ABSTRAK

SIMULASI INVERSI TOMOGRAFI SEISMIK WAKTU TEMPUH GELOMBANG P MENGGUNAKAN JEJAK SINAR SEBAGAI IDENTIFIKASI STRUKTUR BAWAH PERMUKAAN GUNUNG MERAPI JAWA TENGAH

Oleh:
Raden roro Hedwigine Amanda Govina Elingtyas Ciptawandira
115.170.037

Studi pada Gunung Merapi dilakukan dengan metode inversi tomografi seismik dari gelombang primer (P) menggunakan jejak sinar *shooting straightforward* sehingga menghasilkan tomogram yang dapat diinterpretasi. Model awal dibuat berdasarkan nilai kecepatan perambatan gelombang P 1-D oleh Wijayanti, Peta Geologi Gunung Merapi oleh Wirakusumah dan model konseptual area Gunung Merapi oleh Chan.

Data sebanyak 83 hiposenter dan 6 stasiun perekam diletakkan pada model awal sesuai karakteristik area penelitian. Model awal tersebut menghasilkan data *input* pemodelan berupa waktu tempuh penjalaran gelombang P. Data tersebut kemudian diberi *noise* untuk menghasilkan data observasi sintetik. Proses pemodelan dan proses inversi menggunakan *damped linear inversion* karena memiliki matriks *Kernell* yang singular.

Analisis tomogram dilakukan pada anomali negatif pemodelan nilai *slowness* yang mengindikasikan adanya fluida yang berasosiasi dengan keberadaan zona lemah. Hasil penelitian menunjukkan adanya satu struktur patahan di bagian Selatan penampang yang berlawanan arah penunjaman dengan dua struktur di bagian Utara penampang. Struktur dalam pada bagian Utara terletak di antara dua kantong magma Merapi. Kantong magma Merapi terdapat pada kedalaman 2.75km dan 3.37 km. Diperoleh nilai resolusi sebesar 37% yang menunjukkan bahwa tomogram hasil penelitian cukup representatif.

Kata kunci: Gunung Merapi; Jejak Sinar; Tomografi Seismik; *Shooting Straightforward*

ABSTRACT

SIMULATION OF P-WAVE TRAVEL TIME SEISMIC TOMOGRAPHY USING RAY TRACING METHOD TO IDENTIFY SUBSURFACE STRUCTURE OF MERAPI VOLCANO IN CENTRAL JAVA

***By*:**
Raden roro Hedwigine Amanda Govina Elingtyas Ciptawandira
115.170.037

Geophysical approach in Merapi Volcano through the seismic tomography inversion method of the P-wave by using ray tracing straight-forward shooting can produce a tomogram that can be interpreted as a description of subsurface condition based on the velocity. The initial model was made based on the value of the P-wave velocity by Wijayanti's research of Merapi subsurface 1-D velocity model, along with Geological Map of Merapi Volcano by Wirakusumah that combine with another conceptual model of Merapi by Chan.

83 hypocenters data according to the characteristics of the research area and 6 recording stations were placed on initial model. Based on it, data input is generated in the form of P-wave propagation travel time. The data is then given noise to produce synthetic observation data. The modeling process and inversion process using damped linear inversion because the Kernel matrix is singular.

Tomogram analysis was accentuated by negative anomaly of slowness which indicates the presence of a weak zone associated with the presence of fluid. The results showed the presence of one fault in the southern part that has opposite direction with two fault in the northern part of tomogram. Deeper fault in the northern area is located between two magma chamber of Merapi. The depth of two Merapi magma chamber are found at 2.75 km and 3.75km. The result has 37% similarities comparing to the initial model that indicate the tomogram is representative.

Keyword: *Merapi Volcano; Ray Tracing; Seismic Tomography; Straightforward Shooting.*