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2-D resistivity structures in Akita prefecture by magnetotelluric method

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We study fluid content in crust or mantle by MT (magnetotelluric method) in association with seismic activity. Noritomi (1981), Ogawa et al. (2001), Takahashi (2000MS), Kudo (2005MS), Yamada (2008MS) and Miura (2009MS) etc. observed electromagnetic signals for MT at many points in Akita prefecture, northeast of Japan and put out 2-D resistivity structures. The aim of this study is to enhance the resolution of resistivity structure. I installed new MT sites in the south of Akita prefecture in addition to previous ones and did the survey from April to December 2009. I defined seven EW lines, four NS lines and two oblique lines and analyzed existing data again as well as the newly acquired data.
I used inversion code of Ogawa and Uchida (1996) for resistivity analysis. Computation with the inversion starts with a uniform model of uniform of 100 Ohm-m in exception with the part of the offshore of Japan Sea with 0.3Ohm-m resistivity.
The characteristics of resistivity structure resulted in this study are followings below.
i) There are outstanding high resistivity blocks in depth of 10-20 km at inland of south part of Akita prefecture.
ii) Low resistivity area in depth of around 30 km is widely seen over the area of Akita prefecture.
iii) Western of Akita prefecture has a low resistivity zone in shallower depth less than 10km underground.
iv) Seismic activities tend to exist around boundaries of resistivity blocks.
Sato et al.(2004) examined seismic velocity structure of crust and mantle in the northeast of Japan by seismic reflection method. Following their result, the lower crust can be recognized as the part of P-wave seismic velocity of 6.6-6.7 km/s. The high resistivity blocks described in the characteristic i) exist in the lower crust.
According to Iwasaki (2001), the Moho (Mohorovicic discontinuity) is on around 30 km depth in the northeast of Japan. In addition, Nakajima and Hasegawa (2008) said that S-wave velocity tends to be low around the Moho. Uyeshima (2005) pointed out that low resistivity area may well be regarded as the area of high content of fluid while the high resistivity area lucks for fluid. Consequently, I speculate that the low resistivity described in the characteristic ii) is revealed partial melting area.
Western part of Akita prefecture concentrates fault and foldings on the ground surface. Therefore, rocks in the upper crust at the western part of Akita prefecture have a lot of fractures and cracks filled with fluid water. The low resistivity zone described in the characteristic iii) probably reveals the water content in the fracture and/or cracks in the upper crust.
Honkura(1991) already referred to the relation of seismic activity and resistivity structure. He suggested that seismic activity tend to be high at the boundary between high and low resistivity areas. Previous MT studies in Akita prefecture (Ogawa et al., 2001; Takahashi, 2000MS; Kudo, 2 005MS; Yamada, 2008MS; Miura, 2009MS) as well as other areas confirmed this relation as a whole. The relation of seismic activity and resistivity structure described in the characteristic iv) is not incongruous with previous studies.

Keywords: MT, Resistivity, Seismic Activity, Event of Geology, Akita prefecture