新潟-神戸ひずみ集中帯の広域的な比抵抗構造

臼井 嘉哉 [1]; 上嶋 誠 [1]; 小河 勉 [1]; 山口 覚 [2]; 最上 巴恵 [3]; 村上 英記 [4]; 丹保 俊哉 [5]; 藤 浩明 [6]; 吉村 令慧 [7]; 大志万 直人 [7]; 小山 茂 [8]; 望月 裕峰 [9]
[1] 東大・地震研; [2] 神戸大院・理・地球惑星; [3] 神戸大院・理; [4] 高知大・理・応用理学; [5] 立山カルデラ博; [6] 京大・院・理学; [7] 京大・防災研; [8] 東大・地震研; [9] 東京大学地震研究所

Large scale resistivity structure across the Niigata-Kobe tectonic zone, Japan

Yoshiya Usui[1]; Makoto Uyeshima[1]; Tsutomu Ogawa[1]; Satoru Yamaguchi[2]; Tomoe Mogami[3]; Hideki Murakami[4]; Toshiya Tanbo[5]; Hiroaki TOH[6]; Ryokei Yoshimura[7]; Naoto Oshiman[7]; Shigeru Koyama[8]; Hiromine Mochizuki[9]
[1] ERI, Univ. Tokyo; [2] Earth and Planetary Sci., Kobe Univ.; [3] Graduate School of Sci.,Kobe Univ.; [4] Dept. Applied Sci.,Kochi Univ; [5] Tateyama Caldera Sabo Museum; [6] Graduate School of Science, Kyoto University
; [7] DPRI, Kyoto Univ.; [8] ERI, Tokyo Univ.; [9] Earthquake Research Institute University of Tokyo

The dense GPS network observation revealed the Niigata-Kobe tectonic zone (NKTZ, e.g. Sagiya et al., 2000), which is the region with large strain rate. In order to figure out mainly why the strain rate is large in the NKTZ, we are investigating the resistivity structure of and around this zone. Because it is necessary to investigate the crust-to-upper mantle large scale structure there, we performed the Network-MT survey over this zone. In this method, the telephone lines are used to measure the voltage differences, so that we can estimate impedance tensors with high S/N ratio in long periods.

We estimated impedance tensors as functions of periods along an array of observation points of voltage differences from Fuchu, Toyama Prefecture to Akigami, Gifu Prefecture. In calculation of the impedance tensors at all the stations, the magnetic field data at Kamitakara, Gifu Prefecture were used, while those obtained at Wajima, Ishikawa Prefecture were utilized as remote reference data (Gamble et al., 1979). As a result, the impedance tensors with small errors were obtained in the period range from 8 to 20000 seconds with the aid of a robust remote reference data processing code (Chave and Thomson, 1989). From these impedance tensors, we estimated the regional strike of the resistivity structure there as N65E-S65W with the approach provided by Swift (1967).

Along the profile perpendicular to the strike, we investigated the two-dimensional resistivity structure by using an inversion code with smoothness constraints (Ogawa and Uchida, 1996). In the inversion analysis, we only used the data of the TM mode. The model obtained from the analysis reconstruct the sounding curves very well (RMS=1.15). Moreover, it has several similar crustal structures with those in the model provided by Yoshimura et al. (2007).

In our model, there exists a conductive area extending from 10km below Akigami to 100km below the Atotsugawa fault. Since the location corresponds to the central part of the NKTZ, we guess this area has some relationships with the large strain rate in the NKTZ.

However, there is the Toyama bay to the north of our investigation area. Its three-dimensional land-sea distribution can affect impedance tensors although these effects are not suitably taken into account in the present two-dimensional analysis. In order to evaluate the effects, we calculated impedance tensors from the model including three-dimensional seafloor topography with a three-dimensional magnetotelluric forward modeling code (Siripunvaraporn et al., 2002). In this model, the sea (0.25 ohm-meter) is inserted into a uniform half-space (100 ohm-meter) by using bathymetry data sets; ETOPO2v2, (NOAA, 2006) and J-EGG500 (JODC, 1998).

As a result of this calculation, it is recognized that the sounding curves of off-diagonal elements have characteristic features at the sites near the Toyama bay; increase of apparent resistivity and small phase (less than 45-degree) from 10 to 1000 seconds. These features are not found in the sounding curves calculated from the model in which the sea (0.25 ohm-meter) is placed two-dimensionally in a uniform half-space (100 ohm-meter).

But, the forward modeling code based on Siripunvaraporn et al. (2002) calculates impedance tensors as the magnetic fields and the electric fields are measured at the same location while in our study the magnetic field data obtained at Kamitakara were treated as those at all observation points. Therefore, in future, we evaluate the effects of the three-dimensional land-sea distribution by calculating the impedance tensors from the electric field of each observation point and the magnetic field at Kamitakara. After that, we then reconstruct more reliable resistivity structure model by quantitatively considering the effects.