanding in that concern. Parker-Oldenburg method is a commonly used clasical interface gravitational inversion for Moho topographic determination. However this method is exessively reliant on its two hyperparameters: Moho density contrast and its reference depth. To overcome those issues, I utilize the promising genetic algorithm to optimize the inversion procedure based on its advantages. The implementation on this study was able to supress the uncertainty to less than a hundred meter with proper and representative gravity data and inversion supervisor. The inversion result reveal that Eastern Indonesian crust submerged $34\ km$ *deep inside the lithospheric mantle, with a confirmation of lherzolitic crust from previous studies based on the density contrast. Isostatic state was determined, and shows the non-equilibrium load due to northward movement of Australia toward Pacific that can be traced in the New Guinean Interior and Weber Deep. Assessment with equivalent models shows a good realism of the inverted Moho.*

Keywords: Eastern Indonesia, Genetic algorithm, Gravitational inversion, Moho, Parker-Oldenburg.