3D magnetotelluric imaging of fluid distribution in a seismogenic region, Miyagi, NE Japan

齋藤 全史郎[2]、*小川 康雄[1]、市來 雅啓[3]、佐藤 秀幸[4]、木下 雄介[2]、鈴木 惇史[2]、Amatyakul Puwis[1]
Zenshiro Saito[2], *Yasuo Ogawa[1], Masahiro Ichiki[3], Hideyuki Satoh[4], Yusuke Kinoshita[2], Atsushi Suzuki[2], Puwis Amatyakul[1]

1. 東京工業大学理学院火山流体研究センター、2. 東京工業大学地球惑星科学専攻、3. 東北大学大学院理学研究科、4. 産業技術総合研究所
1. Volcanic Fluid Research Center, School of Science, Tokyo Institute of Technology, 2. Earth and Planetary Sciences, Tokyo Institute of Technology, 3. Graduate School of Science, Tohoku University, 4. National Institute of Advanced Industrial Science and Technology

Northern Miyagi is located in one of the strain concentration zones in NE Japan. This area is well known to have high seismicity and experienced two large earthquakes, the 1962 Northern Miyagi Earthquake (M6.5) and the 2003 Northern Miyagi Earthquake (M6.2). The 2003 earthquake was well studied and its focal mechanism and aftershock distribution support that the earthquake was a high angle reversed fault, which is a reactivation of an originally normal fault, created in the Miocene during the Japan opening. The surface extension of the fault is recognized as a flexure. Geologically, the area is mostly simply covered with thick sediment and is surrounded by granitic rocks of Kitakami Mountains to the east and to the north. The objective of this study is to image the geofluid in three dimensions and relate them to earthquake activities in the region. The previous studies have done by 2D modeling. We used MT data at 67 sites in total: 39 sites are new, 24 sites of them are arranged in an approximately 2 km grid and other 15sites are along E-W profile above the focal area of the 2003 Northern Miyagi earthquake, whereas two older dataset were along profiles, one NEE-SWW profile with 16 sites (Mitsuhata et al., 2001), and one NNE-SSW profile with 12 sites (Nagao, 1997). We inverted the data using WS3dMTINV (Siripunvaraporn and Egbert, 2009). The model showed that two shallow (less than 10km depth) and three deep (deeper than 10km) conductors exist: One of shallow conductors represent sedimentary layers. The thickest part is located around Izu-Numa in the northwestern part of the study area. Another is westward dipping conductor as fractured zone of the fault. The hypocenters of the aftershocks of 1962 earthquake distribute at the deeper extension of this dipping conductive layer. deep conductors are located at more 10km depth near the focal area of the 1900, 1962 and 2003 Northern Miyagi earthquake, respectively. The seismic activity is seen at shallower side of the border between itself and high resistivity anomaly. The deep conductors may imply an anomalous body containing saline fluids originating from slab fluids. And, we noticed that seismic activity is high around the deep conductors covered by high-resistivity, especially, along the fault. This may suggest the episodic migration of fluid from the fluid reservoir to the upper brittle crust triggers high seismicity.

キーワード：地殻流体、比抵抗、マグネトテルリック法、宮城県北部地震
Keywords: fluid, electrical resistivity, magnetotellurics, Northern Miyagi Earthquake

