

INTISARI

Pemodelan Struktur Bawah Permukaan Gunungapi Lokon dan Soputan Menggunakan Pemodelan Inversi 3D Berdasarkan Data Gravitasi GGMplus

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Gunungapi Lokon dan Soputan merupakan gunungapi aktif di Minahasa yang memiliki bahaya bencana tinggi, oleh karena itu diperlukan upaya mitigasi. Salah satu upaya mitigasi yang dapat dilakukan yaitu penelitian dengan metode gravitasi. Penelitian ini bertujuan untuk memetakan anomali gravitasi regional dan lokal, menggambarkan struktur bawah permukaan dengan analisis horizontal derivatif dan memodelkan secara 3D struktur bawah permukaan di Gunungapi Lokon dan Soputan.

Penelitian ini menggunakan data sekunder dari GGMplus yang berupa *gravity disturbance*. *Gravity disturbance* (anomali *free-air*) perlu diolah hingga mendapatkan anomali bouguer lengkap, kemudian dikontinuasi ke atas untuk memisahkan anomali lokal dan regional. Anomali lokal dan regional kemudian dianalisis dengan analisis horizontal derivatif dan dimodelkan secara 3D dengan program *Grablox* dan *Bloxer*.

Hasil analisis pola sebaran anomali regional bernilai tinggi berarah baratdaya-timurlaut diduga merupakan *partial melting* dan magma Gunungapi Soputan, Lokon-Empung dan Mahawu. Berdasarkan analisis horizontal derivatif menunjukkan lebar anomali tinggi di Gunungapi Soputan 9,5 km, Lokon-Empung 7,7 km, dan Mahawu 19,2 km × 6 km. Berdasarkan pemodelan 3D terlihat densitas tinggi 3,31 gram/cm³ - 3,45 gram/cm³ di mantel atas yang merupakan *partial melting* dan densitas 2,7 gram/cm³ sampai 2,99 gram/cm³ pada lapisan kerak merupakan magma. Hasil analisis pola sebaran anomali lokal bernilai tinggi di lokasi Gunungapi Soputan, Lokon-Empung dan Mahawu dan diduga merupakan magma Gunungapi tersebut. Berdasarkan analisis horizontal derivatif menunjukkan dimensi pusat anomali Gunungapi Soputan 1,6 km × 2,4 km, sedangkan Gunungapi Lokon 1,3 km × 1,5 km. Berdasarkan pemodelan 3D di area Gunungapi Soputan dan Lokon-Empung terlihat densitas tinggi 2,7 gram/cm³ - 2,99 gram/cm³ yang merupakan magma basaltik penyusun bawah permukaan Gunungapi tersebut. Berdasarkan hasil analisis model anomali gravitasi, telah dibuat model tentatif bawah permukaan daerah penelitian.

Kata kunci: GGMplus, anomali gravitasi, analisa horizontal derivatif, pemodelan inversi 3D, Gunungapi Soputan, Gunungapi Lokon.

ABSTRACT

Modeling of the subsurface structure of Lokon and Soputan Volcano using 3D inversion modeling based on GGMplus gravity data

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Lokon and Soputan volcanoes are active volcanoes in Minahasa which have a high hazard of disaster, therefore mitigation efforts are needed. One of the mitigation efforts that can be done is research with the gravity method. This study aims to map regional and local gravity anomalies, describe subsurface structures with horizontal derivative analysis and 3D model subsurface structures at Lokon and Soputan Volcanoes.

This study uses secondary data from GGMplus in the form of a gravity disturbance. Gravity disturbance (free-air anomaly) needs to be processed to get a complete bouguer anomaly, then it is continued upward to separate local and regional anomalies. Then, local and regional anomalies were analyzed using horizontal derivative analysis and modeled in 3D using the Grablox and Bloxer programs.

The results of the analysis of high-value regional anomaly distribution patterns trending southwest-northeast is thought to be partial melting and magma of Mount Soputan, Lokon-Empung and Mahawu. Based on the horizontal derivative analysis, the height anomaly at Mount Soputan is 9.5 km, Lokon-Empung 7.7 km, and Mahawu 19.2 km \times 6 km wide. Based on 3D modeling, it can be seen that the high density of 3.31 grams/cm³ - 3.45 grams/cm³ in the upper mantle which is partial melting and a density of 2.7 grams/cm³ to 2.99 grams/cm³ in the crust is magma. The results of the analysis of local anomaly distribution patterns are of high value at the Mount Soputan, Lokon-Empung and Mahawu locations and are thought to be the magma of the volcano. Based on the horizontal derivative analysis, the anomaly center dimension of the Soputan volcano is 1.6 km \times 2.4 km, while Lokon Volcano is 1.3 km \times 1.5 km. Based on 3D modeling in the Soputan and Lokon-Empung volcanic areas, it can be seen that the high density of 2.7 grams/cm³ - 2.99 grams/cm³ is the basaltic magma that makes up the subsurface of the volcano. Based on the results of the analysis of the gravity anomaly model, a model of the subsurface geological map of the study area has been made.

Keywords: GGMplus, gravity anomaly, horizontal derivative analysis, 3D inversion modeling, Soputan Volcano, Lokon Volcano.