R003-04
D 会場 ： 11/25　AM1（9:15-10:45）
10:00〜10:15:00

#LIMBONG Gita Amelia Marianto[1,2], NURHASAN Nurhasan[2]
[1 東大地震研, [2 バンドン工科大

Two-Dimensional MT Inversion with Impedance and Tipper Response using KLU, Cholesky, and BiCGSTAB Solvers

#Gita Amelia Marianto LIMBONG[1,2], Nurhasan NURHASAN[2]
[1Earthquake Research Institute, The University of Tokyo, [2Bandung Institute of Technology

This study develops a two-dimensional magnetotelluric inversion program utilizing both impedance and tipper responses. The forward modeling in the inversion framework is carried out using a finite element numerical method based on nodes and unstructured triangular elements to solve the electromagnetic field problem formulated as a second-order differential equation. The inversion process is implemented using the Gauss-Newton algorithm, along with several matrix solver algorithms (KLU, Cholesky, and BiCGSTAB) to evaluate computational accuracy and efficiency. Validation of the forward modeling program was conducted using standard COMMEMI 2D-0 and COMMEMI2D-1 models. The average percentage error of apparent resistivity for the COMMEMI2D-0 model ranged from 5.06% to 6.44%, while for the COMMEMI2D-1 model, the range was between 1.80% and 1.95%. Further validation of the inversion program was performed using synthetic Earth models, including a homogeneous Earth model, a layered Earth model, and an Earth model with anomalies. The results from the three matrix solver algorithms show that while different solvers yield similar inversion accuracy, they differ in computational efficiency, particularly in terms of iteration time and memory usage. Among them, the KLU algorithm demonstrated the best performance, with shorter iteration times (200 – 3200 seconds) and lower memory usage (2.0 – 3.1 GB) compared to the others. In addition, the integration of tipper responses significantly improved the modeling results for Earth structures with lateral resistivity variations, producing more accurate outcomes than those obtained without tipper integration.