Resistivity structure of the crust across the Northeastern Japan arc

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Wideband magnetotelluric soundings were performed in the central part of the Tohoku district. Along the survey line from Yuri-Honjo to Hanamaki, there exists a data set of MT sounding performed by the Research Group for Crustal Resistivity, Japan (Ogawa et al., 2001). We extended the survey line to the east from Hanamaki to Otsuchi near the Pacific coast. The sounding was performed in 2000 by using MTU-5 manufactured by Phoenix Geophysics Co. Ltd. at 17 sites. Three sites were added in 2007. To avoid discontinuity of resistivity structure near the junction of two survey lines, we analyzed whole data along the line from Japan Sea coast to Pacific coast. Fifty points exist on the line of about 160 km long. We used the frequency range of from 10 to 0.0005 Hz. Electric strike of the crustal structure was assumed as N15E which was estimated by using the Groom-Bailey decomposition (Groom and Bailey, 1989). Two-dimensional resistivity model was estimated by inversion scheme of Ogawa and Uchida (1996). Data of apparent resistivity and phase of TE and TM modes were analyzed. The rms misfit was 2.49 with the error floor of 5 % in apparent resistivity.

In the western half of the survey line, the general distribution of resistivities is similar to the results of Ogawa et al. (2001). From the middle to the eastern half of the line, there are 5 remarkable low resistive zones (LRZ). Two of the 5 LRZ are C3 and C4 conductor in Ogawa et al. (2001). Because of an increase of data on the eastern part, features of C3 and C4 are different from the former results. Two LRZ in the upper crust coincide with the surface distribution of granite in Kitakami Mountains. Shallow conductive area which is on the western side of Tono granite corresponds to the area of ultra basic rocks. Another upper crust LRZ coincides with the Kurihashi granite area. The top of this LRZ exists about 4 km deep, and is much shallower than that of Tono granite area. A remarkable LRZ in the lower crust is at the eastern end of the line.

The distribution of low and high resistive zones coincides with the seismic velocity structure (Iwasaki et al., 2001). Microearthquakes in the crust occur near the edges of LRZs. Refrectors of seismic S-wave (Hori et al., 2004) distribute also near edges of LRZs.