Resistivity structure in the vicinity of source region of the 1923 Kanto earthquake and slow slip events

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The Kanto district is located near the triple-junction of the tectonic plates, where the Philippine Sea (PHS) plate subducts beneath the Eurasian (EUR) plate from the south, while the Pacific (PAC) plate subducts beneath the EUR and PHS plate from the east. Historically, large earthquakes occurred repeatedly in the Kanto district. Recent two major earthquakes in this region were 1923 Kanto earthquake (M=7.8) and 1804 Genroku earthquake (M=8.4). In addition, recent geodetic studies revealed that the slow slip event which is called silent earthquake occurred repeatedly in the vicinity of Boso Peninsula. Seismological studies such as the controlled source exploration and seismic tomography have revealed the configuration of subducting plates and the physical conditions in the source region of above tectonic events.

In this study, we studied the electromagnetic condition of plates and the subsurface structure. We carried out the magnetotelluric (MT) surveys in the southern part of Boso Peninsula in 2001 and 2005. The observation points distribute on the 2 north-south baselines which across the Kamogawa graben, therefore, we obtained 2 resistivity images.

The models show that high resistivity block exists between the relatively conductive layers. This high resistivity structure may be interpreted as subducting PHS plate, and the layers above and below of PHS plate may be coincident with EUR and PAC plates, respectively. The thickness and resistivity values of PHS plate are similar with those in the Tokai region (Utada et al., 1987). The conductive layers, of which the depth is less than 30 km, indicate lateral heterogeneities. There is a clear vertical boundary just beneath the northern marginal fault of the Kamogawa graben. The extremely conductive layers in the northern and southern areas are coincident with the forearc basin and accretionary prism, which are associated with the subduction of PHS plate. Distribution of high conductivity zone is quite similar with low velocity zone of seismic waves (Matsubara et al., 2005; Sato et al., 2005). These spatial variations may be interpreted as the heterogeneous distribution of fluid (Hyndman, 1988).

The resistivity of uppermost PHS plate indicates east-west variation. Depth to the upper boundary of PHS plate seems to be almost same among two baselines, however, thickness of extremely conductive layer is different. Same tendency has been shown by the receiver function analyses in the Kanto district (Igarashi et al., 2004). The depth to the resistive PHS plate under the northern marginal fault shows curve of a bow shape in the western profile, while almost flat in the eastern one. Such difference may be caused by the presence of conductive layer of uppermost PHS plate, moreover, it may affect the coupling of plates. The study area is closed to the focal zone of 1923 and 1804 earthquakes, and slow slip events. Our resistivity mode may suggest a relationship with the occurrence of these tectonic events. We intend to discuss their relations in the presentation.