

New technology of marine EM survey

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The resistivity image deduced by Electrical-Magnetic survey is an important information to estimate subsurface structure. EM surveys have been applied to natural resource survey. Moreover, resistivity imaging for investigation around the earthquake area and volcano scientifically have obtained many excellent results. On the other hand, the marine EM survey technology have made remarkable progress in recent.

It is important for the investigation of mega-thrust earthquake to estimate the water distribution of the earth crust and mantle. EM survey is a powerful tool because resistivity image is very sensitive to the existence of water. Our research group carried out the land and marine MT surveys in the Kii peninsula and the offshore Kii Peninsula where the 1944 Tonankai earthquake occurred. Kasaya et al. (2005) constructed a 2D resistivity model using inversion technique. The modeled resistivity structure imaged the resistive Philippine Sea Plate, and its resistivity becomes more conductive as the plate subducts. Moreover, the resistivity of the oceanic crust exhibits complex change.

It is important to obtain an accurate image in the shallow depth for the comparison with the core sample and electrical logging. To estimate the accurate shallow resistivity image, small-sized instrument with high sampling rate and GPS synchronized clock is needed. However, existing Ocean Electro-Magnetometers (OBEMs) are large shape with the heavy metallic frame. Our research group developed small-sized OBEMs that satisfied new needs, and Two times test observations with new instruments have already succeeded.

On the other hand, submarine DC resistivity survey and marine EM survey using artificial source have been making progress. Inoue (2005) produced submarine DC resistivity instrument, and reported some result in the shallow sea. Our group also developed a deep sea DC resistivity sounding system with towing electrode cable above sea bottom. We tried a sounding off Sado area in Japan sea, and obtained very interesting result relating with the methane hydrate. Furthermore, marine EM survey using active source have been studied (e.g. Evans et al., 1999; Tada et al., 2005). By integrating each sounding method, we will be able to obtain a detailed image in any depth.