Geophysical Research Abstracts
Vol. 12, EGU2010-9120, 2010
EGU General Assembly 2010

Electrical conductivity structure from inversion analysis of magnetotelluric data acquired in northern Victoria, Australia

Seong Kon Lee (1), Tae Jong Lee (1), Toshihiro Uchida (2), In Hwa Park (1), Zara Dennis (3), Yoonho Song (1), and Jim Cull (3)

(1) KIGAM, Geothermal Resource Division, Daejeon, Republic Of Korea (seongkon@kigam.re.kr), (2) Geological Survey of Japan, AIST, 1-1-1 Higashi, No. 7, Ibaraki, Tsukuba, 305-8567, Japan, (3) School of Geosciences, Monash University, Wellington Rd., Clayton, VIC 3800, Australia

Two campaigns of MT soundings were carried out successively in 2007 and 2008, in central Victoria, Australia, as a collaboration research between Republic of Korea, Australia, and Japan. The main purpose of these surveys are to investigate electrical conductivity and thus help understanding of tectonic structure in central Victoria, which is believed to be closely linked to mineralization and magmatic processes of this region.
The strategy of MT surveys is to firstly acquire MT data along a seismic surveyed line and then compare electromagnetic and seismic survey results each other to check if the two data set produce the compatible results and/or how much they are correlated and see if we could identify structural similarity in the subsurface apart from the first line by successive MT survey.
For this purposes, the first MT survey was done in 2007 along the seismic transect of 2006 done by Geoscience Victoria, and obtained compatible images between electromagnetic (EM) and seismic methods. As a second stage, the second MT survey was done in 2008 to investigate geological structure of northern part of the first survey line. The survey areas are located in western Lachlan Fold Belts, which is the part of Tasman Fold Belts in southeastern Australia. In both surveys, we locate MT stations in west-east direction considering regional geological strike is in N-S direction. An MT profile of 2008 is almost parallel to the one of 2007 and approximately 50 km away. We operated remote reference (RR) sites in both surveys. We acquired two electric field components and three magnetic field components of MT band from 0.00034 $\sim$ 317 Hz, and extracted impedances of good quality via remote reference processing.
Two-dimensional inversions with various algorithms were done along survey lines. The first MT survey line, which was established along the seismic survey line, shows that the positions of conductivity discontinuity near surface are well matched with the positions of major faults, such as Heathcote Fault, and Mt. William Fault, which are the structural boundary between Bendigo and Melbourne zones in western Lachlan Fold Belts. We could identify high resistivity bodies in inverse models conceived to be Devonian granite or granodiorite, which might be related to mineralization. The boundaries from the interpretation of the reflection seismic data are well matched the high- and low- conductivity boundaries representing folded structure in Bendigo zone, which is reported to be formed by structural shortening during compressional orogenic activity in Silurian. The second MT survey line, which was established north to the first line, also shows that the positions of conductivity discontinuity near surface are well matched with the positions of major fault, such as Avoca Fault, which is the structural boundary between Stawell and Bendigo zone. We also observed high resistivity bodies in inverse model, which are also conceived to be Devonian granite.